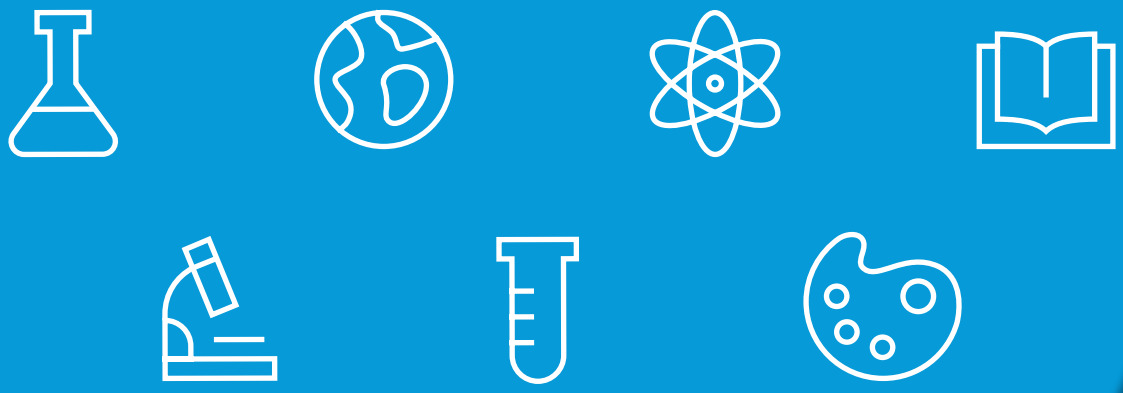
GW Research SHOWCASE



2022 ABSTRACT SUBMISSIONS

THE GEORGE WASHINGTON UNIVERSITY

WASHINGTON, DC

TABLE OF CONTENTS

GW Research SHOWCASE

SCHEDULE OF EVENTS

DATE	TIME	ABOUT *(All links to programs can be found on the website)*
APRIL 10	**12-1:30PM ET** GW UNDERGRADUATE REVIEW RELEASE EVENT Virtual via Zoom	The members of the GW Undergraduate Review (GWUR) are pleased to announce the release of Volume V of the annual undergraduate research journal. Volume V includes research papers authored by nine outstanding undergraduate researchers, all of whom possess different academic interests and concentrations. Join us to celebrate their contributions to student research at GW!
APRIL 11	**12-1:30PM ET** CAREERS IN RESEARCH: PERSPECTIVES FROM GW ALUMNI AND CAREER COACHES Virtual via Zoom	Join alumni and students for a panel discussion where GW alumni and career coaches will share their experiences and insights working in research roles in various industries and sectors, moderated by GW Career Coach, Katherine Greene. Current students and alumni are invited to attend this session to learn more about how to secure research positions after graduation, how to leverage student research experience in the job search process, and other tips and tricks about becoming a researcher beyond GW! This event will offer insights with alumni and students interested in pursuing a career in the research field (or who are currently working in it). Following the discussion, there will be a Q&A session with the panelists. This event is open to all GW students and alumni. Panelists include: • **Marian Ackun-Farmmer**, **Ph.D.**, **SEAS BS '12** | Postdoctoral Researcher, Department of Biomedical Engineering, University of Maryland • **Rebecca 'Toyin Doherty**, **GSEHD MA '06** | Founder, ALVAINA Foundation • **Kalpana Vissa**, **GWSPH BS '18**, **MPH '20** | Presidential Management Fellow - Management Analyst, Department of Health and Human Services Office of Inspector General and Adjunct Faculty Instructor, The George Washington University School of Medicine and Health Sciences • **Dennis Weeks** | Career Coach, GW Center for Career Services
	2-3PM ET SHARING KNOWLEDGE: PUBLISHING STUDENT RESEARCH AND SCHOLARSHIP AT GW Virtual via Zoom	Student leaders from multiple student publications a GW will describe the importance of publishing one's research and scholarship, the eligibility requirements and review/selection processes for their publication, as well as opportunities to get involved with their organization as a staff member. This session is open to all current students and will cover opportunities for both undergraduate and graduate student researchers. Panelists include: • **Brett Litzler**, **MPP '22** | Executive Director, *Policy Perspectives* • **Jessica Bride**, **BA '22** | Editor in Chief, *Undergraduate Review and Capitol Letters* • **Samantha Barnes**, **MA '22** | Editor in Chief, *International Affairs Review* • **Andrew Khanin BA '24** and **Elijah Karshner BA '22** | Managing Editor and Editor-in-Chief, *Undergraduate Economics Review* • **Nikhil Samuel**, **BA '24** | Chief Editor, *Onero Institute* • **Bailei Hardy**, **MA '23** | Director of Publications, *DC Student Consortium on Women, Peace, and Security*
APRIL 12	**12-4:30PM ET** UNDERGRADUATE STUDENT POSTER PRESENTATIONS Virtual via Zoom	Undergraduates from across the university will present their research posters to judges and compete for prizes. These sessions will be conducted online via Zoom and are open to the GW community. Presentation details are linked from individual posters in the GW Research Showcase 2022 iPoster Gallery.

GW Research SHOWCASE

DATE	TIME	ABOUT *(All links to programs can be found on the website)*
APRIL 13	**11AM-4:30PM ET** GRADUATE AND PROFESSIONAL STUDENT POSTER PRESENTATIONS Virtual via Zoom	Graduate and Professional Students from across the university will present their research posters to judges and compete for prizes. These sessions will be conducted online via Zoom and are open to the GW community. Presentation details are linked from individual posters in the GW Research Showcase 2022 iPoster Gallery.
	4-5PM ET MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH PRIZE CEREMONY Virtual via Zoom	Join Milken Institute School of Public Health (GWSPH) research leadership for a celebration of its GW Research Showcase winners in undergraduate and graduate student categories. GWSPH Dean Lynn Goldman and an invited keynote speaker will provide remarks.
APRIL 14	**11AM-4:30PM ET** SPECIAL PRIZE CATEGORY POSTER PRESENTATIONS Virtual via Zoom	Undergraduate, graduate, and professional students whose research has been selected for additional prize categories will present their research posters to judges and compete for prizes. These sessions will be conducted online via Zoom and are open to the GW community. Presentation details are linked from individual posters in the GW Research Showcase 2022 iPoster Gallery. • *Clinical and Translational Research Student Organization* • *Clinical and Translational Science Institute at Children's National* • *Cancer Center* • *Global Women's Institute* • *Honey W. Nashman Center for Civic Engagement and Public Service* • *Humanities Center* • *Nanofabrication & Imaging Center* • *Office for Diversity, Equity and Community Engagement* • *Office of Innovation and Entrepreneurship* • *Office of Sustainability* • *Office of the Vice Provost for Research*
	6-8PM ET NEW VENTURE COMPETITION FINALS CEREMONY	**Jack Morton Auditorium | 805 21st Street NW, Washington, DC 20052** After 2.5 months and 4 rounds of competition, we are almost ready to announce this year's winners of the NVC! Join us to hear from the winning teams, and many special guests who help make this event possible.
APRIL 22	**ALL DAY** SEAS R&D SHOWCASE	**Science & Engineering Hall | 800 22nd Street NW, Washington, DC 20052** The SEAS Student Research & Development Showcase was founded by SEAS alumnus Randolph "Randy" Graves in 2007 and has become an annual event for the school. The Showcase celebrates and highlights more than 100 state-of-the-art research projects being conducted by undergraduate, master, PhD students, postdoctoral scholars, and research scientists across the school.
APRIL 27	**2-3:30PM ET** GW RESEARCH SHOWCASE 2022 WINNERS RECEPTION	Winners of GW Research Showcase 2022 category-based and special prizes and their mentors are invited to a reception to receive their certificates and celebrate their contributions to student research across an array of disciplines at GW! Invites to winning students, mentors, and affiliated staff will be sent via email. Opening remarks will be given by Provost Christopher Bracey and the keynote address will be given by Vice Provost for Research Pam Norris. Light refreshments will be provided.

For more information
visit **researchshowcase.gwu.edu**
or email **ResShowcase@gwu.edu**

@GWResShowcase

THE GEORGE WASHINGTON UNIVERSITY
WASHINGTON, DC

GW RESEARCH SHOWCASE 2022 WINNERS
UNDERGRADUATE STUDENT RESEARCH DAY

Discipline-Based Presentation Winners

Biological Sciences	**Chloe Shaw (CCAS)** *Bald sea urchin disease progression and recovery in the sea urchin, Strongylocentrotus purpuratus, and a characterization of the pathogenic microbiome.*
Biomedical Engineering I	**Rahil Patel & Destie Provenzano (SEAS)** *An evaluation of the applicability of T1W MRI based facial anonymization algorithms to 3-dimensional volumetric renderings of computed tomography (CT) data*
Biomedical Engineering II	**Faisal Al Munajjed (SEAS)** *CyBIS Prototype to Rapidly Measure Human Immune Response Severity and Detect Infection*
Chemistry	**Speline Irakoze (CCAS)** *Diverse Postfunctionalizon of Iodo Substituted Magnetic Complezes Using Palladium Catalyzed Coupling Reactions*
Ecology and Biological Anthropology	**Rheya Sward (CCAS)** *Shrubification of maritime forest understories: A response to sea level rise and climate change*
Economics and Organizational Sciences	**Shaelyn McCarthy (CCAS)** *Gender Stereotypes and Leader Prototypes in Male-Dominated Organizations* **Tyler Andrew Lackey (CCAS)** *The Transformational and Charismatic Leadership of Malcolm X*
Health Sciences	**June Sass (SPH)** *Aspergillus Fungi Display Emerging Multi-Drug Resistance to Anti-fungal Medications in California Clinical Isolates* **Alyssa Stark (CCAS)** *Large Field of View High-Resolution Scanning Electron Microscopy to Evaluate Neuronal Synapses Throughout the Hypothalamus*
History	**Ryan Singsank (CCAS)** *Being the Perfect Host: The Reagan Administration and the Boycotts of the 1984 Olympics*
Humanities	**Winnie Lokule (CCAS)** *Ugandan Literature: How Language Informs Culture in "Song of Lawino" and Kintu* **Simon Saliby (CCAS)** *Citizen Energy: Examining the Role of Citizens in Promoting the Social Acceptance of Germany's Energy Transition*
International Affairs: Studies in Gender & Development	**Olivia Issa & Emmanuelle Dyer Melhado & Sara Alassaf (CCAS)** *Key Recommendations for Higher Education Institutions to Provide Non-Financial Support to Refugee-Background Students*
International Affairs: Conflict and Security Studies	**Amanda Msallem (ESIA)** *The Complex Crisis of Lebanon: Humanitarian Escalation, Economic Vulnerability, and Limitations of Practitioner Response*
Physical Sciences	**Marisa Lazarus (CCAS)** *Characterization of Cold Plasma Jet Plume Lengths* **Sean Letavish (SEAS)** *Virtual Reality in the Semiconductor Industry*

Political Science and Communication	**Zachary Nosanchuk (SMPA)** *The Politics of "Defund the Police": A Study of the Dispersion of Left-Wing Messaging in 2020's U.S. House Elections* **Mallory Thompson (ESIA)** *Understanding the Female Participants of the Capitol Riot*
Psychology	**Olukemi Green & Lauren Kiker (CCAS)** *Examining the Feasibility and Acceptability of a Virtual Wellness Group for African American Mothers during COVID-19*
Public Health I	**Hannah Edwards (CCAS)** *Vitamin D Deficiency: The Silent Killer of the Black Population*
Public Health II	**Amalis Cordova-Mustafa (SPH)** *Risk of Eviction and Mental Health During the COVID-19 Pandemic*
Socio-Cultural Studies	**Jurnee Louder (CCAS)** *For Imposters, By Imposters: Community-Engaged Research to Mitigate Imposter Phenomenon Prevalence in Peer Tutors*
Studies in Economic Geography and the Built Environment	**Grace Traylor (CCAS)** *Captive Communities: An Examination of the Distribution of Dollar General Stores in Rural and Low-income Communities*
Studies in Neuro and Psychological Development	**Justin Grady (CCAS)** *Conscientiousness protects visual search performance from the impact of fatigue*

GRADUATE AND PROFESSIONAL STUDENT RESEARCH DAY
Discipline-Based Presentation Winners

Art and Clinical Psychology	**MaryJo Parsley (CCAS)** *A Research Proposal: Isolation and Haptic Art Therapy Techniques During the COVID-19 Pandemic*
Biomedical Engineering	**Julie Han (SEAS)** *CRISPRi Gene modulation of Cardiac Electrophysiology in Pre-differentiated Cardiomyocytes*
Biomedical and Mechanical Engineering	**Nora Caroline Zalud (SEAS)** *Blood Flow Induced Onset of Cardiovascular Diseases – The Effect of Entrance Flow Development on Wall Shear Stress in a Carotid Artery Bifurcation Model*
Business and Society	**Yuxi Cheng (GWSB)** *Immigration Policy Shock and Firm Skill Downgrading: Evidence From DACA*
Climate Change and its Implications	**Rachel Spiegel (CCAS)** *60 Years of Permafrost Monitoring in Utqiagvik, Alaska*
Curriculum, Instruction and Educational Access	**Titiksha Raj Kashyap (GSEHD)** *Empower Using Assessment: Using AIG to Create Formative Assessments*
Organizational Science and Leadership	**Chilanay Safarli (GSEHD)** *Women Leadership in Central Eurasia: Implications for HRD in Azerbaijan*
Physical Sciences	**Jiawei Meng (SEAS)** *Electrical Pulse Driven Multi-Level Nonvolatile Photonic Memories Using Broadband Transparent Phase Change Materials*
Studies in Chemical and Biological Sciences	**Hannah Jacobson (CCAS)** *The Role of the Ancient Gut Microbiome in Metabolism and Energy Harvesting*

Studies in Data Sciences and Mathematics	**Keshav Srinivasan (CCAS)** *Cohesive Powers of Directed Graphs*
Studies in Engineering and Data Analysis	**Laura Roberson (SEAS)** *Comparing Consumer Preferences for Electric Vehicle Financial Incentives*
Studies in International and Special Education	**Adam Berman (GSEHD)** *Making Work Work; Improving Employment Outcomes for Autistic Adults*
Studies in Mechanical and Electrical Engineering	**Ryan Welch (SEAS)** *The Nano- and Micro-Structures formed due to Laser Processing Bi2Te3, SiGe, and CoSi*
Studies in Psychology	**Emma Siritzky (CCAS)** *Associative binding occurs for both task-relevant and task-irrelevant features in visual search*
Studies in Society and Culture	**Madeline Hall (CPS)** *Ranking System Intentions and Impact: Examining the Role of Public Measures in Promoting Gender Equity in the Workplace*
School of Nursing	
First Place	**Chibuzo Efuribe** *Effect of a Web-based Educational Intervention in Improving Depression Knowledge and Help-seeking Behavior in Women* **Keesha Holmes** *Ventilator-Associated Pneumonia Bundle Compliance: A Quality Improvement Project*
Second Place	**Amy McCarthy** *The Impact of Mentorship on Nurses' Level of Self-Efficacy and Motivation to Pursue Board Leadership Positions* **DeeDee Foster** *Structured Type 2 Diabetes Education to Improve Self-Monitoring Blood Glucose, Self-Care Management, and Diabetes Knowledge in a Multicultural Family Practice Clinic*
Third Place	**Elizabeth Choma** *A Community Educational Intervention to Improve Firearm Safety Behaviors in Families* **Kymberlee Cox** *Certified Nurse Program: Mitigating Barriers to Certification* **Kimberly Madison** *Antibiotic Stewardship for Asymptomatic Bacteriuria in Older Adults Residing in Long-Term Care at End-of-Life*
Milken Institute School of Public Health	
First Place - Masters	**Alana Herran** *Association Between Perceived Neighborhood Crime and Physical Activity: A Systematic Review on Adults Living in Urban Environments* **Catherine O'Donnell** *Prenatal Exposures to Air Pollution and Maternal and Fetal Thyroid Function: A Systematic Review*
First Place - Doctoral	**Rebecca Robbins** *A nuMoM2b Heartland-Specific Pregnancy Exposure and Result Study: Associations between Glyphosate, Aminomethylphosphonic Acid (AMPA), 3-[hydroxy(methyl)phosphinoyl]propionic acid (MPPA), and Gestational Diabetes Mellitus.*

Second Place - Doctoral	**Jasmine Kaidbey** *Impacts of the COVID-19 pandemic on children's sugary drink consumption: A qualitative study*
First Place - Recent Alumni/Professional	**Emily Weiss** *The Patient Voice: A Qualitative Evidence Synthesis of Women's Experiences of Cervical Cancer in Sub-Saharan Africa*
Second Place - Recent Alumni/Professional	**Jasmine Slusser** *Masked Maltreatment: A Study of Child Abuse Reporting in Berks County, Pennsylvania During COVID-19*

School of Medicine and Health Sciences

First Place	**Mary Salgado** *Pathogen Reduction of Whole Blood using UV Light and Riboflavin and its Effects on Frozen Red Blood Cell Components Post Deglycerolization and Storage at 1-6 °C for 14 Days*
Second Place	**Chet Voelker** *Determining the Efficacy of Saliva in the Detection of SARS-CoV-2 Using Contrived and Clinical Samples*
Third Place	**Bryan Sullivan** *Contribution of Perceived Patient Self-efficacy and Hospital Readmissions: A Case-control Study*

Institute of Biomedical Sciences

First Place	**Brendan Mann** *Persistent Dysregulation of Vδ1 T Lymphocytes in ART-Suppressed People Living with HIV*
First Runner Up	**Jacob Medina** *Photothermal Therapy of Melanoma with anti-CD137 Coated Prussian Blue Nanoparticles*
Second Runner Up	**Samantha Dow** *Sexual Dimorphism in Brain Cellular Senescence During Angiotensin II-Induced Hypertension*
Third Runner Up	**Erin Grundy** *Identification and Generation of Repetitive Element-Specific T Cells to Target Ovarian Cancer*

SPECIAL PRIZES

Cancer Center

Cancer Laboratory Science Prize	**Erin Grundy (SMHS)** *Identification and Generation of Repetitive Element-Specific T Cells to Target Ovarian Cancer*
Population Science and Health Equity Cancer Research Prize	**Michael Wynne & Charles Klose & Joyce Chen & Brandon Waddell (SMHS)** *Gleason upgrading between Region of Interest-directed vs. systematic template biopsy for mpMRI PIRADS 5 lesions*

Clinical and Translational Research Student Organization

Clinical and Translational Research First Place	**Hannah Smith (SMHS)** *Sex-Dependent Impact of Losartan on Anxiety and Hyperreactivity*

Clinical and Translational Research Second Place	**Jacob Medina (SMHS)** *Photothermal Therapy of Melanoma with anti-CD137 Coated Prussian Blue Nanoparticles*

CTSI-CN

Promoting Health Equity in Clinical and Translational Research Prize	**Hannah Rapoport (SPH)** *Effectiveness of Digital Delivery of Type 2 Diabetes-Related Lifestyle Interventions in Decreasing A1c: A Systematic Review* **Catherine Zwemer (SMHS)** *Penetrating Trauma in Women* **Samantha Dow (SMHS)** *Sexual Dimorphism in Brain Cellular Senescence During Angiotensin II-Induced Hypertension* **Yumin Kim (SMHS)** *Artificial Intelligence in Coronary Artery Disease Imaging: Has the Future Arrived?*

Global Women's Institute

Women's Rights and Gender Equality First Place Undergraduate	**Nur Bookwala (CCAS)** *The role of artificial intelligence and automation in the diagnosis and management of otitis media*
Women's Rights and Gender Equality Second Place Undergraduate	**Caroline Pickering (ESIA)** *Women and Agroecology: Inclusion, Exclusion, and Empowerment in Peru*
Women's Rights and Gender Equality First Place Graduate	**Krishna Patel (SPH)** *Explanatory Pathways of Female Genital Mutilation/Cutting among Women with Daughters in Kenya: The Modifying Effect of Law*
Women's Rights and Gender Equality Second Place Graduate	**Dagmawit Teka (SPH)** *Addressing FGM/C in the DMV: Creating an Integrated Community of Care*

Humanities Center

First Place - Undergraduate	**Izy Carney (CCAS)** *"Dirty Work" Pay: Environmental Racism and the 1970 Washington, D.C. Sanitation Strike*
Second Place - Undergraduate	**Wyatt Kirschner (CCAS)** *Counterintelligence and SDS at George Washington University*
Honorable Mention - Undergraduate	**Winnie Lokule (CCAS)** *Ugandan Literature: How Language Informs Culture in "Song of Lawino" and Kintu*
Honorable Mention - Undergraduate	**Ella Rauer (CCAS)** *An It Girl Never Dies: The Revival of Margaret "Peggy" Shippen*
First Place - Graduate	**Atticus Johnson (TSPPPA)** *The Semiotics of Urban Redevelopment: The Policy Agenda of Public Murals in Historically Black Neighborhoods in Washington, D.C.*
Second Place - Graduate	**Ariana Kaye (CCAS)** *Andy Warhol's Photographs*
Honorable Mention - Graduate	**Samuel Burmester (GSEHD)** *Critical Circulation Literacy, Multimodal Composition, and Social Change Making*

Nanofabrication and Imaging Center	
Nanofabrication	**Jiawei Meng & Nicola Peserico & Xiaoxuan Ma & Volker J. Sorger (SEAS)** *Electrical Programmable Low-loss high cyclable Nonvolatile Photonic Random-Access Memory*
Microscopy	**Weizhen Li & Julie Han & Emilia Entcheva (SEAS)** *Multiparameter pipeline assessment of cardiac electrophysiology, transcriptional and translational quantification using 96-well human iPSC-CMs samples*

Nashman Center for Civic Engagement and Public Service	
Community Engaged Research First Place	**Olivia Issa & Emmanuelle Dyer Melhado & Sara Alassaf (CCAS)** *Key Recommendations for Higher Education Institutions to Provide Non-Financial Support to Refugee-Background Students*
Community Engaged Research Second Place	**Adam Berman (GSEHD)** *Making Work Work; Improving Employment Outcomes for Autistic Adults* **Abigail Care & Alexa Betances (CCAS)** *ArtReach GW at THEARC: An Observational Evaluation*
Community Engaged Research Honorable Mention	**Jurnee Louder (CCAS)** *For Imposters, By Imposters: Community-Engaged Research to Mitigate Imposter Phenomenon Prevalence in Peer Tutors*

Office of Diversity, Equity, and Community Engagement	
First Place - Undergraduate	**Bailey Moore (SPH)** *Equitably Engaging Priority Populations in Clinical Research* **Carolyne Im (SMPA)** *Unusual Suspects: The Growing Prominence of Trans-Exclusionary Feminism in Anti-Trans Politics in the United Kingdom and United States*
Second Place - Undergraduate	**Olivia Issa & Emmanuelle Dyer Melhado & Sara Alassaf (CCAS)** *Key Recommendations for Higher Education Institutions to Provide Non-Financial Support to Refugee-Background Students*
Third Place - Undergraduate	**Emma Sacks (CCAS)** *Discrimination and Latinx adolescents' depressive symptoms and externalizing behaviors: The role of parental support*
First Place - Graduate	**Vivika Fernes & Malavika Mahendran (SMHS)** *Centering Community Voices in The Black Male Dementia Caregiver Burden Study*
Second Place - Graduate	**Lauren Johnson (SPH)** *Environmental Justice Implications of Unconventional Natural Gas Development: A Systematic Review of Disproportionate Health Outcomes in Non-White Individuals Exposed to Fracking*
Third Place - Graduate	**Adam Berman (GSEHD)** *Making Work Work; Improving Employment Outcomes for Autistic Adults*

Office of Innovation and Entrepreneurship	
Innovation and Entrepreneurship Prize	**Sean Letavish (SEAS)** *Virtual Reality in the Semiconductor Industry* **Joshua Ghofrani (SMHS)** *Nanoparticle-enhanced immune cells for eradicating the HIV reservoir* **Faisal Al Munajjed (SEAS)** *CyBIS Prototype to Rapidly Measure Human Immune Response Severity and Detect Infection*

Office of Sustainability	
Sustainability and Resiliency Prize	**Laura Roberson (SEAS)** *Comparing Consumer Preferences for Electric Vehicle Financial Incentives*
Sustainability and Environmental Justice Prize	**Lauren Johnson (SPH)** *Environmental Justice Implications of Unconventional Natural Gas Development: A Systematic Review of Disproportionate Health Outcomes in Non-White Individuals Exposed to Fracking*

Office of the Vice Provost for Research	
Cross-Disciplinary Research First Place Undergraduate	**Myra Zaheer (CCAS)** *The role of artificial intelligence and automation in the diagnosis and management of otitis media*
Cross-Disciplinary Research Second Place Undergraduate	**Jacob Tafrate (CCAS)** *Natural Hazards and Informal Road Networks North of Lake Baikal*
Cross-Disciplinary Research First Place Graduate	**Ademir Vrolijk (SEAS)** *Towards a Better Understanding of Solving Complex Problems Through Innovation Contests*
Cross-Disciplinary Research Second Place Graduate	**Grace Wofford (TSPPPA)** *Living Like We're Dead: Existential Anxiety, Climate Change Perceptions, and Pro-Environmental Behavior.*

RESEARCH SHOWCASE

BASIC BIOMEDICAL SCIENCES

INSTITUTE FOR BIOMEDICAL SCIENCES

Role of the Cranial Mesenchyme in Neural Tube Defects

Neural tube defects (NTDs) are among the most common structural birth defects leading to long-term disability or even death. NTDs result from a failure of neural tube closure as the flat neural plate rolls into a tube to form the central nervous system. This process requires morphogenesis of both the neural tissue and underlying cranial mesenchyme (CM) comprised of paraxial mesoderm (PM-CM) and neural crest (NC-CM) derived cells. Abnormal PM-CM and NC-CM are both implicated in NTDs.

While the cellular movements and shape changes that drive morphogenesis within the neural plate are well characterized, how morphogenesis of the CM contributes to neural tube closure and the respective contribution of the PM-CM and NC-CM remains poorly understood. My thesis project will test the hypothesis that expansion of the CM is a driving force for neural fold elevation.

Movement of the CM was observed using simultaneous multi-view light-sheet microscopy and analyzed using ImageJ. CM explant assay data demonstrate increased CM movement occurs in the Hectd1 mutant mouse model with NTDs. My experiments utilized this assay combined with lineage tracing to determine whether PM-CM or NC-CM is the migratory population in the CM.

Our live imaging studies indicate that cells move in a dorsal lateral direction during neural fold elevation consistent with cell movement driving elevation. Explant assays suggest that P-M and NC-CM cells are the cells migrating in wild type embryos. Future experiments will explore the cell lineages migrating in Hectd1 mutant, molecular, and cellular mechanisms responsible and how this disrupts neural fold elevation using explant assays and RNA sequencing experiments.

Primary Presenter

Claire Charpentier

Co-Presenter(s)

Status

Graduate Student - Doctoral

Authors

Claire Charpentier, Irene Zohn

Research Mentor/ Department Chair

Irene Zohn

RESEARCH SHOWCASE

BASIC BIOMEDICAL SCIENCES

SCHOOL OF MEDICINE AND HEALTH SCIENCES

The role of GPR84 in myeloid cell function during skin wound healing

Skin provides protection against pathogens and external insults, making it essential that wounds breaching this biological barrier heal quickly and efficiently. Wound healing relies on a coordinated immune response composed of multiple overlapping phases. While a strong pro-inflammatory response is essential early during the process, infiltrating inflammatory macrophages must then transition to a pro-healing phenotype to support tissue repair. G Protein-Coupled Receptor 84 (GPR84) is a medium chain fatty acid receptor that has been coined the "volume knob" for inflammation. While it is highly expressed during inflammation in the brain, kidney, and intestines, little is known about its involvement in skin wound healing. To identify the contribution of GPR84 signaling to wound healing, we utilized a GPR84 antagonist in a murine model of normal healing. Inhibiting GPR84 signaling early during the injury response reduces myeloid cell recruitment during the inflammation phase, resulting in a lasting effect by delaying wound closure during the proliferation phase. Contrastingly, applying a GPR84 agonist rescues myeloid cell recruitment and polarization in wounds from diabetic mice that exhibit impaired myeloid cell recruitment and delayed healing. This may occur by direct signaling to macrophages, or indirectly through other myeloid or epithelial cells that express GPR84. Given that irregular tissue inflammation contributes to delayed healing and chronic wounds, a role for GPR84 in normal wound healing provides a target with readily available clinical antagonists and agonists to control or enhance myeloid inflammation and improve wound healing outcomes.

Primary Presenter

Paula O. Cooper

Co-Presenter(s)

Status

Postdoc

Authors

Paula O. Cooper, Najuma Babirye, Tanvir Dhaliwal, Ines Molina, Satish Kumar Noonepalle, MaryEllen Haas, Brett Shook

Research Mentor/ Department Chair

Brett Shook

RESEARCH SHOWCASE

BASIC BIOMEDICAL SCIENCES

SCHOOL OF MEDICINE AND HEALTH SCIENCES

Resolving Blood Bank Interference Due to Anti-CD38 by Comparing Dithiothreitol (DTT) to Tube Method

In the blood bank, some monoclonal antibody medications, such as Daratumumab (anti-CD38), can cause interference with antibody detection. Treatment with this medication is highly effective in targeting the malignant cells in patients with Multiple Myeloma. With this treatment being utilized more frequently it is vital that blood banks find an easier and effective way of resolving this testing issue. Currently, blood banks use a reducing reagent, such as Dithiothreitol (DTT), to denature the CD38 receptors on the reagent red blood cells that the anti-CD38 from the Daratumumab is binding to which causes the false positive results. The use of DTT is not practical for all blood banks and these cancer patients cannot wait days for a blood transfusion while their sample is sent to a reference laboratory. Performing the antibody screens in tube rather than gel allows for the cells to be cleaned which will remove any extra proteins from the solution. This study compared the effects of patients of Daratumumab with tube method to DTT to determine if tube method is an appropriate solution to resolving this interference. Tube method was effective in resolving the interference from anti-CD38 medications and allowing for the detection of common antibodies. The use of tube method to resolve anti-CD38 interference in the blood bank was shown to be cheaper, quicker, more accurate, and easier when compared to the DTT method.

Primary Presenter

Emilie Marie Curren

Co-Presenter(s)

Status

Recent Alumni

Authors

Emilie Marie Curren

Research Mentor/ Department Chair

Rohini Ganjoo

RESEARCH SHOWCASE

BASIC BIOMEDICAL SCIENCES

SCHOOL OF MEDICINE AND HEALTH SCIENCES

Association of SNX19 with flotillin-1 and caveolin-1 in its lipid raft localization and regulation of D1R endocytosis

Sorting nexin 19 (SNX19), a member of the SNX-PXA-RGS-PXC subfamily of sorting nexins, plays an important role in lipid raft microdomain localization, but its association with flotillin-1 and caveolin-1, two of the most important lipid raft components, and in particular its linkage with the endocytosis and trafficking of dopamine D1 receptor (D_1R) have not been determined in the renal proximal tubule. In the present study, we found that SNX19 was localized with lipid rafts in human and mouse renal proximal tubule cells (RPTCs), which regulated D1R endocytosis. In mouse RPTCs, SNX19 co-localized with flotillin-1 and caveolin-1, which was increased by treatment with fenoldopam (25 nM, 5 and 30 min), a D1-like receptor agonist. The targeting of SNX19 in lipid rafts and its colocalization with flotillin-1 and caveolin-1 was attenuated by deletion of a flotillin binding domain (*EEGPGTETETGLPVS*) or caveolin-1 binding domain (*YHTVNRRYREF*) or both domains in mouse RPTCs. The increase in intracellular cAMP production caused by fenoldopam was also abrogated by the deletion of either flotillin-1 or caveolin-1 or both binding domains. Furthermore, fenoldopam treatment decreased the colocalization of SNX19 with microtubules without an effect on actin filaments. The decrease in fenoldopam-mediated colocalization of SNX19 with microtubules was abrogated by treatment with nocodazole (10 μM, 1hr), a microtubule depolymerization inhibitor. In conclusion, SNX19 contained both flotillin-1 and caveolin-1 binding domains and its binding with flotillin-1 and caveolin-1 are important in SNX19-mediated D_1R signaling and endocytosis, which was dependent on microtubule integrity.

Primary Presenter

Hewang Lee

Co-Presenter(s)

Status

Research Scientist

Authors

Hewang Lee, Van Villar, Bibhas Amatya, Ines Armando, Laureano D. Asico, Robin A. Felder, Pedro A. Jose

Research Mentor/ Department Chair

Pedro Jose

RESEARCH SHOWCASE

BASIC BIOMEDICAL SCIENCES

SCHOOL OF MEDICINE AND HEALTH SCIENCES

Dynlt1b Differential Expression in Squamocolumnar junction in p16 Knockout (KO) and Wild Type (WT) Mice: Potential Role in Barrett's metaplasia

Background: Barrett's esophagus (BE) is an inflammation-driven metaplastic disease associated with gastric esophageal reflux disease that affects thousands of Americans each year. Although risk to develop into adenocarcinoma is around 1%, BE requires frequent endoscopic surveillance, which is a significant financial and emotional burden to patients. CDKN2A gene alterations result in accelerated squamocolumnar (SCJ) Barrett's like metaplasia in a mouse model established in the Sepulveda laboratory.

Hypothesis: Transcriptional alterations in SCJ of mice carrying a deletion of CDKN2A (p16f/f) metaplasia may uncover novel mechanisms of BE-associated neoplasia progression in the mouse model and in SCJ derived organoids.

Methods: RNAseq was performed in 3 wild type (wt) and 3 p16f/f mice SCJ tissue. Organoids were generated from wt and p16f/f mice SCJ. cDNA was obtained from RNA lysates of one wt organoid and from two clones of p16f/f derived organoids, and transcript levels were quantitated by qPCR sing ddCt analysis, for genes of interest. Genes for qPCR were selected as those with differential expression in SCJ of p16 f/f and WT mice and between low and high-level p16 expression samples of Barrett's in human samples assayed for whole transcriptome.

Results: The Dynein light chain Tctex-type 1B (Dynlt1b) gene expression was found to be increased in p16f/f mice compared to wild type SCJ. qPCR in RNA from organoids showed increased expression in the two clones derived from p16/ff SCJ compared to wt organoid tissue. Dynlt1b gene expression levels were 4.8 and 2.8-fold higher compared to control in both high and low-proliferation organoid p16/ff clones, respectively. Experiments to examine expression of other differentially expressed genes are ongoing.

Conclusions: Dynlt1b is part of the dynein motor complex which transports many different cargoes within cells and is also an important modulator of the cell cycle. Our data indicate that dynlt1b may be involved in the mechanisms of Barrett's like metaplasia in the mouse model. Since dynlt1b alterations were confirmed in the mouse epithelial organoids, it is likely a consequence of CDKN2A/p16 deletion in epithelium that gives rise to Barrett's metaplasia in the mouse model. Furthermore, dynlt1b may be explored as a biomarker of Barrett's esophagus.

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RESEARCH SHOWCASE

BASIC BIOMEDICAL SCIENCES

SCHOOL OF MEDICINE AND HEALTH SCIENCES

The protective effect of the D2R on inflammation in human renal proximal tubule cells is dependent on sex and the presence of hormones in human.

The renal dopaminergic system is important for regulating the kidney function and blood pressure, as well as for the immune response. Mice with intrarenal dopamine deficiency have increased oxidative stress and infiltration of inflammatory cells. The modulation of the renal inflammatory response is mediated, at least in part, by the D2 subtype (D2R) of dopamine receptors which function is impaired in the presence of polymorphisms (such as rs6276 and rs6277) of the *DRD2* gene. Sex and sex-related hormones, also play a role in the regulation of the inflammatory response. However, how sex and sex hormones affect the protective effect of D2R on renal inflammation is not known. Therefore, this project tested the hypothesis that the effects of deficient D2R function on renal inflammation differ between the sexes. Human renal proximal tubule cells (RPTCs) were isolated and genotyped for the presence or absence of the *DRD2* rs6276 and rs6277 variants. Four cell lines were studied, 2 derived from female or male subjects not bearing SNPs (D2RWT) and 2 from female or male subjects heterozygous for both rs6276 and rs6277 (D2R SNPs). To determine the effect of hormones that are present in fetal bovine serum (FBS), we cultured the cell lines in medium containing FBS or charcoal-stripped FBS. RPTCs lysates were subjected to immunoblotting of D2R, tumor necrosis factor α (TNF- α), transforming growth factor β1 (TGF- β1), and cyclooxygenase-2 (COX-2), and quantitative real-time polymerase chain reaction for D2R, TNF- α, and TGF- β1. D2R expression was higher in females than in males in both D2RWT and D2R SNPs that were increased in female D2R WT females cultured in charcoal-stripped media. Protein and mRNA expressions of TNF- α TGF- β1, and COX-2 were higher in both male and females D2R SNPs than in D2R WT cells, and increased in male D2R SNPs cultured in charcoal-stripped media. Sex may play an important role in the regulation of these proinflammatory factors, because male D2R SNPs had higher TNF- α and TGF- β1. mRNA expression levels when compared with females with the same genotype. Protein expression of COX-2 was higher in RPTCs with D2R SNPs, particularly in males. These results indicate that in RPTCs the presence of the D2R SNPs imparts an inflammatory phenotype that is dependent on sex and presence of hormones, but remain to be identified.

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RESEARCH SHOWCASE

BASIC BIOMEDICAL SCIENCES

SCHOOL OF MEDICINE AND HEALTH SCIENCES

Pathogen Reduction of Whole Blood using UV Light and Riboflavin and its Effects on Frozen Red Blood Cell Components Post Deglycerolization and Storage at 1-6°C for 14 Days

The Armed Services Blood Program (ASBP) is responsible for collecting, storing, and providing safe and potent blood products to overseas military treatment facilities and deployed members in combat operations. One of several types of blood products the ASBP manufactures is the frozen red blood cell (FRBC) component. Frozen red blood cells that are deglycerolized using an FDA-approved method and stored at 1-6 °C for 14 days are a safe alternative to liquid stored red blood cells. Pathogen Reduction Technology (PRT) using ultraviolet (UV) light has been a successful proactive approach in mitigating and reducing the risk of transfusion-transmitted infections. PRT works by irreversibly altering the nucleic acid structures of pathogens and significantly reducing their ability to propagate to infectious levels. PRT treatment has shown to be effective against viruses, bacteria, and parasites without affecting the functionality of the blood product. Consequently, this study sought to investigate the effects of pathogen reduction treatment of whole blood derived deglycerolized red blood cells after storage at 1-6 °C for 14 days.

Non-leukocyte whole blood units were collected from eligible volunteer donors. Two units of identical blood type were pooled and equally divided into test and control groups. Test units were treated with UV light and riboflavin while the control units remained untreated. All units were frozen using a closed system glycerolization method and stored at ≤ 65 °C for approximately 21 days. The units were deglycerolized, stored at 1-6 °C for 14 days, and analyzed for transfusion acceptability and quality.

The post-storage red blood cell counts and hemoglobin values for the test group were significantly ($p<0.05$) lower than the control group, suggesting that pathogen reduction treatment caused increased destruction of red blood cells within the test units. In addition, the average Lactate value of the test group was also significantly ($p<0.05$) lower than the control group. However, these values remained within acceptable ranges and no other differences in red blood cell parameters were found to be significant.

This study successfully performed pathogen reduction of whole blood with UV light and riboflavin to produce transfusable DRBCs that can be stored at 1-6 °C for 14 days. Although in-vitro analysis demonstrated a significant effect on some parameters, the differences were consistent with storage lesion effects and were still within acceptable ranges and acceptable for transfusion.

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RESEARCH SHOWCASE

BIOMEDICAL ENGINEERING

SCHOOL OF ENGINEERING AND APPLIED SCIENCE

Multifunctional Optoelectronic Device for Spatiotemporal Mapping and Modulation of Electrophysiological Signals

Current understanding of electrophysiology in cardiac tissues have proven to be successful in the treatment of abnormal heart conditions. Cardiac optogenetics has emerged as a promising technique in which light-sensitive ion channels also known as opsins can be used to selectively modulate cardiac function. For example, channelrhodopsin-2 (ChR2), a widely used excitatory opsin, has been shown to control heart rhythm under light stimulation when expressed in the myocardium of intact hearts. Further studies are required to better understand the utility of cardiac optogenetics as a tool to investigate and treat arrhythmias. Here, we will present a flexible multifunctional optoelectronic device composed of a 4x4 transparent microelectrode array (MEA) superimposed onto a 2x2 micro-light-emitting diode (μ-LED) array for simultaneous co-localized optical stimulation and electrical mapping of cardiac activity. The transparent MEA we designed and fabricated exhibit a uniform performance across all channels in the array for robust and stable mapping over a large-area. The optical transparency of the MEA enables photons from the underlying μ-LEDs to pass for optogenetic control of cardiomyocytes ontop of the devices. We show that the final multifunctional optoelectronic device can (1) stimulate intact mouse hearts expressing ChR2 from various locations across the left ventricle; and (2) simultaneously electrically map the propagation of cardiac electrical waves both *ex vivo* and *in vivo* with high-fidelity. This work has broad applications for future basic and translational studies investigating the efficacy of cardiac optogenetics in the diagnosis and treatment of cardiac arrhythmias.

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RESEARCH SHOWCASE

BIOMEDICAL ENGINEERING

SCHOOL OF ENGINEERING AND APPLIED SCIENCE

CyBIS Prototype to Rapidly Measure Human Immune Response Severity and Detect Infection

Reverse transcriptase-polymerase chain reaction (RT-PCR) is the primary diagnostic assay used for the detection of SARS-CoV-2 RNA. While highly sensitive and specific, it has little predictive value for the severity of COVID-19 symptoms. There remains a need for fast and accurate measure of the host response to infections. We are developing a point-of-care diagnostic device called CyBIS which uses a fingerstick of blood to isolate neutrophils and measure their immune activation in 30 minutes. Biomarkers for disease severity were identified by comparing whole transcriptomes from healthy volunteers and COVID-19 patients from the GW Hospital intensive care unit. Based on the RNA changes, we identified neutrophil elastase activity as an informative biomarker of host immune response to viral infection. To build the CyBis prototype, a microcontroller coded with Python controlling an LED is set up, emitting a light that goes through the 3D-printed canalized chip, and read by a light sensitivity sensor. All the components are engineered to fit in a small compact device. To operate CyBIS, neutrophils are isolated from a drop of whole blood (50 ul) using magnetic beads bearing antibody to CD15. The whole blood mixed with CD15-coated beads is mixed in a custom 3D-printed chip that has microfluidics able to wash the neutrophils free of contaminating cells and soluble elastase inhibitors. The washed neutrophils are lysed and reacted with a colorimetric substrate for elastase. In real time over a 30-minute assay, the cleavage of the substrate is quantified, and the enzymatic rate constant (Vmax) is calculated as a measure of elastase activity. In a series of COVID-19 patients at the GW Hospital, elastase activity appears to be a sensitive, rapid measure of infection severity. Future studies will determine whether CyBIS would be able to detect other types of infections in humans, and even other species.

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RESEARCH SHOWCASE

BIOMEDICAL ENGINEERING

SCHOOL OF ENGINEERING AND APPLIED SCIENCE

3D Electrospin-printing (3D ESP) of photocrosslinkable serum methacrylate (SerMA) -based fibrous scaffolds for neural tissue repair and regeneration

Current methodologies for surgical implantation of cellularized grafts onto nervous tissue defects often see marked cytological decline, which can impede favorable graft to tissue integration. Novel stem cell- based technologies have aimed at improving cellular retention within the graft site, but are limited in their ability to expand surviving cell population to infill the full defect volume. A primary contributor to the issue of limited *in situ* expansion of nascent neural cells within the graft zone is in the tendency to "pre-differentiate" stem cells prior to implantation. Whereas the pre-differentiation of patient-specific stem cells towards neurogenic phenotypes prior to implantation has shown marked improvements over conventional allograft and allografts methodologies in terms of overall cell survival, full integration of engrafted cells within the defect site has yet to be fully elucidated. To address the two-fold issues of poor engrafted cell survival and integration seen across conventional and pre-differentiated stem cell-based neural grafts alike, we have developed a novel neural scaffold which has the ability to modulate neural stem cell differentiation *in situ*, which can allow for both optimal cellular expansion and integration. Our biphasic fibrous neural scaffolds are fabricated using our custom-made 3D electrospun-printer (3D ESP) platform, and feature highly aligned photocrosslinked electrospun fibers which can controllably release neurogenic morphogens, such as all-trans retinoic acid (ATRA), to modulate the differentiation of neural stem cells (NSCs) seeded on the fiber surface. The polymer solution used to spin the neural guidance fibers, as well as the spin-printed scaffolding underlying the fibers, contains a formulation of bovine blood serum which has been chemically modified with methacrylate groups, which enables it’s photocrosslinking under the absorbance of UV light. This methacrylated blood serum, herein deemed serum-methacrylate (SerMA) significantly enhances neural stem cell proliferation rates over scaffolds fabricated from the conventional bioink materials gelatin methacrylate (GelMA) and poly(ethylene glycol) diacrylate (PEGDA). Moreover, by directly incorporating ATRA into the fiber pre-polymer solution, and modulating its release from the fiber bulk by tuning the fiber composition, the differentiation of NSCs can be reliably delayed without the need for exogenously applied differentiation agents or stimulation. We have found that this delay of differentiation allows for enhanced cellular coverage of the scaffold surface. Additionally, we have found that the control release of the small molecule drug metformin HCl from the scaffolds further enhances the neurogenic differentiation of NSCs.

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RESEARCH SHOWCASE

BIOMEDICAL ENGINEERING

SCHOOL OF ENGINEERING AND APPLIED SCIENCE

Optimization of a whole heart staining approach to identify infarct size in excised perfused hearts after coronary ligation

Myocardial infarction from coronary occlusion is the main cause of sudden cardiac arrest, a leading cause of death in the United States. The effect of coronary occlusion on cardiac function is frequently studied in excised perfused heart experiments by ligating the left anterior descending (LAD) coronary artery and measuring changes in electromechanical function. Electrical changes include ST segment ECG shifts and arrhythmias. At the end of an experiment, infarct size is often measured using triphenyl tetrazolium chloride (TTC) stain to provide contrast between healthy and damaged tissue. The goal of this project was to optimize the measurement of healthy and damaged myocardium after LAD ligation in a perfused heart experiment to provide insight into pathologic electromechanical function measured during the experiment. Infarct size was measured by two cycles of retrograde perfusion of hearts with a 42 mM solution of TTC (0.42 grams of TTC in 30 mL of perfusate) followed by submerging hearts in the TTC solution for 10 minutes. Hearts were stained again by retrograde perfusion with Evans Blue dye to stain healthy tissue having active coronary perfusion. Hearts were then sliced 5 times in cross-section from apex to base after freezing at -20°C and digitally photographed. The result of TTC staining was that the metabolically inactive infarcted tissue presented as white, and healthy metabolically active tissue was red. The combination of TTC and Evans Blue staining created three zones: 1) white indicating infarcted tissue, 2) purple (red and blue) indicating actively perfused tissue, and 3) lighter blue (white and blue) indicating tissue in the infarct zone that was potentially perfused by collateral arteries. This staining approach provided deeper insight into the differences between the size of the infarct and the size of metabolically inactive tissue. The size of the infarct was then measured using digital image analysis. Quantifying infarct size in this way could support the development new therapies that reduce infarct size and deadly arrhythmias during a coronary occlusion.

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RESEARCH SHOWCASE

BIOMEDICAL ENGINEERING

SCHOOL OF ENGINEERING AND APPLIED SCIENCE

CRISPRi Gene modulation of Cardiac Electrophysiology in Pre-differentiated Cardiomyocytes

CRISPR technology has emerged as an invaluable tool for gene editing for knockout, inhibition, and activation studies with capabilities to expand to larger scale studies with the usage of gRNA libraries. The usage of commercial pre-differentiated human pluripotent stem cell derived cardiomyocytes (hiPSC-CM), overcome some of the limitations exhibited in batch-to-batch variability of in-house differentiated cardiomyocytes. Additionally, we harnessed optical mapping techniques to measure action potential duration and calcium wave propagation at high spatial temporal resolution to study the dynamic coupling between two important electrophysiological parameters critical for proper cardiac function. We sought to develop a scalable platform for high-throughput CRISPRi loss-of-function gene studies combining all-optical characterization of cellular cardiac electrophysiology in pre-differentiated cardiomyocytes and respective assays to understand mechanisms of action. We designed single guide RNAs (sgRNAs) targeting around the transcription start sites of KCNH2, KCNJ2, and GJA1. The sgRNAs were cloned into a lentiviral vector containing eGFP. A dox-inducible dCas9-KRAB was inserted into the AAVS1 safe harbor site of the pre-differentiated hiPSC-CMs by way of transfection and transduced with lentivirus carrying the different sgRNAs. Cells were then transduced with an adenoviral vector containing ChR2-eYFP to allow for optical stimulation. After 5 days of dox induction, samples were stained with voltage and calcium sensitive dyes for all-optical electrophysiological measurements. A sgRNA targeting KCNH2 resulted in about 40% downregulation of KCNH2 mRNA and significant prolongation of spontaneous APD90 (+12%, $p<0.05$). A sgRNA targeting KCNJ2 caused about 60% knockdown efficiency of mRNA levels and exhibited minimal changes in spontaneous beat frequency in high density cell preparations (+7%, n.s.) but more pronounced effects in lower density cell preparations (+30%, $p=0.002$). Additionally, the final sgRNA targeting GJA1 exhibited about 40% downregulation of GJA1 mRNA and exhibited significant slowing of conduction velocity (-19%, $p=0.01$) at 1 Hz pacing conditions. Our findings suggest that our platform for CRISPRi mediated knockdown of diseases-associated genes in pre-differentiated cardiomyocytes can provide an improved model to evaluate gene function in cellular cardiac electrophysiology and can be adapted to screen for a more diverse gene sets as well as be combined with CRISPRa-mediated gene activation for further comprehensive evaluation of the mechanisms controlling cardiac electromechanical coupling. This system allows for the investigation of the molecular underpinnings underlying cardiac electrophysiology and can be adapted for cardiotoxicity studies of new drugs for pharmaceuticals that are in the pipeline for market.

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RESEARCH SHOWCASE

BIOMEDICAL ENGINEERING

SCHOOL OF ENGINEERING AND APPLIED SCIENCE

Using Telemetry in Treadmill Studies to Assess Key Components of Cardiac Function

Sleep apnea affects approximately 22 million people worldwide with direct correlation to increased risk for heart disease. Imbalance of autonomic tone is a hallmark of heart disease and analysis of heart rate (HR) and blood pressure (BP) provides key insight into cardiac function. Using DSI implantable telemetry devices, we can record Electrocardiogram (ECG) and BP data during exercise and exercise recovery to measure peak effort capacity and heart rate recovery (HRR), two indicators of cardiac function and autonomic tone. Sprague Dawley rats are used as a model based on literature describing neural control and cardiac function. To assess peak exercise maximum BP and HR data in diseased hearts, ETA F-10 or HDX-11 (DSI) telemetry devices are implanted in 6 to 7-week old rats. One week after surgery they are exposed to a chronic intermittent hypoxia (CIH) protocol that mimics obstructive sleep apnea. The CIH protocol cycles an environmental chamber between room air and a hypoxic gas mixture (6% O_2, 94% N_2). Each cycle lasts 6 minutes at 10 cycles per hour for 8 total hours during the rats' nocturnal period. Immediately before beginning CIH exposure, the rats begin treadmill experiments used to record HR, BP, animal activity, and temperature, which continues throughout the duration of the experiment. The treadmill protocol is as follows: rats are recorded for 1 hour to establish a baseline using a Harvard Apparatus five-lane treadmill at an incline of 5 degrees. Subsequently, the treadmill begins moving at 8 m/min for 3 minutes, increasing in speed by 5 m/min every 3 minutes until the animal reaches exhaustion, defined as failing to continue exercise after 5 air puffs from a compressed air canister. Following exhaustion, animals are recorded for 15 minutes as they recover. Before, during, and after exercise, the DSI telemetry devices transmit raw signals to a PhysioTel receiver which are converted to ECG and BP data in LabChart. During exhaustion and recovery, HR at peak effort, defined as the instantaneous HR immediately before the treadmill is stopped, and HRR, defined as the change in HR immediately following peak effort, can be quantified and further analyzed to interpret physiological changes caused by CIH in an experimental model of sleep apnea. Potential applications include the research of compounds that affect autonomic tone or the electrical firing of the heart. In summary, telemetry devices that measure cardiac function during peak exercise prove useful for assessing physiological interventions.

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RESEARCH SHOWCASE

BIOMEDICAL ENGINEERING

SCHOOL OF ENGINEERING AND APPLIED SCIENCE

Ambient pressure dependence of Ultrasound contrast agents response

Microbubbles are used as ultrasound imaging contrast agents. These micron size bubbles are made of a gas core encapsulated in a stabilizing shell. The compressible gas core enables microbubbles to oscillate strongly in response to an acoustic pressure wave that contrast them with surrounding tissue which are relatively weaker sound scatterers. Nonlinear and linear oscillations produce scattering response in fundamental, harmonics and subharmonics frequency. The subharmonic response show unique features. They display three regimes of occurrence, growth, and saturation with increasing excitation pressure. In addition, they have shown strong sensitivity to the ambient pressure variation which can be utilized in non-invasive pressure estimation for diseases such as portal hypertension where using a catheter pressure measurement can cause infections and complications. In this study, we investigated harmonics and subharmonic response of microbubbles in different acoustic pressures and ambient overpressures.

Microbubbles with perfluorocarbon (C_4F_{10}) gas core and lipid shell of DPPC/DPPE-PEG200 was made using mechanical agitation method. We measured their response to acoustic excitations ranging from 50 kPa to 700 kPa in 3MHz frequency using focused single element ultrasound transducers. By increasing ambient pressure inside an airtight sample chamber using a syringe pump, we investigated the change in the acoustic response of microbubbles in ambient overpressures ranging from 0 to 20 kPa.

It was found that, subharmonic response shows higher sensitivity to ambient pressure variation in comparison to other harmonics. We observed that at different above mentioned stages of generation, subharmonic response varied differently with ambient pressure. While in occurrence stage the subharmonic response increases with ambient pressure, it shows a decreasing trend in growth and saturation stages. Interestingly, we noted that the ambient overpressure could induce subharmonic production at very low acoustic pressures where there is no subharmonic production.

There is growing interest in utilizing subharmonic response sensitivity of microbubbles in non-invasive pressure estimation. The findings of this study provide better understanding of the correlation between ambient pressure and acoustic response which in turn promote potential applications.

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RESEARCH SHOWCASE

BIOMEDICAL ENGINEERING

SCHOOL OF ENGINEERING AND APPLIED SCIENCE

Thermographic Breast Cancer Detection using Transfer Learning Techniques

Breast cancer is a disease with the highest incidence and mortality among women, and early detection is directly correlated with an increase in survival. Mammography is the current gold standard for detecting breast cancer, but tumors are difficult to detect in dense breasts. This is because dense breasts contain more breast tissue than fat, which decreases contrast with the tumor in mammograms. Thermography is an imaging technique that utilizes infrared wavelengths to create an image that represents object temperature as image intensity. Tumors often experience vasodilation, resulting in a higher local temperature compared to the surrounding tissue, which can be detected via thermography. Machine learning techniques have been shown to be a promising new tool for classifying breast cancer thermal images. Transfer learning is a machine learning method that uses an established model and modifies it to classify a new category of images.

Patients with breast cancer were imaged thermally using an N2 Infrared camera for 15 minutes each. Thermal images were manually cropped and segmented in MATLAB, and each image containing two breasts was split into two images each containing one breast and sorted into healthy and cancerous based on truth data. Using the Inception V3 model in MATLAB, we trained the model to classify a single breast image as healthy or cancerous. Inception V3 is a convolutional neural network used widely for image analysis and object classification. A total of 600 single-breast images are used, with 70% used for training and 30% used for validation. This research is ongoing, and results will be presented in the final poster.

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RESEARCH SHOWCASE

BIOMEDICAL ENGINEERING

SCHOOL OF ENGINEERING AND APPLIED SCIENCE

Data augmentation to improve the performance of convolutional neural network models

Data augmentation is a method to create new and modified datasets to train and test a classifier model on variations of the images, similar to real-life applications. The 2017 SPIE ProstateX challenge released a series of Prostate MRI images to solicit classifier models that could identify and classify prostate cancer. Our study sought to experiment with data augmentation to determine how to improve current models based on the ProstateX dataset. We used a VGG-16 model for the classification of clinically significant prostate lesions on the T2-weighted MRI images from the dataset. Next, we explored various data augmentation methods to improve the performance of the model. The images in the existing dataset were rotated 90 degrees counterclockwise three times to generate three new sets of images. We also explored another method in which the images were randomly cropped to create another set of images. Our original model achieved an accuracy of 0.71 and a loss of 2.16 and the model with the cropped and rotated images achieved an accuracy of 0.83 and a loss of 1.22. We concluded that data augmentation for MRI Prostate data is a feasible way to improve model performance compared to existing base methods. Our next steps are to explore the use of generative adversarial networks (GANs) to generate additional variations of the data to improve the training of the CNN model.

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RESEARCH SHOWCASE

BIOMEDICAL ENGINEERING

SCHOOL OF ENGINEERING AND APPLIED SCIENCE

Multiparameter pipeline assessment of cardiac electrophysiology, transcriptional and translational quantification using 96-well human iPSC-CMs samples

Human induced pluripotent stem cell-derived cardiomyocytes (hiPSC-CMs) is widely accepted as a valuable model for high-throughput preclinical drug cardiotoxicity screening and personalized medicine. However, restrained by the sample size, longitudinal multiparametric characterization of 96-well hiPSC-CMs hasn't been achieved before.

To better associate hiPSC-CMs' electromechanical function changes with cell molecular level changes, we developed and validated a multiparameter pipeline for hiPSC-CM syncytium in a 96-well format that links function to protein amount or mRNA transcription level. And we applied this pipeline assessment to evaluate the cell uncoupling effect of a pan-histone-deacetylase inhibitor (HDACi) Trichostatin A (TSA).

With all-optical cardiac electrophysiology, hiPSC-CM membrane voltage activities and calcium release were compared between treated and non-treated samples, followed by mRNA-extraction-free qPCR or capillary electrophoresis protein assay. Validation of both molecular assays was done by linear response tests and the impact of optogenetic treatments was assessed.

From 96-well iPSC-CM samples, cardiac gap junction protein Connexin 43 (Cx43) and the corresponding mRNA GJA1 showed a good linear response (R^2>0.98). GJA1 transcript and Cx43 protein levels were not influenced by fluorescent dyes or genetically-encoded fluorescent proteins. In TSA-treated samples, extreme slowing of conduction velocity and the occurrence of arrhythmic spiral waves were in line with reduced GJA1 and Cx43 levels, implicating cellular uncoupling as causing the functional change.

Our multiparameter pipeline assessment enriches the data dimension from each 96-well hiPSC-CMs and allows verification of certain changes to be validated at multi-levels. The small starting material requirement of this method also demonstrates its scalability toward high-throughput analysis. The correlation between function and molecular level changes of TSA-treated samples provided a proof-of-concept application of the pipeline.

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RESEARCH SHOWCASE

BIOMEDICAL ENGINEERING

SCHOOL OF ENGINEERING AND APPLIED SCIENCE

Rotationally invariant texture features: A comparative study

Texture is an intrinsic property of the world and plays a large role in our ability to discriminate between objects around us. Texture measures have been widely researched with the goal of utilizing them for image processing and machine learning tasks. Texture is most commonly calculated by computing a gray level co-occurrence matrix (GLCM) from which feature vectors can be calculated. The GLCM can be thought of as a 2D histogram of neighboring pixel intensity values. The GLCM is commonly constructed by considering pixels at an offset of d at 4 angles. From this, the number of occurrences of specific pairs of pixel values are stored in a matrix. One problem that arises from this calculation is sensitivity to rotation. In a practical application, this could lead to inaccurate or misleading results. One method for calculating texture features that are invariant to rotation is to construct a co-occurrence matrix that is invariant to rotation. This can be done by considering information from every direction while calculating the GLCM. Features calculated from a GLCM constructed in this way be invariant to rotation. Another method for calculating texture features invariant to rotation is to apply transformations to features extracted from rotationally variant GLCMs. This can be done by calculating several GLCMs at various offsets and using a discrete Fourier transform to create rotationally invariant features. In this study, we compare our novel method for constructing rotationally invariant features using a multi-scale co-occurrence matrix (MSCM) with the Fourier transform method used by Bianconi and Fernandez. We performed this comparison using a K-Nearest Neighbors algorithm to classify images from the Brodatz texture dataset. The classifier was trained using features from unrotated images and tested with features from rotated images. The results presented compare classification accuracies using our MSCM method and the Fourier transform method.

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RESEARCH SHOWCASE

BIOMEDICAL ENGINEERING

SCHOOL OF ENGINEERING AND APPLIED SCIENCE

Effects of a Western Diet on the Development of Diabetes and Cardiovascular Disease in Ovariectomized Rats Exposed to Chronic Intermittent Hypoxia

For several consecutive decades cardiovascular disease (CVD) has been a leading cause of death in the United States. Heart failure is a prevalent CVD where the heart is unable to pump enough blood to meet tissue oxygen requirements, particularly during exercise. Of the 6.6 million cases of heart failure reported in the US, half can be categorized as heart failure with preserved ejection fraction (HFpEF). Although heart failure affects both sexes, approximately 60% of those diagnosed with HFpEF are postmenopausal women, a bias that is strikingly apperant in women of color. In particular, Black and Hispannic women have the highest rates of being diagnosed with type 2 diabetes, obesity, hypertension and heart failure. In addition to basal metabolic changes that occur after menopause and other sex-based pathologies, these disparities have been linked to a Western diet that is high in fat and sugar.

Our goal was to examine the effect of Western diets on cardiovascular health in rats ovariectomized to induce a postmenopausal state and exposed to chronic intermittent hypoxia (CIH), a model of sleep apnea and a common syndrome in obese patients. Twenty female Sprague Dawley rats were ovariectomized at 7 weeks of age and separated into 5 groups categorized by diet (high fat (HF), high fat + high sugar (HF+HS), and control chow) and CIH exposure. Half the animals fed a non-control diet were exposed to CIH, where for 8 hours/day animals were housed in an environment where room air was replaced with a hypoxic mixture (94% N2, 6% O2) every 6 minutes. The development of obesity, diabetes, and cardiovascular disease was monitored via body weight, glucose and insulin tolerance blood assays, and echocardiographic measurements using a VisualSonics high-resolution small animal imager. The study is currently in its ninth month. Animals will undergo their final assessments within a month, at which time the final results will be analyzed. Preliminary data suggests that animals in each of the Western diet groups (HF, HF+CIH, HF+HS, HF+HS+CIH) have developed progressive states for obesity, diabetes, and a drastic decline in cardiovascular health with implications for HFpEF.

In summary, we have observed that a HF and HF+HS diet after an ovariectomy increases the risk for obesity, diabetes, and CVD in this animal model. This outcome has important implications for high risk populations, including postmenopausal woman of color, a group that is disproportionately diagnosed with heart failure.

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RESEARCH SHOWCASE

BIOMEDICAL ENGINEERING

SCHOOL OF ENGINEERING AND APPLIED SCIENCE

A Review of Image Segmentation Methods in the Detection and Risk Stratification of Prostate Cancer

Prostate cancer is the most diagnosed non-skin cancer malignancy in men. Diagnosis can be difficult, as prostate cancer is often asymptomatic in its early stage, has only a portion of cases that are clinically significant, and is variable in pathological grading. Multiparametric magnetic resonance imaging (mpMRI) captures many anatomical and functional properties of the prostate, making it a promising tool for improving the diagnostic accuracy for prostate cancer.

Our study sought to evaluate the current literature regarding applications of machine learning to prostate cancer MRI lesions as this may lead to standardization of pathological grading, improvement in sensitivity and specificity, and distinguishing benign lesions from cancerous ones. Accurately segmenting the prostate and lesions is essential for extracting important information about the tumor. Segmentation is usually performed manually, which is time consuming and observer dependent. This negatively impacts reproducibility and results in interobserver variation. Fully automatic segmentation of the prostate gland and prostate lesions attempts to address the limitations of manual segmentation. Comparison is needed of current machine learning methods that fully automate image segmentation to assess which methods can be used in clinical application. Differences between typical machine learning and deep learning techniques are analyzed as well as a comparison of performance of several deep learning models. Evaluation of neural network generalizability is critical in assessing the clinical potential of these methods. We concluded that current methods are promising but challenges for fully automated segmentation are still presented by varying signal intensity from differing MR imaging protocols, small volume, prostate tissue heterogeneity, physiological variation of the prostate across patients, and under- or over-segmentation.

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RESEARCH SHOWCASE

BIOMEDICAL ENGINEERING

SCHOOL OF ENGINEERING AND APPLIED SCIENCE

An evaluation of the applicability of T1W MRI based facial anonymization algorithms to 3-dimensional volumetric renderings of computed tomography (CT) data

Brain scan imaging data, such as computed tomography (CT) and magnetic resonance imaging (MRI) data, can be utilized to create 3-Dimensional volumetric images of facial regions. Previous studies have demonstrated the ability to identify patients from these renderings using commonly available facial recognition algorithms. Such renderings pose a serious security concern for public data sharing and patient privacy. We previously investigated if facial features could be identified on SIM-CT images for radiation oncology; however, it is unknown whether CT images can be anonymized using publicly available anonymization software, which is typically geared at T1W MRI data. Our study sought to investigate the feasibility of off-the-shelf anonymization software used for T1W MRI data to de-identify facial features on CT, T1W, and T2W MRI data. For this study, Fsl, AFNI, Pydeface, and MRIdeface were tested on open source CT scans of two patients acquired from The Cancer Imaging Archive (TCIA). This study evaluated if the software was able to run on each type of data, remove facial features, and preserve regions of the brain. Anonymized T1W and T2W MRI data were used to validate that the software was able to run. 3D slicer was used to generate 3-dimensional volumetric renderings of the facial regions before and after anonymization. All of the off-the-shelf anonymization softwares were able to de-identify the CT data and preserve brain data. These findings show potential for use when sharing CT medical data for secondary research while simultaneously protecting patient security.

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RESEARCH SHOWCASE

BIOMEDICAL ENGINEERING

SCHOOL OF ENGINEERING AND APPLIED SCIENCE

Quantification of epigenetic modulator gene expression in human induced pluripotent stem-cell-derived cardiomyocytes reveals mechanisms of epigenetic control of cardiac electrophysiology

The complex epigenetic landscape of the heart is critical for cardiac electrophysiology and pathology. Epigenetic modulators such as histone deacetylases (HDACs) and histone acetyltransferases (HATs) are master regulators of gene expression and recently, novel pharmacological agents, HDAC inhibitors (HDACi), have been developed as treatments for cancer and immune diseases. The effects of these drugs on the heart are not fully understood and the underlying cardiac epigenetic relationships remain uncharacterized. To advance our understanding of chromatin regulation in the heart, and specifically how modulation of DNA acetylation may affect functional electrophysiology responses, human-induced pluripotent stem-cell-derived cardiomyocytes (hiPSC-CMs) were deployed. Untreated hiPSC-CM were subjected to qPCR to determine baseline relative expression of HDAC genes. Additionally, hiPSC-CM samples were independently transfected with small interfering RNA (siRNA) against each HDAC gene and subsequent bulk RNAseq was compared to adult heart tissue data available from the GTEx database. After log transformation and geometric mean normalization, hiPSC-CM and adult heart RNAseq data were embedded in 2D space using UMAP. Partial Least Square (PLS) models were used to examine the activity of HDACs and HATs on critical transcription factors (TFs) and subsequent action on key cardiac ion channels genes (ICs). This project informs the use of hiPSC-CM as a scalable, high-throughput experimental model for cardiac epigenetics studies and for future cardiotoxicity testing of HDACi.

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RESEARCH SHOWCASE

BIOMEDICAL ENGINEERING

SCHOOL OF ENGINEERING AND APPLIED SCIENCE

Rapid Detection and Identification of Low Titer Viruses Found In Cerebral Spinal Fluid

Viruses associated with certain neurological viral diseases are often difficult to detect using traditional molecular or immunologic assays because of low viral loads in the clinical samples. We developed a carbon nanotube (CNT)-based microfluidics platform that allows enrichment of virus particles from a sample and detection by Surface enhanced Raman spectroscopy (SERS) coupled with machine learning. We tested how well this approach could detect and identify Human polyomavirus 2 (aka John Cunningham virus or JC virus) and Human T-lymphotropic virus (HTLV) in cerebrospinal (CSF) fluid. SERS is a highly sensitive technique that measures the Raman scattering of molecular bonds. The diversity of molecular combinations found within the viral structure and surface proteins leads to unique Raman spectra. 10,000 spectra were collected for each virus as well as from a clean (no virus) CSF sample. After signal preprocessing to perform baseline correction, a convolution neural network (CNN) was trained to predict which virus, if any, a sample contained. The CNN was able to distinguish negative samples from infected samples, and to correctly identify the viral agent present with an accuracy of 89%. With each spectra requiring only 5 seconds for collection, these results demonstrate the ability of Raman imaging to provide a rapid and label-free mechanism of viral characterization and identification when coupled with a CNT enrichment platform.

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RESEARCH SHOWCASE

BIOMEDICAL ENGINEERING

SCHOOL OF ENGINEERING AND APPLIED SCIENCE

Development of Fibrinolytic Platelet System to Dissociate Cancer Cell Clusters

There is a critical need to reduce cancer cell metastasis by addressing the platelet-cancer cell interactions and the clustering of circulating tumor cell (CTCs). During metastasis, platelets support CTCs by protecting them from shear stress, shielding them from NK cell recognition, releasing pro-oncogenic and angiogenic factors, and enabling passive and active arrest of CTCs in the vasculature. Additionally, cancer cells tend to form clusters that have a much higher metastatic potential than single CTCs. Therefore, the objective of this project is to develop a fibrinolytic platelet system utilizing a modified platelet carrier to deliver a tissue plasminogen activator (tPA) to the CTC clusters, disassociating the CTCs while also inhibiting the platelet-CTC interactions. To accomplish this task tPA was loaded onto two different modified platelet systems: platelet decoys and lyophilized platelets. The receptor characteristics and drug loading of these systems were assessed via flow cytometry. Flow cytometry was also used to characterize the interactions between the fibrinolytic platelet system and cancer cells *in vitro*. Then the fibrinolytic activity of the systems was assessed via an Anaspec fluorescence assay to ensure that the tPA retained its effectiveness once loaded. Furthermore, the ability of the system to disassociate cancer cell clusters *in vitro* was assessed using a light transmission aggregometry method. The results demonstrate that the tPA was successfully loaded onto both platelet decoys and lyophilized platelets while maintaining the fibrinolytic activity of the platelets. Additionally, the platelet carriers maintained significant expression of the GP IIb/IIIa receptor which is heavily involved with platelet-CTC interactions. This was reinforced by the high percentage of cancer cells that interact with the tPA-loaded carriers. The data also proves that the fibrinolytic platelet systems can successfully disassociate cancer cells *in vitro*. Together these results indicate that we have successfully developed a fibrinolytic platelet system that maintains relevant receptors and tPA activity while being capable of interacting with cancer cells and disassociating cancer cell clusters. The next stage of this project is to assess the effectiveness of this system in disassociating CTC clusters *in vivo*.

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RESEARCH SHOWCASE

BIOMEDICAL ENGINEERING

SCHOOL OF ENGINEERING AND APPLIED SCIENCE

Using Reflectance Transformation Imaging to Identify Surface Features of Common Objects and Biological Specimens

Reflectance Transformation Imaging is an imaging method that compiles multiple digital photographs of a stationary object illuminated by light projected from different directions. The images are computationally synthesized, and the result is an interactive model that reveals information about surface texture, shape, and color that may not be visible with regular visual inspection.

Our team completed the final troubleshooting steps to assemble an RTI Dome, a hemisphere fitted with 64 white and 32 ultraviolet (UV) LED's surrounding a dark space in which to image an object. We triggered a digital camera shutter from our software to synchronize it with the illumination sequence of individual dome's LED's.

The angle of light being emitted from an LED and reflected from the surface of the object is the surface normal. After all images are taken, the RTI Builder software calculates and saves the surface normal per pixel in each image, and uses this data to create a reconstruction of quantitative surface relief.

We tested how well this software could reveal surface characteristics of several objects using white light. First, we tested the ability of the method to capture and display an object with high contrast (black and white) and sharp edges. Next, we tested the software's ability to display surface textures of a leaf, such as reflectance, veins, and color. We observed the leaf using specular enhancement, one of the rendering modes in the RTI Viewer software. This mode enhances surface texture and reflectiveness by varying specularity, color, and highlight. Utilizing this mode, the direction of light and reflectiveness of the leaf were emphasized.

We plan to continue testing the RTI Dome to characterize its capabilities of color differentiation and texture detection. Once the dome's imaging capabilities and limits are identified using white light, we will begin using the software to image leaf specimens under UV light. We predict that we will be able to detect the leaf's fluorescence and markings that are invisible to the naked eye. Understanding how to use the UV imaging mode of RTI dome will help us on future projects to identify surface tissue deterioration and growth, surface contamination, and scratches or textures on organ surfaces.

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RESEARCH SHOWCASE

BIOMEDICAL ENGINEERING

SCHOOL OF ENGINEERING AND APPLIED SCIENCE

Feature Analysis of Breast Tumor and Kidney Tumors and Analysis of the Most Efficient Machine Learning Algorithm that Identifies the Correct Classification of Tumors

This research project is a comparative study that focuses on machine learning algorithms that could be better suited at identifying cancerous tumors within the breast versus within the kidney. The ability to use machine learning to differentiate between cancerous and benign tumors could prevent the need for biopsies. Moreover, by determining which models perform better for various cancer classification tasks, general users may be more apt to select the better set of models for their task. To examine models best suited for each type of cancer classification, image features were extracted from images and statistical analysis performed to determine the significance of each of the individual features. In addition to Histogram, Gray Level Run Length, and Gray Level Co-occurrence Matrix features, code has been written to analyze the boundaries of tumors. Using a chain code that maps the boundary of each tumor, the extent of smooth versus jagged edging on the boundaries is calculated. In the next step, machine learning algorithms will be used to identify features that are more suitable for classifying cancerous and benign tumors for each cancer type, breast versus kidney. The machine learning models analyzed will include neural networks, k-nearest neighbors, random forest, logistic regression, and support vector machine.

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RESEARCH SHOWCASE

BIOMEDICAL ENGINEERING

SCHOOL OF ENGINEERING AND APPLIED SCIENCE

Stretchable and Transparent Metal Nanowire Microelectrodes for Simultaneous Electrophysiology and Optogenetics Applications

Optogenetics has revolutionized many research programs in biology and medicine by affording the ability to modulate activity of specific subtypes of cells through light-sensitive proteins. However, this emerging technique does not provide direct information on the extent to which cells under investigation participate in complex biological processes. Thus, electrophysiological recording, the gold-standard method for monitoring electrical activity of cells, serves as a useful complement to optogenetics. Integrations of these two techniques will pave the way for investigating causality in biological systems. Traditional opaque microelectrode arrays (MEAs), though promising for high-resolution recordings, are not ideal for optical interfacing because they impede light delivery to tissue beneath the microelectrodes and produce light-induced artifacts, which interfere with recorded signals. Furthermore, state-of-the-art transparent microelectrodes suffer from mechanical mismatch between the electrodes and the soft, curvilinear surface of biological tissues, causing acute/chronic damage in the surrounding tissue area.

Here, we present stretchable and transparent MEAs using silver nanowire (Ag NW) for conformal biointerfacing, including simultaneous optogenetic stimulations and electrophysiological recordings, with mechanically active organs. We successfully fabricated stretchable and transparent MEAs by sandwiching patterned Ag NW structures between PDMS substrate and encapsulation layers. The Ag NW interface exhibits a low sheet resistance, a stretchability of 40%, an advantageous impedance, and a high optical transparency above 80%. Ex vivo studies on mice demonstrate that stretched Ag NW microelectrodes can achieve high-fidelity electrophysiological monitoring of cardiac activity with co-localized optogenetic pacing. Stretchable and transparent MEAs presented here represent an innovative and simple approach to fabricate nanowire-based MEAs. More importantly, this work suggests the broad potential of metal nanowire microelectrode technology in combining electrophysiology with optophysiology to investigate mechanically active organ systems for both applied and basic biomedical research.

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RESEARCH SHOWCASE

BIOMEDICAL ENGINEERING

SCHOOL OF ENGINEERING AND APPLIED SCIENCE

Structural and Electrical Remodeling in Mice Hearts from Moderate Endurance Exercise

Excessive exercise in athletes causes harmful cardiac remodeling while normal levels of exercise can be beneficial. In this study, we determined the effects of moderate endurance exercise on cardiac structure and function in male and female mice.

Male and female (n=9 each) C57BL/6 mice were run on a treadmill for 45 minutes/day, 5 days/week for 6 weeks. Echocardiograms and electrocardiograms (ECG) were recorded at a biweekly interval. After week 6, arrhythmia susceptibility was determined in explanted hearts and arrhythmia incidence and duration were recorded.

In sedentary control male and female mice, age-related changes in ECG and echocardiography were observed. Additionally, in exercised male mice, electrical remodeling included PR interval prolongation at weeks 2 and 4 (10% and 9%). In this group, structural remodeling included decrease in left ventricular posterior wall thickness during systole (LVPWs) in week 2 (9%) and increase in left ventricular posterior wall thickness during diastole (LVPWd) in week 4 (4%). This remodeling was associated with an increase in the duration (370%) and incidence (192%) of ventricular tachycardia (arrhythmia).

In exercised female mice, no significant changes in electrical remodeling were observed in the recorded ECG parameters. However, significant mechanical remodeling was observed such as decrease in stroke volume (SV) in week 2 (13%), ejection fraction (EF) in weeks 2 and 6 (9% and 10%), fractional shortening (FS) in weeks 2 and 6 (11% and 13%) and increase in cardiac output (CO) in weeks 2, 4 and 6 (13%, 18% and 16%). In this group, structural remodeling included decrease in LVPWs in weeks 2 and 6 (5% and 4%) and increase in left ventricular end systolic diameter (LVESD) in weeks 4 and 6 (15% and 15%) and left ventricular end diastolic diameter in weeks 4 and 6 (9% and 8%). Taken together, this could be indicative of left ventricular dilation in female exercised mice. Similar to the male exercised mice, there was an increase in the number (425%) and duration (483%) of arrhythmias in female exercise mice.

Moderate exercise induced significant electrical and structural remodeling in the heart which increased arrhythmia susceptibility. While structural remodeling was observed in both female and male mice, electrical remodeling was more prevalent in male mice and mechanical function was altered in female mice alone. Therefore, significant sex differences exist in cardiac adaptations to moderate endurance exercise.

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RESEARCH SHOWCASE

BIOMEDICAL ENGINEERING

SCHOOL OF ENGINEERING AND APPLIED SCIENCE

Breast Tumor Localization Via Analysis of Deformation and Displacement Using 3D Finite-Element Image Analysis

Among women in the United States of America, breast cancer occurs at a rate of 1 in 8 women and has a high mortality rate. Typical diagnosis of breast cancer begins with mammography; this procedure, however, commonly fails to detect tumors that are small and in highly dense breast tissue. To help combat this issue, companion research in this lab uses thermography, an imaging technique that detects infrared wavelengths (8-12μ) to create images that represent an object's temperature as image intensity. Cancerous breast tumors often experience reduced vasoconstriction, so as the breast cools, the tumor will create a difference in energy dissipation between the healthy and cancerous tissues that can be detected by a thermogram. An issue that arose in that research is the deformation due to gravity between when the patients are imaged sitting in a chair and when the surgeon measures the location of the tumor during removal while the patient is supine. Depending on breast size and tissue properties, this can lead to errors when comparing the tumor location found in the thermogram and the true location reported by a surgeon. We will use a three-dimensional computer-aided design (CAD) model to analyze, in MATLAB, the deformation due to gravity of patients' breast when moving from sitting up to supine positions. Using digital signal processing techniques as well as the reduced-order calculations provided in MATLAB, the object can be defined and its magnitude and direction of deformation measured. The CAD models will initially assume uniform breast tissue and mechanical properties, have a randomly-located tumor, and a nipple that will be located in the same place on each model. The code will compute the distance between the tumor and nipple when sitting and supine, then compare the results to discover any changes between those positions. This research is ongoing.

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RESEARCH SHOWCASE

BUSINESS

SCHOOL OF BUSINESS

Consumer attitude and expectations; how they play an important role in the overall outcome of the consumer product/service experience?

Attitude and expectations play a large role in how we experience a product or service. Consumers can have vastly different experiences even when they are consuming the same product or service. There are many variables, but this project will be focusing mainly on "Expectation Confirmation Theory" to help identify how and whether an original product, service, location, or other variable can be used to win in a competitive landscape. Seeing how consumer expectation and attitudes play a role in pre, during and post consumption cycle.

The methods used will be conducting interviews with individuals and sending out surveys to collect data about their "pre, during and post" relationship/interactions with a product, service, event, or any other consumables. Once the data is collected, data analysis will be performed and models will be formed to showcase the findings.

This presentation addresses the importance of consumer attitude before, during and after they interact with a product or service. Once these customer attitudes are known for a specific product or service, businesses are able to strategize on how they want to make important decisions for their business.

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RESEARCH SHOWCASE

BUSINESS

SCHOOL OF BUSINESS

Examining the effect of Lowering the Federal Tax Rate on Businesses

On December 2017, the Tax Cuts and Jobs Act (TCJA) was signed into law. It was the largest tax code overhaul in over 30 years. It had supply-side incentives and was created to strengthen the economy. The Tax Cuts and Jobs Act ("TCJA") of 2017 changed several deductions and expenses that affect businesses. The cumulative effect of the act reduced the tax rate on businesses. The purpose of this research study was to examine the effects of reducing tax on businesses. It has long been said that the needs of businesses, citizens, workers and our country can be met by lowering the tax on businesses. Indeed, politicians as well as corporate executives have long noted that lowering taxes on corporations would in turn increase employment, as companies create jobs. A popular saying is that companies create jobs and by lowering taxes on them will enable companies to create more jobs with the money that they save by paying less in tax.

The study examines the business environment prior to the TCJA and follows it to the present. Data collected for this paper shows how a tax cut for businesses affected businesses themselves and the labor force. It explores if the TCJA lived up to its promise. This study provides a thorough analysis of a far-reaching congressional act: its intended effect and its actual effect.

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RESEARCH SHOWCASE

BUSINESS

SCHOOL OF BUSINESS

Immigration Policy Shock and Firm Skill Downgrading: Evidence From DACA

How would immigration policy affect firms labor market hiring strategy? Using high-frequency data on over 1.5 billion online job postings, we ask this question by analyzing firms labor market response to the passing of Deferred Action for Childhood Arrivals (DACA) in 2012. We find that after the passing of DACA, firms increased the number of job postings in regions that are more exposed to undocumented immigrants, especially for jobs that only require high-school degrees and part-time jobs, suggesting DACA triggered a larger labor supply in those regions. In terms of skill requirement, DACA leads firms to reduce the postings on high skill jobs while increasing postings on low skill jobs in regions that are more exposed to undocumented immigrants. These effects are most prominent among smaller firms and firms that are more financially constrained. In addition, these firms' operational performance became worse and revealed larger risk concerns towards DACA and undocumented immigrants. Finally, we find suggestive evidence that the loss of bargaining power and being less capable of adjusting to the change of local labor market structure could explain such variations.

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RESEARCH SHOWCASE

BUSINESS

SCHOOL OF BUSINESS

Sharing Without Caring?: How Self-Concealment Influences Idea Creativity at Work

Whereas a large body of research examines the antecedents of individual creativity, comparatively little work studies the psychological and interpersonal aspects of the creative process. This gap in the literature is meaningful because interpersonal dynamics in social groups may raise psychological barriers which put pressure on individuals to conform to the influences of their social group. Past research indicates that conformity pressures can affect individuals' desire to share ideas in groups. I build on earlier work to examine the psychological mechanisms that underlie this effect. I propose that when individuals feel they must conceal part of their identity, they feel less of a sense of belonging, which causes them to express ideas that connect them more to others yet are less likely to be creative. Across three studies I find that self-concealment relates to a desire to feel connected with others—termed belonging motive frustration. An experimental study of LGB employees shows that frustrated belonging mediates the self-concealment—creativity relationship and unexpectedly results in higher expressed creativity. Post hoc analyses reveal a boundary condition to these findings: perception of concealed identity. Results indicate a constructive consequence of self-concealment in the interpersonal processes related to creative idea expression. Findings have implications for research about impression management and creativity, as well as for organizations focused on creating innovative work environments.

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BUSINESS

SCHOOL OF BUSINESS

Scapegoating a Nonfamily Member After Organizational Misconduct in Family Firms

Who is blamed for organizational misconduct in family firms? While extant studies assume that dismissing executives/directors is a corrective action to avoid future misconduct, doing so may operate as a defensive action to placate stakeholders without organizational change by scapegoating less responsible executives/directors. Nonetheless, several theories suggest a mixed role of family members in scapegoating (the likelihood that nonfamily members will exit a firm, as opposed to family members). For example, agency theory argues that less agency conflict will lead to less scapegoating, but behavioral theory posits that high socioemotional wealth will result in scapegoating. By combining agency and behavioral theories, this paper theorizes that scapegoating occurs in family firms. These family firms may scapegoat nonfamily members after organizational misconduct as the number of family member executives/directors increases. This scapegoating is based on several reasons; in this case, the board emphasizes the preservation of socioemotional wealth, less attribution to family member executives given their family-based emotional ties, family members' low motivation to abandon their family-firm specific resources, and their strong power from the top hierarchy and family identity. Additionally, family member executives' power from sitting on board can strengthen the scapegoating of nonfamily members. This study further explores the consequence of nonfamily member departure in family firms: not significant evidence for reducing future violations. Overall, this study contributes to the literature on organizational misconduct by suggesting that scapegoating serves as a firm’s defensive response.

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SCHOOL OF BUSINESS

Institutional Blockholder Exit Threats and Corporate Social (Ir)responsibility

Institutional blockholders, who have incentives to gather private information and sell their shares when managers underperform, exert governance through exit threats. Hence, managers align their actions with shareholders' interests to dissuade blockholders from selling. Prior studies document that exit threat is an effective governance channel that enhances firms' financial performance. In this paper, we investigate whether exit threats by institutional blockholders can also exert governance on firm's social performance and discipline managers' corporate social behavior. Using 25 years of data from 1993 to 2018, we find that as exit threats increase, firms reduce not only social irresponsibility (CSI), but also social responsibility (CSR), implying that CSI and CSR are independent actions that both reflect agency problems rather than firm value enhancement. Furthermore, consistent with exit theory, the negative impact of exit threats on CSI and CSR increase as managerial wealth is sensitive to stock price, the firm is cash-rich (more susceptible to "bad" agency problems), and following Schedule 13G filings that indicate blockholders' intent to remain passive (exert governance through exit threats only). We contribute to research on firm-level sustainability and the role of blockholders in disciplining both socially responsible and irresponsible activities that may not be in the shareholders' interests.

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RESEARCH SHOWCASE

BUSINESS

SCHOOL OF BUSINESS

California wineries and climate change: Extreme events, resource-supply adaptation, and wine quality

Current actions across countries to mitigate the impacts of climate change to the 2°C outlined in international climate agreements are currently insufficient, indicating an increasingly important need to understand both the impacts of climate change as well as how to adapt to the inevitable changes. This paper examines how extreme climate events impact firm product performance and resource-supply adaptation strategies. Using a dataset of 50,156 wine-winery-year observations for 535 wineries covering the years 1981-2019 in the California wine industry, we examine how extreme heat, cold, and precipitation events impact wine quality and winery adaptation strategies involving grape varietals and vineyard sources. We use a panel regression with firm-, region-, and year-fixed effects to test for the relationship between extreme climate events, winery resource-supply adaptation strategies, and wine quality. First, we find that there is an *adaptation gap* which is a mismatch between adaptation responses by wineries and the adaptation needs of wineries. Second, we find that extreme climate events can not only create adverse conditions for firms but can also create advantageous conditions where the firms can *prosper*. Finally, we find that the impact of extreme climate events on performance and adaptation strategies differ by both the *type* of extreme climate event and the *dimension* of the extreme climate event.

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RESEARCH SHOWCASE

BUSINESS

SCHOOL OF BUSINESS

Climate Risk Disclosure and Environmental Performance: An Impression Management Perspective

The impression management perspective has received growing attention in voluntary environmental disclosure literature. This stream of literature has traditionally focused on situations when firms have positive environmental activities to enhance or when they face threats or negative environmental events to conceal or obfuscate. Rather than considering either positive or negative situations, this paper enriches prior research by examining impression management tactics used by firms with more positive outcomes and by firms lacking or with fewer positive outcomes to enhance in the context of environmental issues. An analysis of S&P 500 firms' climate risk disclosures in annual reports suggests that highlighting physical risk of climate change relates to fewer environmental strengths, while emphasizing on energy-related climate risk is associated with more environmental strengths, accounting for firm and industry-by-year fixed effects. I argue that the dimension of climate risks a firm chooses to highlight depends on managers' perception of external evaluation of their firm's level of environmental engagement. Instead of objectively disclosing climate risk exposure, firms may selectively adjust the proportion of different dimensions of climate risk in their disclosure so as to appear better in their lesser environmental management activities or in their environmental strengths. Moreover, I find that firms are less likely to use such tactics to gain a more favorable impression when the uncertainty about (physical) climate risk realization is reduced or when firms are more likely to be subjected to greenwashing suspicions. This paper makes contributions to the literature on impression management and voluntary climate risk disclosure.

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RESEARCH SHOWCASE

BUSINESS

SCHOOL OF BUSINESS

A Dynamic Multivariate Integer Autoregressive Model for Count Time Series and its Bayesian Analysis

The integer autoregressive (INAR) processes play a vital role in modeling count series. In this paper, we integrate a random environment that follows a state-space evolution into the univariate INAR(1) model from McKenzie (1985), and we term our model Dynamic Multivariate INAR(1). The random environment provides an efficient and scalable multivariate generalization of the univariate INAR(1) model with dynamic multivariate negative binomial predictive distributions. Furthermore, it also allows the Dynamic Multivariate INAR(1) model to account for time-varying contemporary dependency structures. We propose a Monte Carlo Markov Chain method and a Particle Learning algorithm for parameter learning and inference of state variables. In an experiment based on a real dataset, we show that the Dynamic Multivariate INAR(1) model substantially outperforms competing models in terms of one-step-ahead out-of-sample forecasts.

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RESEARCH SHOWCASE

CANCER/ONCOLOGY

INSTITUTE FOR BIOMEDICAL SCIENCES

HDAC6 inhibitors enhance the phagocytic capacity of macrophages by downregulating the CD47/SIRPα axis

CD47 is an innate immune checkpoint overexpressed by cancer cells and interacts with signal regulatory protein alpha (SIRPα) to prevent the phagocytic capacity of macrophages. CD47 blockade is a novel immunotherapeutic approach that aims to enhance the innate anti-tumor response in cancer patients. Despite its success in treating hematological malignancies, its therapeutic efficacy is restricted in solid tumors. In melanoma, CD47 blockade has only proven successful when combined with other therapeutic approaches such as immune checkpoint blockade. Our group has previously demonstrated that histone deacetylase 6 (HDAC6) inhibitors have immunomodulatory properties, including the modulation of macrophage phenotype and inflammatory function. In this study, we evaluated the role of HDAC6 in modulating macrophage phenotype and the CD47/SIRPα axis. Using primary bone marrow-derived macrophages and human monocyte cell lines, we observed that HDAC6 inhibition enhances the phenotype of pro-inflammatory M1 macrophages while decreasing the anti-inflammatory M2 phenotype. In addition, HDAC6 inhibition decreases the expression of SIRPα and increases the expression of other pro-phagocytic signals such as CD36, MFGE8 and LRP1 in macrophages. HDAC6 inhibition also downregulates CD47 expression in mouse and human melanoma models. We hypothesized that HDAC6 inhibition would increase phagocytosis of melanoma cells by downregulating the CD47/SIRPα axis. We observed that pro-inflammatory M1 macrophages treated with the HDAC6 inhibitor Nexturastat A had an increased phagocytic capacity compared to untreated M1, as evaluated by flow cytometry and confocal microscopy. These effects, mediated by SIRPα downregulation, were further enhanced in the presence of CD47 blocking antibodies. Using mouse melanoma models, we observed that the combination of systemic Nexturastat A and intratumoral delivery of anti-CD47 decreased tumor growth in vivo. Altogether, our results provide a rationale for evaluating combination therapies aiming to enhance the phagocytic capacity of macrophages induced by CD47 blockade.

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RESEARCH SHOWCASE

CANCER/ONCOLOGY

INSTITUTE FOR BIOMEDICAL SCIENCES

Identification and generation of repetitive element-specific T cells to target ovarian cancer

The highly immunosuppressive nature of the tumor microenvironment in ovarian cancer (OC) allows these tumors to grow undetected by the immune system, resulting in late diagnosis and poor therapeutic outcomes. One way to partially reverse this immunosuppression is through the administration of epigenetic therapeutics, which stimulate an immunogenic interferon response in OC cells by inducing the transcription of repetitive elements (REs). As REs are normally silent in terminally differentiated cells, their upregulation in tumor cells suggests that these genomic elements can be used as inducible treatment targets. T cells specific for an RE-derived protein antigen, the non-functional envelope gene of endogenous retrovirus K (ERV-K-Env), can recognize this antigen and kill OC cells while sparing healthy cells. Whether these ERV-K-Env-specific T cells will have enhanced tumor cell killing capabilities when combined with immunogenic epigenetic therapy is unknown. In addition to ERV-K-Env, other epigenetically upregulated REs serve as an unexplored pool of tumor-associated antigens that may be novel treatment targets.

To test the hypothesis that combining ERV-K-Env-specific T cells with epigenetic therapy will result in enhanced killing of tumor cells compared to epigenetic therapy alone, we isolated T cells from healthy donors and transduced these cells with a T cell receptor specific for ERV-K-Env. Preliminary analysis in an allogeneic setting indicates specific recognition of the cognate ERV-K-Env antigen when presented by a B lymphoblastoid cell line. Upon confirmation of target antigen specificity from multiple healthy donors, we will then assess if this specific recognition is enhanced by treating HLA-matched OC cell lines with epigenetic therapy. In addition to these studies with the candidate RE ERV-K-Env, we are also conducting bioinformatic analyses of RNA-sequencing data to identify other potential targetable REs upregulated in OC by epigenetic therapy. These efforts serve as a novel therapeutic approach to enhance the immune response to OC, with the goal of increasing the overall survival rate for these patients.

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RESEARCH SHOWCASE

CANCER/ONCOLOGY

INSTITUTE FOR BIOMEDICAL SCIENCES

Photothermal Therapy of Melanoma with anti-CD137 Coated Prussian Blue Nanoparticles

Background – Photothermal therapy (PTT) is an emerging approach to cancer therapy that typically utilizes nanoparticle-based photothermal agents and laser exposure to kill cancer cells via hyperthermia or ablation. In addition to tumor cell killing, secondary effects of PTT are tumor antigen release and immunogenic cell death. While these effects are immunologically beneficial, PTT alone may not provide adequate stimulation of cytotoxic T cells, key effector cells needed for tumor control. While co-administration of costimulatory antibodies with PTT has been explored, co-localized administration of these modalities within the tumor microenvironment (TME) using a single nanoparticle construct needs further investigation to maximize the antitumor immune effects of these treatments. Here, we propose that PTT-based tumor ablation concomitantly with direct stimulation of cytotoxic T cells using costimulatory antibodies will yield improved outcomes for treating melanoma in vitro and in vivo. Due to its subcutaneous origins and metastatic severity, melanoma serves as a suitable cancer to explore the immunotherapeutic effects of PTT. Specifically, we test the potential of PTT with Prussian blue nanoparticles (PBNPs) to both thermally ablate tumors and serve as a vehicle to administer the T cell stimulating antibody anti-CD137 (αCD137) directly to the TME. We hypothesized that coating PBNPs with αCD137 elicits co-localized activation of cytotoxic T cells within the tumor draining lymph nodes after thermal ablation of the tumor.

Methods – PBNPs were synthesized from K4[Fe(CN)6] and FeCl3 hydrated salts. PBNPs were coated with αCD137 via electrostatic binding to yield αCD137-PBNPs. 5-week-old C57BL/6 mice (n=5/group) were inoculated with 1 million SM1 melanoma cells and left untreated or treated with intratumoral (i.t.) αCD137 (3 doses), i.t. αCD137-PBNPs (3 doses), PBNP-PTT, or αCD137-PBNP-PTT + 2 boosters of i.t. αCD137-PBNPs. Each individual dose contained 25μg of αCD137.

Results – Untreated mice and mice treated with αCD137 or aCD137-PBNPs reached tumor size endpoints within 15-23 days. Mice treated with αCD137-PBNP-PTT exhibited complete primary tumor regression in 100% of the treated mice, but experienced hepatotoxicity as measured by discoloration of liver. 60% of mice treated with PBNP-PTT survived 124 days and were rechallenged with SM1 cells, whereupon 1 mouse rejected rechallenge and 2 mice reached tumor volume endpoint 56 days after rechallenge.

Conclusion – Our investigation has demonstrated the potential of αCD137-PBNPs for PTT and elimination of primary tumors in murine melanoma models. However, achieving nontoxic dosing and maximizing the costimulatory effects of α

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RESEARCH SHOWCASE

CANCER/ONCOLOGY

MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

Documentation of Hospice Discussions in Clinical Notes of Older Adults with End-Stage Renal Disease

Background: Hospice care is associated with quality end of life (EOL) care for terminally ill patients. Compared to patients with terminal cancer, advanced kidney disease patients face higher mortality and symptom burden; however, they are less likely to use hospice services at the EOL and referred to hospice closer to the time of death. A barrier to hospice utilization for older patients with end-stage renal disease (ESRD) is that Medicare will not cover curative therapies and hospice care simultaneously.

Objective: To use natural language processing (NLP) to determine how frequently hospice discussions are documented in electronic health record (HER) of hospitalized older adults with ESRD and highlight patient-level factors associated with hospice documentation among older patients.

Methods: A retrospective cohort study was conducted with n=370 patients, who were ≥65 years old, hospitalized in 2019 at Brigham and Women's Hospital, and diagnosed with ESRD pre-hospitalization. Initial hospitalization was used as an index date to collect data from unstructured text notes and structured fields within EHR. A validated ontology and NLP software, ClinicalRegex, was used to enumerate clinical notes with hospice documentation. Human annotators reviewed identified phrases to confirm they were relevant (kappa: 0.82) to active use of hospice, hospice discussion or inquiry between clinician, patient, and/or family. Race and ethnicity were documented because hospice documentation may be lower among self-identified Black patients, even though they receive more intensive care. Insurance status was included to determine the association between insurance type and hospice documentation. Descriptive statistics were performed to describe the sample and bivariate analyses to assess the relationship between variables.

Results: Of the 652-patient encounters included, n=40 (6.13%) had validated documentation of hospice discussions. Among validated encounters; median age was 75.2 years. Older women had a higher proportion of documentation (55%) compared to men (45%); and documentation was lower in older Black patients (22.5%) compared to older White patients (67.5%). Older patients on hemodialysis (22.%) with Medicare as the primary coverage were less likely to have documentation compared to those not receiving hemodialysis (77.5%).

Conclusions: Hospice documentation frequency was low in overall cohort. Lack of hospice use among older adults with ESRD is multifactorial. Racial variations in hospice documentation reveal critical gaps in delivering equitable EOL care.

Implications: Findings demonstrate the need of targeted interventions to increase hospice discussion documentation in EHR; and improve communication regarding hospice care options between older patients with ESRD and healthcare providers, especially for patients from racially marginalized backgrounds.

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RESEARCH SHOWCASE

CANCER/ONCOLOGY

MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

Identification of Novel Tumor Associated-Antigens for the Treatment of Diffuse Intrinsic Pontine Glioma (DIPG)

Diffuse intrinsic pontine glioma (DIPG) is a rare and aggressive high-grade glioma (HGG) that accounts for approximately 10-15% of childhood brain stem tumors. The lethality of DIPG has spurred decades of research into improved treatment regimens; however, none have been shown to yield significant improvements in long-term prognosis as compared to conventional involved-field radiation therapy. As a result, more than 90% of DIPG patients pass away within 2 years of their diagnosis.

New therapeutic avenues against DIPG are sorely needed. One promising solution is the use of chimeric antigen receptor (CAR)-expressing T-cells to target an inducible tumor-associated antigen, a targeted therapy that has demonstrated repeated clinical efficacy in treating childhood leukemias and lymphomas. Potential tumor-associated antigens specific to DIPG may be found among repetitive elements (REs), which constitute approximately 43-45% of the human genome but thus far remain a largely untapped target of CAR T-cells. Recent reports have already identified several long terminal repeat (LTR) elements that are upregulated in aggressive glioblastomas as compared to normal brain tissue, and could thus serve as novel biomarkers for treatment. Engineering CAR T-cells specific to an RE surface antigen could supplement or supplant existing DIPG treatment regimens, and lead to gains in overall survival and prognosis.

In this study, we aimed to identify a cohort of REs that could be used as inducible tumor antigens for targeting by CAR T-cells. We utilized TEtranscripts and Telescope to analyze both family and locus-specific differential expression in DIPG compared to normal pons tissue, generating a list of candidate REs that are overexpressed in DIPG. Next, REs were screened for sufficient baseline expression by comparison against known housekeeping genes. Finally, to avoid the negative selection of engineered T-cells, REs which had substantial expression in the thymus were eliminated. Our preliminary analysis yielded a number of full-length LINE-1 elements that could serve as neo-antigens for CAR T-cell therapy. These findings represent the first step in creating a targeted therapy to improve the currently static DIPG survival rates.

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RESEARCH SHOWCASE

CANCER/ONCOLOGY

SCHOOL OF MEDICINE AND HEALTH SCIENCES

Reprogramming macrophages with HDAC6 inhibitors improves macrophage-based cell therapy in melanoma

The balance between M1 (inflammatory) and M2 (tumor supportive) macrophages determines tumor suppression or tumor growth. Tumor-associated macrophages (TAMs) determine either tumor suppression or tumor progression depending on their inflammatory status. M1-like TAMs have a pro-inflammatory (anti-tumor) activity, and M2-like TAMs have an anti-inflammatory (pro-tumor) activity. Therefore, the balance between M1 and M2 macrophages determines the fate of cancer progression. The categorization of macrophages into these two opposing phenotypes is simplistic due to the plastic nature of macrophages. TAMs have a hybrid role as they switch between the two phenotypes. However, high levels of TAMs are usually associated with a poor prognosis as they tend to shift towards the M2 phenotype. Therefore, new strategies to reprogram macrophages to enhance anti-tumor immunity are highly desirable. A higher ratio of M1/M2 has been associated with favorable outcomes in cancer patients.

In order to alter the tumor microenvironment (TME), we used a selective histone deacetylase (HDAC) 6 inhibitor to influence the macrophage phenotype. Adoptive cell therapy (ACT) with macrophages has been studied in the past with little to no benefit to patients. It has been shown that adoptively transferred M1 macrophages are often reprogrammed to the M2 phenotype in the setting of the immunosuppressive tumor environment. However, we investigated the effects of immunomodulation using HDAC6 inhibition to maintain the M1 polarization after exposure to the TME. In this study, we reprogrammed M1 macrophages ex-vivo by treating them with HDAC6 inhibitors and directly implanted them into tumors. The transplanted macrophages were viable, and inhibition of HDAC6 rendered them resistant to M2 phenotype polarization. As demonstrated by immuno-competent SM1 murine melanoma and humanized NSG-SGM3 melanoma models, ACT enhanced anti-tumor immunity by increasing the M1/M2 ratio and infiltration of CD8 effector T-cells. For the first time, we demonstrated that reprogramming macrophages with HDAC inhibitors is a viable cell therapy option to treat solid tumors.

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RESEARCH SHOWCASE

CANCER/ONCOLOGY

SCHOOL OF MEDICINE AND HEALTH SCIENCES

Atypical presentation of Her2+ and β≤-hCG+ leptomeningeal carcinomatosis in a patient with isolated ocular palsies.

Introduction: Leptomeningeal carcinomatosis (LMC) is an uncommon late complication of metastatic malignancy that carries a poor prognosis. Diagnosis is challenging, especially if a history of cancer is unknown, as symptoms can be nonspecific or involve focal deficits such as cranial nerve palsies. We present a case of LMC secondary to gastric adenocarcinoma in a patient whose only manifestations were cranial nerve palsies, and whose cancer was also found to be Her2+ and β-hCG+, two markers not widely recognized in gastric cancer.

Case: A 54-year-old woman with a history of hypertension, diabetes mellitus, and recently diagnosed gastric cancer presented to the emergency department (ED) with crossed eyes for two weeks. Her neurological examination revealed ptosis, impaired adduction and elevation, and fixed dilation of her left eye with a poorly reactive pupil, as well as impaired abduction of her right eye. One small, nonmobile, nontender left supraclavicular lymph node was palpated. Laboratory data was significant for leukocytosis and microcytic anemia. Urine pregnancy test returned positive, and beta-human chorionic gonadotropin (β-hCG) concentration was 118 IU/L. Biopsy revealed poorly-differentiated gastric carcinoma with signet ring features which was Her2+. MRI brain showed enhancement of the left cavernous sinus and bilateral prepontine cistern with involvement of right 6th cranial nerve. Lumbar puncture and CSF cytology were not pursued given the high pretest probability of these lesions being malignant. A gastrojejunal tube was placed, and she received brain radiotherapy, after which she was discharged home. Unfortunately, she returned two days later with gastrointestinal bleeding and respiratory distress. She was admitted to the ICU in hemorrhagic shock and found to be bleeding from her gastric tumor. She subsequently passed away from cardiac arrest.

Discussion: LMC is an uncommon complication that occurs in up to 5% of solid tumors; LMC secondary to gastric cancer is exceedingly rare, with only 0.2% of gastric cancer resulting in leptomeningeal infiltration. Our case is unique due to the isolated cranial nerve findings in the absence of central neurological symptoms, and the atypical markers revealed during workup. β-hCG remains underemphasized in the setting of metastatic gastric cancer. Her2 positivity may denote a more aggressive clinical course in gastric cancer. This report should serve as a reminder of the occult nature of gastric cancer, and the importance of a low threshold of suspicion in the event of focal symptoms, especially in a patient with increased risk of gastric cancer, for early detection and management.

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RESEARCH SHOWCASE

CANCER/ONCOLOGY

SCHOOL OF MEDICINE AND HEALTH SCIENCES

HALP Score as a Biomarker for Nutritional Status to Predict Overall Survival in Patients Post Radical Cystectomy

Radical Cystectomy (RC) is the gold-standard treatment for recurrent high grade T1 or muscle-invasive bladder cancer. Nutritional status is a well-defined independent predictor of overall survival post-RC. Various prognostic biomarkers have been proposed as surrogates for nutritional status to help predict postoperative outcomes. These biomarkers include albumin, anemia, thrombocytopenia and sarcopenia. Recently, the Hemoglobin, Albumin, Lymphocyte, Platelet (HALP) score has been postulated as an all-encompassing biomarker and has been shown to predict overall survival (OS) post-RC in a single previous study. Due to the paucity of studies looking at HALP and RC outcomes, and optimal cutoffs for HALP have not been defined. Our study sought to analyze and optimize HALP thresholds for OS, as well as examine the Psoas Muscle Index (PMI) as a possible additional predictor that can be used with HALP.

Seventy-three RC patients were evaluated from 2010 to 2021. Of 73 RC patients, 50 had sufficient pre-operative laboratory data to calculate HALP. Sixty-two patients had CT scans to analyze PMI, which was calculated using patient height and the psoas major muscle cross-sectional area measured at the L3 vertebral level. Patient date of surgery, tumor grade and stage, American Society of Anesthesiologists (ASA) Classification, survival status, and date of last contact were extracted from our institutional cancer registry. X-tile software was used to find optimal biomarker cutoffs for HALP. The Cox Proportional Hazards model was used to identify predictors of OS.

Median age was 67 (58-74) years, 58 (79.5%) were male, and 36 (49.3%) received neoadjuvant/adjuvant chemotherapy. Forty-seven (64.4%) had pathological stage ≥pT2, 25 (35.7%) had lymph-node involvement, and 4 (5.5%) had palliative surgery. Median HALP score was 28 (21 – 42). Median PMI was 569 (456 –700). Fifty-six (76.7%) had an ASA ≥ 3. Median follow up was 29.3 months (12.0– 51.9). Forty-eight (65.8%) were alive at last follow-up. HALP (as a continuous variable) was a significant predictor of OS on multivariable Cox regression analysis (HR 0.95, 95% CI 0.90 - 0.99) (P=0.021), adjusting for age, sex, and node involvement; PMI and ASA were not significant. X-tile analysis showed an optimal HALP cutoff of 25.0. Patients with HALP < 25 had inferior OS (median, 32.5 months) compared with those with HALP ≥ 25 (median, not reached) (P=0.025) (Figure 1).

We conclude that patients with low HALP Score were shown to have a significantly inferior OS, with an optimum HALP cutoff of 25.0. We further suggest that the HALP score can be a reliable prognostic biomarker and can assist in nutritional management before surgery. PMI was not a significant predictor of OS and did not add value to HALP score. Future studies may investigate better measures of sarcopenia, which could potentially be combined with HALP score.

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RESEARCH SHOWCASE

CANCER/ONCOLOGY

SCHOOL OF MEDICINE AND HEALTH SCIENCES

Interstitially administered photothermal therapy stimulates strong tumor control against neuroblastoma

High-risk neuroblastoma is a leading cause of cancer-related death in children due to its poor prognosis of 40-50% survival. Nanoparticle-based photothermal therapy (PTT) is a promising treatment modality for high-risk neuroblastoma because it rapidly debulks tumors and generates an *in situ* vaccine effect capable of potentiating strong antitumor responses when combined with immunotherapy. As a clinically relevant approach for treating deep-seated tumors including high-risk neuroblastoma, which are inaccessible to superficial beam lasers typically used for PTT, we propose to interstitially administer PTT (I-PTT). In this study, using Prussian blue nanoparticles for PTT, we compare I-PTT with superficial PTT (S-PTT) in terms of their heating efficiency, PTT-induced immunogenicity, and overall therapeutic benefit. I-PTT was administered using a fiber optic coupler fitted with a cylindrical terminal diffuser attached to an external beam laser. The fiber was positioned within a tumor/sample to administer I-PTT *in vitro* and *in vivo*, and this mode of PTT was compared with S-PTT.

We determined I-PTT generates more efficient heating than S-PTT, attaining higher temperatures (≥ 10.5°C) and 2-4 fold higher thermal dose for the same output laser power. At similar thermal doses *in vitro*, I-PTT reduced murine neuroblastoma cell viability greater than that observed for S-PTT. When assessing immunogenic cell death (ICD) *in vitro*, I-PTT induced ICD at lower thermal doses compared to S-PTT, as measured by its biochemical correlates: ATP, calreticulin, and HMGB1. We then assessed tumor growth and survival of syngeneic N2A or 9464D neuroblastoma tumors after administering I-PTT and S-PTT at comparable thermal doses to tumor-bearing mice. We observed that I-PTT efficiently ablated tumors at a rate greater than S-PTT, improving overall survival in both N2A and 9464D tumor models. Once long-term surviving mice were rechallenged with tumors, I-PTT-treated mice exhibited improved tumor rejection or relatively lower tumor volumes compared to S-PTT-treated mice, suggesting improved antitumor immune benefits with I-PTT. In a two-tumor study where the thermal dose for I-PTT was 2-fold lower than that of S-PTT, we observed similar secondary tumor growth rates and no significant differences in overall survival. Taken together, these results suggest that besides providing access to deeper tumors, I-PTT vastly improves the administration of PTT compared to S-PTT in terms of heating efficiency, immunogenicity, and therapeutic benefit. Consequently, I-PTT is ideally positioned for combination with immunotherapy to provide novel treatment regimens for high-risk neuroblastoma and other solid tumors.

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RESEARCH SHOWCASE

CANCER/ONCOLOGY

SCHOOL OF MEDICINE AND HEALTH SCIENCES

Distinct roles of p38 isoforms in HPV-positive and HPV-negative head and neck cancer: insights from TCGA dataset analysis

New therapeutic strategies are urgently needed for advanced head and neck squamous cell carcinoma (HNSCC) to overcome drug resistance and toxicity and improve patient outcomes. p38 kinases control adaptive cellular responses to stress and may function as non-oncogene addiction factors in malignant cells. Previous studies from our laboratory showed that pharmacologic and genetic co-inhibition of p38α and p38δ isoforms in human and mouse oral cancer cell lines resulted in G2/M cell cycle arrest, as well as inhibition of both cell viability and colony formation capacity, suggesting a potential benefit of targeting of these isoforms in HNSCC. Here we employed several web-based bioinformatic tools including GEPIA, LinkedOmics, TIMER and TIMER2.0, as well as GSCA and GSCAlite, to examine the gene expression, prognostic value, and clinical correlations of all four mammalian p38 isoforms p38α, p38β, p38γ, and p38δ (encoded by *MAPK14*, *MAPK11*, *MAPK12*, and *MAPK13* genes, respectively) in The Cancer Genome Atlas (TCGA) head and neck squamous cancer (HNSC) datasets, either unstratified or stratified by human papilloma virus (HPV) status. Our data showed that the expression levels of *p38α*, *p38β*, and *p38γ* were higher in unstratified HNSC tumors (n = 520) relative to normal tissue samples (n = 44). In addition, *p38γ* expression was higher in HPV- (n = 421) compared to HPV$^+$ (n = 97) HNSC tumors, while *p38δ* expression was higher in HPV$^+$ compared to HPV- HNSC tumors. Moreover, Kaplan-Meyer analysis showed that in HPV- HNSC patients, high *p38β* expression correlated with improved cumulative survival. In contrast, in HPV$^+$ HNSC patients, low *p38γ* expression was associated with improved cumulative survival, suggesting that high level of *p38γ* is a strong predictor of a poor prognosis in this group of patients. No significant differences in cumulative survival were observed between patients with high and low levels of *p38α* or *p38δ* expression in HNSC subtypes stratified by HPV status. Of note, *p38δ* expression was overwhelmingly negatively correlated with immune biomarker levels; conversely, *p38α* expression was positively correlated with immune biomarker levels in HNSC samples. Overall, our findings suggest distinct and context-dependent roles for p38 isoforms in HNSC and highlight a potential path for translational research efforts.

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RESEARCH SHOWCASE

CANCER/ONCOLOGY

SCHOOL OF MEDICINE AND HEALTH SCIENCES

Docetaxel-Induced Interstitial Pneumonitis Superimposed on Rheumatoid Arthritis-Associated Interstitial Lung Disease

An 82-year-old male with rheumatoid arthritis-associated interstitial lung disease (RA-ILD) on methotrexate (MTX) and metastatic prostate cancer t undergoing docetaxel/carboplatin chemotherapy presented with shortness of breath and hypoxic respiratory failure acute dyspnea, productive cough, and hypoxemia. Chest computed tomography angiography (CTA) revealed new diffuse patchy and consolidative ground glass opacities suspicious for multifocal pneumonia with a potential component of acute acceleration of interstitial lung disease (ILD) in a usual interstitial pneumonitis (UIP) pattern. His hypoxia was refractory to broad antibiotics with negative infectious workup. Bronchoscopy with bronchoalveolar lavage (BAL) was performed and showed signs of acute eosinophilic pneumonia. Despite high corticosteroid treatment, the patient required an invasive mechanical ventilation support for worse hypoxemia and expired within a month. Here we report a case with docetaxel-induced interstitial pneumonitis which is a rare and fatal side effect and only few cases have been published in the literature.

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RESEARCH SHOWCASE

CANCER/ONCOLOGY

SCHOOL OF MEDICINE AND HEALTH SCIENCES

Gleason upgrading between Region of Interest-directed vs. systematic template biopsy for mpMRI PIRADS 5 lesions

Multiparametric MRI/transrectal ultrasound fusion biopsy has increased the detection of clinically significant prostate cancer. Prevailing recommendations involve fusion biopsy (FB) of suspicious MRI regions of interest (ROI) along with systematic, template (TB) biopsy sampling of the entire gland. Given the high reported incidence of cancer detection for PIRADS 5 lesions, a targeted-only biopsy paradigm may afford sufficient detection of index pathology while minimizing morbidity. We analyze rates of upgrading between fusion and targeted samples in PIRADS 5 lesions to determine the clinical utility of template sampling in these patients.

Upon retrospective examination of institutional data, we identified n=63 patients with PIRADS 5 lesions who underwent FB with both targeted and extended sextant template-directed cores. Patients with Gleason group (GG) >1 pathology were analyzed for rates of upgrading (i.e. GG≥2) between ROI-targeted and template-directed pathology. PIRADS 5 was principally defined as a >1.5cm hypo- or hyperdense lesion or definitive extraprostatic extension.

Clinically significant cancer (GG>2) was found in 90% of patients with a PIRADS 5 score, with 5% revealing benign pathology and 5% clinically insignificant (GG=1). Average ROI core samples in the cohort was 3.1. FB yielded the dominant gland pathology in 83% of the cohort. FB upgraded index from TB in 29% of patients, 22% of which were upgraded from clinically insignificant to significant. Remaining 17% of cohort had index pathology yielded from TB. Geographical partitioning analysis showed index pathology on TB came from the same or adjacent ROI sextant in these upgraded cases. Only two (3.3%) overall pathologic reports were upgraded from clinically insignificant to significant after considering template biopsy, with ROI and template positions identical in these cases.

We detect a high rate of clinically significant cancer on ROI-directed biopsy of PIRADS 5 lesions. The addition of TB detected an additional 3.3% of clinically significant cancers and both were GG=2. Furthermore, index cancer from TB came from adjacent or identical sextants, suggesting a near miss of ROI-targeting. This evidence supports ROI-directed biopsy alone for patients with mpMRI for PIRADS 5 lesions with potentially increased sampling at the ROI site, although ideal number of targeted biopsy cores warrants further study.

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RESEARCH SHOWCASE

CARDIOLOGY/CARDIOVASCULAR RESEARCH

INSTITUTE FOR BIOMEDICAL SCIENCES

Modest Sex Differences in Cardiac Electrophysiology and Response to Estrogenic Chemicals

Cardiovascular disease incidence is generally lower in females than males, yet females have higher mortality after acute cardiovascular events. Despite these differences, cardiotoxicity testing has largely been limited to male subjects. As such, it remains unclear how sex differences impact both underlying cardiovascular physiology and myocardial responsiveness to chemical exposures. Humans are consistently exposed to bisphenol A (BPA), an exogenous estrogenic chemical that is commonly employed in the manufacturing of consumer and medical-grade plastics. As a known endocrine disruptor, BPA may exacerbate intrinsic sex differences in cardiac electrophysiology.

This study aimed to examine intrinsic sexual dimorphisms in cardiac electrophysiology and cardiac response to BPA. Langendorff-perfused whole guinea pig heart preparations were loaded with voltage- and calcium-sensitive dyes and optical signals were recorded at baseline. Human-induced pluripotent stem cell cardiomyocytes (hiPSC-CM) were cultured on a microelectrode array and electrical signals were recorded at baseline and after exposure to BPA.

At baseline, cardiac optical signals showed action potential duration at 80% repolarization (APD80) and calcium transient duration at 80% reuptake (CaD80) were moderately prolonged in female, compared with male guinea pig hearts during 220 msec epicardial pacing (APD80: 139 vs. 132 msec, $p<0.005$; CaD80: 149 vs. 140 msec, $p<0.02$). These findings align with baseline recordings from hiPSC-CM, where field potential duration (FPD) was moderately prolonged in cells from female donors, compared with male (397 vs. 374 msec, $p=0.01$). After acute treatment (5 min) with 30uM BPA, FPD was shortened in cells from female donors, compared with vehicle control (338 vs. 393 msec, $p<0.0001$). No significant effect was observed for cells from male donors. Using *ex vivo* and *in vitro* models, we identified intrinsic sex-specific differences in cardiac electrophysiology. In alignment with existing literature, the effects of BPA on cardiac electrophysiology were sex-specific and are likely mediated by direct effects on the L-type calcium channel current. Future work includes the use of in vivo models to validate these observations, and additional mechanistic studies to fully elucidate the safety profile of BPA on cardiac physiology.

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RESEARCH SHOWCASE

CARDIOLOGY/CARDIOVASCULAR RESEARCH

SCHOOL OF MEDICINE AND HEALTH SCIENCES

ECPR and ECPELLA in the Resuscitation of WPW Cardiac Arrest

Wolff-Parkinson-White (WPW) syndrome is characterized by a broad spectrum of clinical conditions ranging from asymptomatic to paroxysmal episodes of atrioventricular tachycardia. Extracorporeal cardiopulmonary resuscitation (ECPR) incorporates extracorporeal membrane oxygenation (ECMO) along with cardiopulmonary resuscitation (CPR), which has been shown to have benefits in out-of-hospital atrioventricular tachyarrhythmia. We present the case of WPW cardiac arrest that was resuscitated using ECPR.

Our patient is a 25-year-old male with otherwise no medical comorbidities who presented a witnessed arrest in the field receiving bystander CPR. EMS achieved ROSC after two rounds of CPR and defibrillation. The patient was intubated for airway protection and started on vasoactive agents for vascular support. The initial EKG revealed concerns for WPW syndrome, echocardiographic showed severe global hypokinesis with biventricular failure, and the Laboratory work was significant for severe lactic acidosis of 5.6 mmol/L. The diagnosis of cardiogenic shock was established, and hence he was started on inotropic support with epinephrine. Despite escalating levels of chemical support, his course was complicated by PEA cardiac arrest requiring repeated resuscitation. With ongoing instability without clear etiology, the decision was made to proceed with VA-ECMO cannulation for ECPR support emergently. In lieu of the poor cardiac function, an Impella device was placed for assistance with left ventricular unloading while allowing time for recovery. Over the next 48 hours, the patients' lactic acidosis resolved with the resolution of shock state. The patient was decannulated from ECMO support on hospital day 4, the left ventricular assist device was removed on hospital day 5, and he then received successful ablation of the rapidly conducting accessory pathway that was thought to be the cause of his initial arrest. The patient was then extubated with intact neurological function.

ECPR is a novel rescue therapy that has been noted to decrease mortality in out-of-hospital atrioventricular tachyarrhythmias. It can be used in combination with a left ventricular assist device to provide further cardiac support while awaiting recovery in reversible conditions.

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RESEARCH SHOWCASE

CARDIOLOGY/CARDIOVASCULAR RESEARCH

SCHOOL OF MEDICINE AND HEALTH SCIENCES

Fatty ECMOPropofol is commonly used in the intensive care unit for sedation in ventilated patients. Prolonged use of propofol in high concentrations can complicate propofol infusion syndrome and can also contribute to lipemia which can cause pancreatitis

Propofol is commonly used in the intensive care unit for sedation in ventilated patients. Prolonged use of propofol in high concentrations can complicate propofol infusion syndrome and can also contribute to lipemia which can cause pancreatitis and severe metabolic acidosis. We describe a case of lipemia leading to membrane lung (ML) dysfunction during extracorporeal membrane oxygenation (ECMO) and worsening hypoxemia.

A 25-year-old man who presented poly-trauma after a 30-foot fall with multiple orthopedic traumas to the lower extremities whose hospital course was complicated by acute respiratory distress syndrome in the setting of presumed fat emboli along with multi-organism pneumonia, leading to refractory hypoxemia requiring paralytic therapy and increasing amounts of sedation while intubated, that eventually required further support with venovenous ECMO support. He continued to require a high concentration of prolonged propofol infusion. Our patient remained to have hypoxemia complicating his status despite support, and eventually had pre- and post-oxygenator blood gas checked, which revealed poor oxygenation though had no visual signs of thrombosis, and so the decision was made to exchange the lung membrane which revealed the significant evidence of lipemia that was noted and visualized with cessation of flow. The lipemia and fat collections were thought to be secondary to the hypertriglyceridemia from propofol infusion and hence was discontinued, with improved triglyceride level and improved oxygenation post ML exchange.

Propofol-induced hypertriglyceridemia is a possible cause of membrane lung failure that can contribute to refractory hypoxemia despite ECMO support. Our patient had no clinical signs of developing propofol infusion syndrome and had only a moderate increase in triglyceride levels (686mg/dL), but had contributed to a significant oxygenator membrane dysfunction and hypoxia, with no discernible increase in pump power or decrease in pump flow was observed; that can be hard to identify unless keeping a high index of suspicion. Prolonged use of propofol would require close monitoring along with the possible need for frequent oxygenator change.

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RESEARCH SHOWCASE

CARDIOLOGY/CARDIOVASCULAR RESEARCH

SCHOOL OF MEDICINE AND HEALTH SCIENCES

Long-Term Arrhythmia Outcomes in Adults with Repaired Tetralogy of Fallot

Background: Tetralogy of Fallot (TOF) is among the most common cyanotic congenital heart diseases in adults, accounting for up to 10% cases. While 30-40-year survival is excellent at 85%-90%, patients are at risk of arrhythmias and sudden cardiac death (SCD) after repair. The objective was to determine the frequency of various arrhythmias and assess therapies used to treat each type.

Methods: A retrospective review was conducted of all adults with repaired TOF (n=242) from the Washington Adult Congenital Heart Program at Children's National Medical Center. Data were extracted from patient charts and analyzed in R, Version 4.1. We used a Chi-squared Goodness of Fit test to compare frequency of any arrhythmia with the 43% reported by Khairy et al.

Results: With a mean age of 38.1 years (55% female, 64% white), and mean follow-up duration of 30.2 years, 29.8% of the cohort (n=72) developed at least one arrhythmia, significantly lower than the 43% previously reported (X^2=17.3; $p < 0.0001$). The most frequent was ventricular tachycardia (n=37). Medical therapy had a 41.6% success rate; ablation (n=27) carried a 74.1% success rate. Devices (pacemaker=9; ICD=28) were implanted in 37 patients (ICD, 67.8% primary prevention). Twelve patients with ICDs had shocks (3 inappropriate), nine had antitachycardia pacing, and six had both. In our series, there were no cases of SCD.

Conclusion: The frequency of arrhythmias in adults with repaired TOF approximates 30% in our cohort, less than what has been reported previously. Catheter ablation was effective for those who failed medical therapy. Future investigation will aim to identify risk factors associated with the development of various arrhythmias.

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RESEARCH SHOWCASE

CARDIOLOGY/CARDIOVASCULAR RESEARCH

SCHOOL OF MEDICINE AND HEALTH SCIENCES

Artificial Intelligence in Coronary Artery Disease Imaging: Has the Future Arrived?

Background: Artificial intelligence in cardiovascular imaging may allow for increased automation of human-like tasks to enable improved reliability, accuracy, and rapidity in the evaluation of patients with suspected coronary artery disease. Invasive coronary angiography (ICA) is the current standard used to evaluate stable symptomatic patients with suspected coronary artery disease (CAD) and guide decisions of coronary revascularization. However, most patients who undergo nonemergent ICA do not have intervenable CAD. For these patients, ICA adds unnecessary health care costs and risks for procedural compilations.

Methods:The study evaluates patients from the international, multicenter Coronary Computed Tomographic Angiography for Selective Cardiac Catheterization (CONSERVE) randomized controlled trial comparing a novel artificial intelligence-guided coronary computed tomography angiography (AI-CCTA) to clinical coronary CT angiography (CCTA) reads in selective referral to ICA as well as major adverse cardiovascular events (MACE). CCTA exams were analyzed using an FDA-cleared cloud-based software (Cleerly, NY, NY) that performs AI-enabled coronary segmentation, lumen and wall determination, plaque quantification, and stenosis determination. Data were collected for downstream ICA and MACE.

Results:The study included 747 stable patients (60±12.2 years, 49% women) from 22 international sites. Using AI-CCTA, 9% of patients had no CAD compared to 34% in the clinical CONSERVE CCTA reads. 87% of patients were expected to potentially defer ICA with absence of obstructive (≥50%) coronary stenosis by AI-CCTA and 95% with absence of severe obstructive (≥ 70%) stenosis. In a mean follow-up period of 1.1 ± 0.4 years, 4.3% of patients (n=32) experienced MACE. Divided by stenosis categories (0, 1-24%, 26-49%, 50-69%, >70%), % coronary stenosis to predict MACE was similar between AI-CCTA (AUC of 0.61; 95% CI 0.52-0.70) and clinical CCTA (AUC of 0.63; 95% CI 0.53-0.73; p=0.87).

Conclusions: In stable symptomatic patients eligible for ICA, use of artificial intelligence in CCTA may allow for 87-95% reduction in invasive testing. The conclusions from this study may allow for increased utilization of artificial intelligence guided testing to ensure equity and access to high quality cardiovascular health care in CAD chest pain evaluation while improving clinical outcomes.

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RESEARCH SHOWCASE

CARDIOLOGY/CARDIOVASCULAR RESEARCH

SCHOOL OF MEDICINE AND HEALTH SCIENCES

Artificial Intelligence in Heart Disease: Diagnostic Accuracy of Next Generation Coronary Imaging to Improve Patient Outcomes

The application of artificial intelligence in cardiovascular medicine has increased exponentially to allow computing to perform complex human-like tasks. In the evaluation of patients with chest pain and coronary artery disease, direct imaging interpretation by artificial intelligence represents a new frontier that may improve accuracy, augment risk stratification, and enhance rapidity of analysis from 6-8 hours to minutes to reduce heart attacks. This study seeks to determine the performance and utility of novel artificial intelligence guided cardiac computed tomography angiography (AI-CCTA), a non-invasive imaging approach, compared to the gold standards for severe coronary artery disease: blinded core lab quantitative coronary angiography (QCA) and invasive fractional flow reserve (FFR).

CCTA, MPI, FFR and QCA data from the NIH/NHLBI-sponsored international CREDENCE Trial were retrospectively analyzed. CCTA exams were analyzed using a novel FDA-cleared cloud-based software (Cleerly, Inc, New York) that performs AI-CCTA enabled whole heart coronary segmentation, lumen and vessel wall determination, plaque quantification and characterization, and stenosis determination.

Patients were included from 21 international sites (n=301; 64±10 years, 71% male). Among the 34% of patients with no ischemia on MPI, AI-CCTA identified 46% with non-obstructive (< 50%) disease, 34% with moderately obstructive (50-69%) stenosis and 20% with severe (≥70%) stenosis. In patients with ischemia (n=199) by MPI, 23% had <50% stenosis and 49% had <70% stenosis. AI-CCTA had a significantly higher area under the curve than MPI for a QCA standard of ≥50% stenosis (0.88 vs 0.66, $p < 0.0001$) as well as a ≥70% QCA stenosis (0.92 vs 0.81, $p = 0.0001$) and for an invasive FFR of <0.8 (0.90 vs 0.71, $p < 0.0001$). An AI-CCTA first approach with a ≥ 70% obstructive threshold may enable a 26% reduction in expected downstream invasive angiography and an estimated 26% cost savings when compared to an MPI first strategy. Mean time for whole heart analysis was 10 minutes.

AI-CCTA demonstrated significantly higher accuracy in comparison to MPI and was able to identify moderate to severe ischemia in over half of the patients who showed no ischemia on MPI. Implementation of an AI-CCTA first approach has the potential to reduce downstream invasive angiography in 1 in 4 patients, and subsequently lessen healthcare costs related to the evaluation of stable chest pain. These findings inform future approaches to the diagnostic pathway of patients evaluated for coronary artery disease while delivering high quality care to improve patient outcomes.

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RESEARCH SHOWCASE

CARDIOLOGY/CARDIOVASCULAR RESEARCH

SCHOOL OF MEDICINE AND HEALTH SCIENCES

Can Artificial Intelligence Guided Quantitative Evaluation of Atherosclerosis Predict Events?

Background: Applying a novel artificial intelligence approach to quantitative coronary computed tomography angiography (CCTA) approach (AI-QCT), we hypothesize that use of AI-QCT may enable identification of plaque thresholds that allow for prognostication of major adverse cardiovascular events (MACE).

Methods: We compared MACE of AI-QCT using CCTA data from the selective referral arm of the multicenter CCTA for Selective Cardiac Catheterization (CONSERVE) Trial. CCTA exams were analyzed using FDA-cleared cloud-based software (Cleerly, NY, NY) that performs AI-enabled coronary segmentation, lumen and wall determination, plaque quantification and stenosis determination. AI-QCT findings were adjudicated to MACE at median 1-year follow-up

Results: 747 stable patients (60±12.2 years, 49% women) were included. Using AI-QCT, 9% of patients had no CAD as compared with 34% in the original CONSERVE CCTA reads. There was a linear and significant association (Figure) between total plaque volume (TPV) and MACE; 2.6% for TPV of 1-300 mm3, 7% for TPV of 301-750 mm3, and 9% for TPV >750 mm3 (p=0.001).

Conclusions: AI-QCT identified plaque volume thresholds of MACE prognostication. This may enable improved identification of at risk patients independent of coronary % diameter stenosis evaluation.

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RESEARCH SHOWCASE

CARDIOLOGY/CARDIOVASCULAR RESEARCH

SCHOOL OF MEDICINE AND HEALTH SCIENCES

A Rare Cause for Acute Systolic Heart Failure: Sjogren's Myocarditis

Primary Sjögren's Syndrome (pSS) is a complex, rheumatologic disease. Varying degrees of multi-system organ involvement can often precede its more familiar glandular symptoms, making it difficult to diagnose. Sjögren's myocarditis leading to the development of acute systolic heart failure (HF) is exceedingly rare, and sparsely described in medical literature. A 48-year-old male presented with two-day onset of frothy urine and bilateral calf pain. Physical exam showed 1+ pitting edema to mid-shins, and pertinent labs included a creatinine of 1.2 mg/dL (baseline 0.8 mg/dL), elevated ESR and CRP, and BNP of 748 pg/mL. TTE revealed normal systolic and diastolic function, but renal ultrasound showed underlying parenchymal disease. While hospitalized, the patient experienced cyclical fevers without identifiable foci of infection, oliguria, worsening edema, and bilateral feet weakness progressing to left foot drop. EMG revealed a sensory-motor neuropathy diagnostic for mononeuritis multiplex. Sural nerve and gastrocnemius biopsy showed inflammatory myopathy with features of small and medium-vessel vasculitis, and kidney biopsy confirmed tubulointerstitial nephritis. Broad rheumatologic laboratory evaluation yielded elevated cryoglobulin levels linking to cryoglobulinemic vasculitis, an Anti-SSA of 4.5, and a positive Schirmer's test. These results in conjunction with findings of mononeuritis multiplex and tubulointerstitial nephritis led to the diagnosis of pSS by the ACR-EULAR criteria, and 1mg/kg of IV methylprednisolone treatment was initiated. Soon after, patient developed severe, acute hypoxic respiratory failure secondary to pulmonary edema with BNP rising to 59,000 pg/mL. Repeat TTE showed a dramatically reduced ejection fraction of 25-30% with bi-atrial enlargement and global systolic dysfunction. Subsequent cardiac MRI without contrast showed focal areas of increased T2 signaling suggestive of edema consistent with myocarditis. After IV corticosteroids, he was transitioned to 40mg of oral prednisone daily, once weekly IV Rituximab, and given guideline-directed medical therapy (GDMT) for systolic HF with an ace-inhibitor, beta-blocker, and high-dose statin. Eventually, a cardiac MRI with contrast was performed also showing late gadolinium enhancement consistent with myocarditis. Given its rarity, Sjögren's myocarditis is often not an etiology clinicians consider when patients develop new, systolic HF, especially during early phases of diagnosing and treating an autoimmune disease. Furthermore, because Sjögren's myocarditis exists primarily in case report literature, no standardized diagnostic algorithms describe appropriate imaging modalities and treatments. Possible therapeutic approaches include the use of corticosteroids, immunosuppressive agents, and/or GDMT when presenting in florid HF. Further studies of Sjögren's myocarditis resulting in HF

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RESEARCH SHOWCASE

CLINICAL SPECIALTIES

CHILDREN'S NATIONAL MEDICAL CENTER

Experience at a Multidisciplinary Pediatric Vulvar Dermatology Clinic

Background: Vulvar dermatology is a field in which pediatricians, gynecologists, adolescent medicine providers, and dermatologists may lack sufficient comfort and training. Delays in diagnosis can prolong patient discomfort and result in irreversible anogenital anatomic changes. Relatively few multidisciplinary vulvar dermatology clinics exist in the United States. We present our preliminary experience at a multidisciplinary pediatric gynecology and dermatology clinic for pediatric and adolescent vulvar disorders.

Methods: After IRB approval, we collected retrospective data from 180 patients seen over a 3.5-year period in a joint dermatology-gynecology clinic at a metropolitan area children's hospital. Statistical analysis was performed using SPSS version 22.0 (IBM Corp, Armonk, NY).

Results: The most common diagnoses were lichen sclerosis (LS) (n= 59, 33%), non-specific vulvovaginitis (n=20, 11%) and vitiligo (n= 17, 9%) (Table 1). The mean age at the time of the first clinic visit was 7.9 $\pm$ 4.7 years. The mean age at diagnosis was 8.1 $\pm$ 2.9 years for LS, 6.1 $\pm$ 2.4 years for vulvovaginitis, and 6.2 $\pm$ 2.3 years for vitiligo. The median time from onset of symptoms to diagnosis of LS was 12 months (range 0.25 to 96 months). Although African Americans experienced longer times to diagnosis of LS and vitiligo as compared to other races, the difference was not statistically significant (Table 2). Lichen sclerosis and vitiligo were most commonly misdiagnosed as each other. Four (7%) patients with LS had been misdiagnosed with vitiligo. Seven (41%) of patients with vitiligo had been previously diagnosed with LS.

Conclusions: Lichen sclerosis, vitiligo, and non-specific vulvovaginitis are common diagnoses in children with vulvar complaints. There remains difficulty with differentiating between vitiligo and LS prior to referral to specialized centers. In children, there remains a relatively long delay between the onset of symptoms and the diagnosis of LS, which although not statistically significant, is greater for African Americans. Future studies are needed to address provider education for the diagnosis of pediatric vulvar disorders and to assess the potential association between access to care and diagnostic delays in the management of pediatric vulvar disorders.

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CLINICAL SPECIALTIES

MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

Equitably Engaging Priority Populations in Clinical Research

It is no secret that systemic and structural racism is present in medicine and has been since the beginning. What is not as often recognized, is how this racism has persisted in medical research which leads to negatively informed practice. Populations who are most impacted by the inequities caused by these factors, are typically described as "hard to reach". This label, whether purposeful or not, places the blame on these patient populations as the reason why in research and practice they are historically excluded, undercounted, and overlooked which is untrue.

A focus group was conducted with Pediatricians at Children's National Hospital, where they were asked a series of questions, guided by the Priorities Populations Framework (Rak, et.al., 2020), to measure their knowledge of historically marginalized and institutionally disinvested populations, and the skill, and attitude needed to properly engage and represent them in clinical research. The course entitled "Equitably Engaging Priority Populations in Clinical Research" aims to inform any pediatric-researchers interested in recruiting, retaining, and fairly engaging historically excluded populations in any stage of their clinical research while also maintaining a health equity lens. This course was created through the synthesis of research on each of the targeted child/youth priority populations: child/youth who live in underserved urban metropolitan areas, child/youth who are managing disabilities, child/youth who identify as LGBTQIA+, child/youth who are part of the global majority. The literature for the course was chosen based on what best provided the information that would allow clinician-researchers to describe the priority populations, recognize each of their specific sets of challenges, and understand why recognizing those challenges helps positively inform practice.

Additionally, using the Health Equity Framework (Peterson et al., 2020), physicians will be able to understand what health equity means and how implementing a health equity lens in research causes researchers to look beyond the traditional individual approaches to research, and understand how institutional and interpersonal biases, such as racism, sexism, classism, homophobia, transphobia, and ableism contribute to health disparities. With the completion of this course, follow-up interviews will be conducted to measure if the physician-researchers feel more equipped to describe the priority populations who have been historically excluded in clinical pediatric research, describe how to apply a health equity lens to pediatric research, and list meaningful ways to engage patients from priority populations during the process of clinical pediatric research to further scientific equity.

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RESEARCH SHOWCASE

CLINICAL SPECIALTIES

SCHOOL OF MEDICINE AND HEALTH SCIENCES

Increased Revision Rates Among Patients Undergoing Unicompartmental and Bicompartmental Knee Arthroplasties when Compared to Total Knee Arthroplasty

Background: With recent advances in partial knee arthroplasty, there is conflicting data regarding the outcomes and revision rates for bicompartmental knee arthroplasty (BKA) and unicompartamental knee arthroplasty (UKA) compared to total knee arthroplasty (TKA). This study uses national data to compare the surgical and medical complications of UKA, BKA, and TKA to aid surgical decision making.

Methods: A retrospective cohort analysis was done using the Mariner dataset of the PearlDiver patient records database from 2010-2019. Current Procedural Terminology (CPT) codes were used to identify patients who underwent UKA, BKA, and TKA for a primary indication of osteoarthritis (OA). Univariate and multivariable analyses were performed to determine 1-year and 2-year revision, prosthetic joint infection (PJI), and loosening, 1-year manipulation under anesthesia (MUA), and 90-day postoperative medical complications.

Results: The BKA cohort was found to have higher odds of one and two-year revision compared to the UKA and TKA cohorts. Additionally, the UKA cohort had higher odds of one and two-year revision but lower odds of 1-year MUA than the TKA cohort. However, both the BKA and UKA cohorts had lower odds of any 90-day postoperative complications when compared to the TKA cohort.

Conclusions: Even with modern implants and approaches, our study found that revision rates are highest for BKA followed by UKA and TKA at two years postoperatively. Notably, medical complications were much less common after all partial knee replacement types when compared to TKA. These findings may be used to guide patients in selecting the appropriate surgery to meet their goals and expectations.

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RESEARCH SHOWCASE

CLINICAL SPECIALTIES

SCHOOL OF MEDICINE AND HEALTH SCIENCES

A Collaborative Approach to Multisystem Erdheim-Chester Disease

A 59-year-old man with a complex cardiac history including recurrent pericardial effusions, non-ST elevation myocardial infarction, severe aortic stenosis, paroxysmal atrial fibrillation (treated with cardioversion) presented to the emergency department for dyspnea. He was feeling more fatigued after walking just a few blocks, with coughing when lying flat, two-pillow orthopnea and lower extremity edema. His prior pericardial effusions were managed with pericardiocentesis, and an open pericardial window surgery drained two liters of fluid. These interventions provided only temporary relief due to fluid re-accumulation. On examination, he had normal vital signs, a systolic ejection murmur at the right upper sternal border, mild jugular venous distension, and 2+ pitting lower extremity edema. An infectious and rheumatologic workup was unrevealing, so fluid re-accumulation was thought to be due to worsening aortic stenosis. An attempted aortic valve replacement surgery revealed extensive fibrotic tissue encasing the pericardium and thoracoabdominal aorta. Due to technical challenge and risk, the surgery was aborted. Subsequent bone scintigraphy, revealed multifocal osseous lesions; a CT scan demonstrated bilateral adrenal masses; and a pelvic MRI showed hair-like projections representing infiltration of the perinephric fat and septa- pathognomonic for Erdheim-Chester Disease (ECD). Adrenal mass and pericardial tissue biopsies displayed fibrotic and inflammatory changes with histiocytic foci admixed with lymphocytes, while immunohistochemistry stained positive for CD68, CD163, Factor IIIa, and negative for CD1a and CD207. Tissue genetics demonstrated the BRAFV600E codon mutation, findings consistent with ECD.

ECD is a rare lymphoproliferative disease of histiocytes— cells derived from macrophage and dendritic lineage. Two theories attempt to explain the abnormal cellular proliferation; one theory is that cells arise from an irregular histiocyte, and the other is the cells descend from a proliferating, mutated precursor cell. Only about 1,000 cases of ECD have been described in the literature since 1930. A variable clinical presentation along with the tendency to affect many different organ systems complicates diagnosis.

This case illustrates the importance of interdisciplinary communication to diagnose and manage complex multi-organ disease. Two specific events propelled the case forward. First, the radiologist called the oncologist to describe CT imaging abnormalities that prompted the diagnostic MRI. Secondly, a multi-disciplinary meeting united cardiac specialists to determine a coordinated management plan: to reattempt aortic valve replacement surgery prior to oncologic intervention with targeted medical therapies. Collaboration in medicine is essential to managing complex cases, benefitting all participants- most importantly, the patient.

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RESEARCH SHOWCASE

CLINICAL SPECIALTIES

SCHOOL OF MEDICINE AND HEALTH SCIENCES

Cutaneous Manifestations of Nutritional Deficiencies and the Role of Food Deserts in the United States

Food deserts exist due to a multitude of factors ranging from socioeconomic status, racial disparity, geography, cost, and accessibility to healthful foods. Given the vast biological function of vitamins and minerals, the spectrum of clinical presentation for nutritional deficiencies ranges from benign to life-threatening. Often, the first indicators of underlying nutritional deficiency are cutaneous manifestations. In this case series we describe three patients who lived in identified food deserts and presented with cutaneous manifestations. The first patient is a 36-year-old female at 25-weeks gestation who had a pruritic and painful rash that began in the genital region and spread centrifugally to her legs. The second patient is a 42-year-old male with a pruritic rash that began at his abdomen and progressed to his thighs. The third patient is a 48-year-old female with scattered lower extremity ecchymoses in different healing stages and scattered perifollicular erythema with corkscrew hairs. All three patients were found to have nutritional deficiencies. Interestingly, cases of zinc, vitamin A, thiamine, pyridoxine, and vitamin C deficiencies and their subsequent cutaneous manifestations have scarce documentation in food deserts. To promote wellness, patients suffering from food insecurity must be identified and connected with essential resources.

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CLINICAL SPECIALTIES

SCHOOL OF MEDICINE AND HEALTH SCIENCES

Medical Alert Protocol Initiation to Improve Effectiveness of Medical Resuscitations

Introduction: Time to coordinate a team-based approach prior to a resuscitation has been shown to be an invaluable step in cardiac arrest care. We created a "Medical Alert" protocol to assemble the key members of our resuscitation team prior to the arrival of critically ill patients beyond solely cardiac arrests in the ED to allow for this coordination. The goal of this study was to assess if this specific protocol can improve overall team resuscitation organization, subjective resuscitation outcomes, and decrease associated barriers to effective responses.

Methods: The "Medical Alert" for critically ill patients was activated based on pre-hospital description or triage evaluation of ongoing CPR, ROSC, significant respiratory distress, shock, GCS < 8, ongoing seizure, or attending physician clinical gestalt. A pre-intervention survey was sent out to all ED clinical staff prior to implementation of the protocol at a large urban academic level I trauma center. After a period of 2 months post-intervention survey data was collected. A Likert scale, graded 1-5, and a subsequent Welch's T-test assessed ordinal data given the assumption of unequal variances and a Œ±-error of 5%. For nominal categorical variables a Chi-Square analysis was utilized with percentages indicating percent responders denoting a specific concern.

Results: The respondents (n=51 pre-, n=38 post-intervention) felt the protocol allowed more time to identify roles (3.02 v 3.56; p=0.03) and led to more effective resuscitations (4.02 v 4.31; p=0.04). This was noted to be independent of all team members being present in a timely manner (3.78 v 4.00; p=0.27). However, the presence of the respiratory therapist was significantly improved (74.5% v 42.1%; p< 0.01). The protocol was felt to allow for more time to prepare (36.5% v 15.9%; p=0.03), enhanced equipment availability (49.0% v 26.3%; p=0.03), clearer team roles (34.6% v 15.8%; p< 0.05), and for more space by designating a specific resuscitation room (46.2% v 23.7%; p=0.03).

Conclusions: This protocol allowed for improved time for communication and organization of team members as well as the perception of more effective resuscitations for critically ill patients beyond solely cardiac arrests. Further objective research is necessary to assess if this protocol leads to improved patient outcomes.

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CLINICAL SPECIALTIES

SCHOOL OF MEDICINE AND HEALTH SCIENCES

CRESTING MORTALITY: DEFINING A PLATEAU IN ONGOING MASSIVE TRANSFUSION

Introduction: Blood-based balanced resuscitation is the standard of care in massively bleeding trauma patients. But there are no data as to when this therapy no longer significantly improves mortality. We sought to determine if there is a threshold beyond which further massive transfusion will not improve in-hospital mortality.

Methods: The Trauma Quality Improvement database was queried for all adult patients registered between 2013 and 2017 who received at least one unit of blood (PRBC) within 4 hours of arrival. In-hospital mortality was evaluated based on the total transfusion volume (TTV) at 4 and 24 hours in the overall cohort (OC) and in a balanced transfusion cohort (BC), composed of patients who received a transfusion at a ratio of 1:1 – 2:1 PRBC:plasma. A bootstrapping method in combination with multivariable Poisson regression (MVR) was used to find a cutoff after which additional transfusion of blood products no longer affected in-hospital mortality. MVR was used to control for age, sex, race, highest abbreviated injury score in each body region, comorbidities, advanced directives limiting care, and the primary type of surgery performed for hemorrhage control.

Results: The OC consisted of 99,042 patients of which 28,891 and 30,768 received a balanced transfusion during the first 4 and 24 hours, respectively. The mortality rate plateaued after a TTV of 41 (95% CI, 40-41) units in the OC at 4 hours and after a TTV of 53 (95% CI, 52-53) units at 24 hours following admission. In the BC, mortality plateaued at a TTV of 40 (95% CI, 36-41) units and 41 (95% CI, 41-42) units at 4 and 24 hours following admission, respectively (figures 1, 2).

Conclusions: Transfusion thresholds exist beyond which ongoing transfusion is not associated with any clinically significant change in mortality. These TTVs can be used as markers for resuscitative timeouts in order to assess the plan of care moving forward.

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CLINICAL SPECIALTIES

SCHOOL OF MEDICINE AND HEALTH SCIENCES

Visualization of Local Vascular Structures in Broca's area in MRI: Feasibility Study for the Use of These Structures in Identifying the Language Dominant Hemisphere.

Functional hyperemia is a selective rise in localized cerebral blood flow in response to an increase in focal metabolic demand of the brain. Although the functional hyperemic response is transient, one could speculate that with functions such as language, which are used frequently and consistently over the years, there may be an increase in the size of the vessels providing arterial inflow and/or venous drainage of the dominant language centers as compared to the contralateral/non-dominant side. In this project, we evaluated the feasibility of MRI examination routinely obtained as a part of functional magnetic resonance imaging (fMRI) in delineating the arterial and venous anatomy of the vessels involved in the area of the brain that include Broca's region, which is a consistent primary language center.

In this IRB approved retrospective chart review, we mapped the arterial input and venous outflow associated with Broca's region in 3-D volumetric T1 post contrast images included in 27 functional MRI examinations that met inclusion and exclusion criteria. Broca's areas were identified in fMRI exams as the part of the brain in the inferior frontal gyrus that demonstrates a robust functional hyperemic response during a language driven task performed by the patient while on the scanner.

The distal branches of the MCA that provide blood supply to the Broca's area are too small to be consistently and accurately characterized. On the other hand, the vein of Labbe, which appears to be the main venous drainage pathway of Broca's area, is consistently visible bilaterally. Of the 27 cases, vein of Labbe` (VL) dominance was left sided in 14 (51.8%), right sided in 9(33.3%) and codominant in 4 (14.8%) cases. All the left dominant VL cases had left sided dominance of language while only 1 right dominant VL case had right-sided dominance of language on fMRI.

The venous outflow of a region of the brain that includes the Broca's area can be reliably characterized on an fMRI examination. In the future, we intend to examine a novel concept of the potential link between the size of this venous drainage pathway and the laterality of the language processing.

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RESEARCH SHOWCASE

CLINICAL SPECIALTIES

SCHOOL OF MEDICINE AND HEALTH SCIENCES

Intraocular Pressure Response in the Untreated Contralateral Eye after Selective Laser Trabeculoplasty

Selective laser trabeculoplasty (SLT) is a procedure commonly used as a primary or adjunctive therapy in glaucoma to lower intraocular pressure (IOP). Currently, there is no consensus on whether SLT causes a decrease in IOP in the untreated contralateral eye. Our study investigates the pre- vs post-operative change in IOP and the number of medications used in a patient's untreated contralateral eye within 12 months after receiving SLT.

A retrospective observational study was conducted on patients who visited the George Washington University Department of Ophthalmology between January 1st, 2008 to January 1st, 2020 with primary open-angle, pseudoexfoliation, pigmentary, or normal-tension glaucoma and received 360 degrees SLT. Patients were excluded if they had laser or glaucoma surgery either before or within 12 months following SLT, other glaucoma types, or used steroids. Demographics were collected and the pre- vs post-SLT IOP and number of medications were analyzed using a paired samples t-test and ANOVA.

A total of 125 patients were included in this study. Mean IOPs for the untreated eyes at baseline, 6-week, 6-month, and 12-month visits were 15.21 ± 3.55 mmHg, 14.29 ± 3.5 mmHg ($P < 0.05$), 14.22 ± 3.61 mmHg ($P < 0.05$), and 14.74 ± 3.53 mmHg ($P > 0.05$), respectively. For the same time points, the mean number of medications were 1.73 ± 1.29, 1.68 ± 1.31 ($P < 0.05$), 1.68 ± 1.30 ($P < 0.05$), 1.68 ± 1.29 ($P > 0.05$), respectively.

The mean pre-op IOP and number of medications in the untreated eye had a statistically significant reduction at 6 weeks and 6 months post-SLT but not at 12 months post-SLT. This study differs from previous research in showing a statistically significant reduction in the mean number of medications in the untreated eye post-SLT. This study's population also improves on the previous study's external validity. There were 125 patients (previously 29, 43, 32) with diverse backgrounds (African American (57.6%), Caucasian (31.2%), Asian (5.6%), Hispanic/Latino (4%), not reported (1.6%) - previously unreported2 or homogenous) and no history of laser treatments (previously included patients with prior laser treatments).

First-time SLT glaucoma patients have a statistically significant decrease in IOP and medications used in the untreated contralateral eye at 6 weeks and 6 months after treatment.

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CLINICAL SPECIALTIES

SCHOOL OF MEDICINE AND HEALTH SCIENCES

Occupational Hazard: One-Year Comparison of Stress Related to COVID-19 In the Intensive Care Unit

Background: The COVID-19 pandemic has psychological impacts on healthcare workers (HCW), especially those in the intensive care unit (ICU). We hypothesized that HCWs in the ICU treating COVID-19 patients would have high levels of risk perception, stress, and burnout one year into the pandemic. However, we believed that wide-spread vaccination would have a potential protective effect.

Methods: An online survey study conducted amongst HCWs across multiple roles in a tertiary academic center ICU during spring of 2020 and spring 2021. Questions evaluated levels of workplace stress index correlates, burnout, and risk perception related to the care of COVID patients. Chi-squared tests compared results along with demographic and professional characteristics of participants. In 2021, vaccination status and Professional Quality of Life Scale (PROQOL) were added.

Results: 151 surveys were collected between spring 2020 (n=83) and spring 2021 (n=68). Participants were 75.5% female, 66.9% white, and 53.4% nurses/technicians/ respiratory therapists. Results revealed that despite high vaccination rates (92.8% of participants), and significantly decreased risk perception, levels of stress remained high. Comparing 2020 to 2021, participants felt less risk at their job (74.7% vs 48.5%; p=< 0.001), less afraid of contracting COVID (85.5% vs 33.8%; p=< 0.001), less likely to feel little control over contracting COVID (54.9% vs 25%; p=< 0.001), and less afraid of transmitting COVID unto others (86.7% vs 61.2%; p=< 0.001). Levels of stress at work (83.1% vs 73.1%; p=0.137) and thoughts of resignation (13.4% vs 14.7%; p=0.82) remained similar between survey years. In 2021, the PROQOL questions demonstrated that 57% of participants met criteria for moderate or high levels of traumatic stress and 75% met criteria for moderate or high levels of burnout.

Conclusions: There were significant decreases in risk perception related to COVID amongst both cohorts. However, regardless of COVID vaccination, ICU HCWs felt high stress levels and burnout at work with ongoing thoughts of resignation. While it appears that vaccination status may be somewhat protective with respect to risk perception, it did not alleviate the mental burden of caring for COVID patients. Further investigation in stress mitigation strategies in ICU providers are paramount.

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CLINICAL SPECIALTIES

SCHOOL OF MEDICINE AND HEALTH SCIENCES

Neuropsychological Assessment of Patients in a Newly Established Turner Syndrome Multidisciplinary Clinic.

Introduction: Turner syndrome (TS) is caused by a missing part or whole second sex-chromosome in a phenotypic female, often manifesting short stature, infertility and cardiac abnormalities. Non-verbal learning challenges are prevalent in TS and recent clinical guidelines recommend formal neuropsychological (NP) assessment. Our goal was to review the spectrum of NP impairment in patients with TS referred from a newly established specialty clinic.

Methods: The study protocol was deemed exempt by the institutional review board. We retrospectively reviewed data from all completed NP assessments between 1/1/2019 and 5/31/2021 along with karyotype, age at diagnosis, and age at estrogen start. Descriptive analyses of parent reports, impairments based on the evaluator's interpretation of scores as stated in the NP summary report, and Spearman correlation with age at estrogen replacement (SAS V9.4) are presented.

Results: Of 75 patients, 23 (31%) had completed NP assessment, with median age 11.4y (2.3-20.2), 48% 45,X karyotype, and 30% diagnosed in the pre/perinatal period. In the summarized NP report, 5/23 (22%) had autism, 7/23 (30%) had attention deficit disorder, 9/23 (39%) had developmental delays, 14/23 (61%) had impaired academic function, 13/23 (57%) had social difficulties, 11/23 (48%) had memory problems, 12/23 (52%) had impairment in math, 13/23 (57%) had impaired visual-spatial abilities, 16/23 (70%) had impairment in executive functioning, and 12/23 (52%) had anxiety disorder. In 11 patients with data on treatment of primary ovarian insufficiency, the age at estrogen start was positively correlated with impaired memory (p=0.009) but not impaired executive functioning or visual-spatial ability. Median parent-reported T-scores on BRIEF (Behavior Rating Inventory of Executive function) and CBCL (Child Behavior Checklist) were normal, but clinically elevated scores were seen in 15% for Global Executive Composite score, 29% for CBCL total problems score, and 25% for CBCL DSM5 anxiety problems score.

Conclusions: Our data confirm the high prevalence of NP impairment in TS affecting multiple domains such as memory, executive functioning, academic performance, visual-spatial abilities, and social engagement, as well as anxiety disorder, in excess of parental report. One limitation is a potentially biased sample since the pandemic led several families to delay the assessment, and those that were completed may reflect patients with a greater degree of impairment. Future studies are necessary to assess barriers to follow-through on NP testing after referral, optimal tools for assessing areas of deficit in TS, frequency of testing, and the impact of test results to inform treatment planning.

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RESEARCH SHOWCASE

CLINICAL SPECIALTIES

SCHOOL OF MEDICINE AND HEALTH SCIENCES

Trends in Arthroplasty Management of Knee Osteoarthritis from 2010 to 2019 based on Type and Computer-Assistance

Background: Interest in partial knee arthroplasty procedures including unicompartmental arthroplasty (UKA), patellofemoral arthroplasty (PFA), and bicompartmental knee arthroplasty (BKA) has increased due to their bone and ligament preservation compared to total knee arthroplasty (TKA). Implant designs, changing thoughts on appropriate indications for partial knee arthroplasty, and the availability of navigation have also impacted the field over the last decade. Thus, the aims of this study were to: (1) compare the trends in utilization by knee arthroplasty type over the last ten years and (2) stratify these trends to determine the utilization of computer assistance.

Methods: A retrospective cohort analysis was conducted using the PearlDiver database. Patients who underwent PFA, UKA, BKA, and TKA for an indication of osteoarthritis (OA) were identified using Current Procedural Terminology (CPT) codes. Trends analysis from 2010 to 2019 was conducted to compare utilization based on procedure type and computer assistance. Statistical analysis was conducted using Compounded Annual Growth Rates (CAGR) and linear regression.

Results: From 2010 to 2019, there was a significant decrease in the utilization of PFA (CAGR:

-5.73%; p=0.011) and BKA (CAGR: -10.49%; p=0.013), but no significant difference in that of UKA (p=0.224) and TKA (p=0.421). There was a significant increase in the utilization of computer assistance for both UKA (CAGR: +19.81%; p=0.002) and TKA (CAGR: +3.90%; p=0.038), but there was no significant difference for computer-assisted PFA (p=0.724) and BKA (p=0.951).

Conclusions: TKA is still the most common arthroplasty procedure for OA. Decreased utilization of PFA and BKA may be explained by reported failure and revision rates for PFA and BKA compared to TKA.

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CLINICAL SPECIALTIES

SCHOOL OF MEDICINE AND HEALTH SCIENCES

Beta-2 spectrin modulates diabetic wound healing via regulating angiogenesis

Background: Impaired wound healing due to diabetes is a big burden to our society. An important factor for delayed healing is impaired angiogenesis. Although angiogenesis has been extensively studied but very few preclinical studies were successfully translated to human wound care. More novel therapeutic targets are urgently needed. Beta-2 spectrin (B2SP) is a cytoskeletal protein and is well-known for its function as an adaptor for Smad3 in the TGF-B pathway. Although TGF-B has been well-studied in diabetic wounds, the role of B2SP has not been investigated.

Methods: We used mouse diabetic excisional dorsal wound model after diabetes was induced by Streptozotocin. To study the function of B2SP in angiogenesis, we generated B2SP endothelial specific knock out mice (B2SP ECKO) and assessed the wound closure rate of these mice compared to the controlled B2SP Flox/flox mice (B2SP F/F). Angiogenic proteins in the wound beds were measured by commercial angiogenic array kit. Angiogenic marker CD31 in the wound bed were assessed by IHC. The function of B2SP in angiogenesis was studied using in vitro angiogenesis assays (sprouting and tube formation assay).

Results: B2SP ECKO exhibited impaired diabetic wound healing compared to B2SP F/F mice (day 4: 12.8±2.1% vs. 33.3±1.6%, p=0.04; day 7: 43.1±1.5% vs. 68.1±2.3%, p=0.02). Angiogenesis array analysis of proteins isolated from the wound beds showed suppressed MMP9 and MMP8 and other pro-angiogenic proteins in B2SP ECKO mice. IHC staining for CD31 in the wound bed showed significantly less percentage area occupied by CD31 in B2SP ECKO mice (3.5±0.8% vs. 5.2±0.6%, p=0.03). B2SP-silenced HUVECs with siRNA suppressed endothelial sprouting (# sprouting on d7 were 5.1±0.7 vs. 7.2±0.8, p=0.04) and tube formation (# mesh at 6 hours were 66.2±5.1 vs. 87.3±10.2, p=0.04).

Conclusion: B2SP plays a significant role in angiogenesis and diabetic wound healing. It is a promising novel therapeutic target for wound healing and should be further explored.

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RESEARCH SHOWCASE

CLINICAL SPECIALTIES

SCHOOL OF MEDICINE AND HEALTH SCIENCES

ENDOTRACHEAL TUBE SURVEILLANCE: CAN POINT OF CARE ULTRASOUND REPLACE CHEST RADIOGRAPHS?

Introduction: There are many potential complications associated with endotracheal tube (ETT) malpositioning in critical care settings, such as bronchial migration or vocal cord herniation. These events can prolong patient recovery and lengthen ICU stays. The goal of this study is to demonstrate that point of care ultrasound (POCUS) is noninferior to chest x-ray (CXR) in identifying proper ETT depth.

Methods: We conducted an observational cohort study of intubated patients across 4 multidisciplinary ICUs at an urban academic hospital who underwent daily POCUS assessment of ETT positioning by novice sonographers (medical students). ICU/ED physicians led 4 hour-long informal trainings to teach medical students POCUS technique. Subjects were excluded if they were COVID positive, in c-spine precautions, had recent neck surgery or planned to be extubated within 24 hours. Patient ETT position was measured using POCUS assessment (balloon cuff border ending between 3-7 tracheal rings) and compared to daily radiographic CXR landmarks (5 cm +/- 2 cm above carina). Recommendations based on sonographic and radiographic landmarks were compared to assess sensitivity and specificity of POCUS to evaluate need for ETT repositioning. Statistical significance was assessed using the Clopper-Pearson binomial confidence interval.

Results: 20 patients were enrolled for a total of 62 ventilator-days. The cohort was majority female (55%), Black/African American (75%) and mean age 55 +/- 18 years. In 58 instances (93.5%), both sonographic and radiographic landmarks agreed on maintenance of ETT position. In 1 instance (1.6%), sonographers recommended ETT repositioning while radiographic landmarks did not. In 3 instances (4.8%), ETTs appeared in place by sonographic but not radiographic landmarks. The data yields a specificity of 98.31% CI [90.91,99.96] for proper ETT placement with a negative likelihood ratio of 1.02 CI [.98, 1.05] and NPV of 95.08% CI [94.92,95.24].

Conclusion: The high specificity and NPV values suggest that if ETT position appears within normal limits on POCUS (tip of ETT between 3-7 tracheal rings), ETT position is likely adequately positioned even when performed by novices. Further studies should investigate the use of POCUS as a monitoring alternative and as a reliable tool post-intubation to confirm ETT depth.

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CLINICAL SPECIALTIES

SCHOOL OF MEDICINE AND HEALTH SCIENCES

Congenital Infectious Encephalopathies – Fetal MRI and Postnatal Outcomes

Background: Congenital infections cause a spectrum of fetal neurologic injury and morbidity in offspring. Fetal magnetic resonance imaging (feMRI) provides a more thorough evaluation of the fetal brain, however has not been routinely used in prenatal congenital infection care.

Objective: To describe feMRI findings in the evaluation of fetal congenital infections and corresponding postnatal outcomes.

Methods: We performed a retrospective study of medical records from 1/1/12 to 5/1/21 of pregnant women referred to the Prenatal Pediatrics Institute at Children's National Hospital, Washington, DC for suspected or confirmed congenital infections. Prenatal and postnatal diagnostic evaluations, including MRI, and multidisciplinary evaluation by fetal neurology and infectious disease along with postnatal outcomes were collected. Cases of Cytomegalovirus (CMV), Toxoplasma gondii (Toxo), and Parvovirus B19 (B19V) were included. Women without infections, with other infections (i.e. Zika virus), or unidentified likely infectious etiologies were excluded. Child medical charts were reviewed to assess outcome.

Results: 19 pregnant women-fetal/infant dyads with CMV (n=14), Toxo (n=4), and B19V (n=1) were included. 4 of 14 (29%) pregnancies with suspected or confirmed CMV were terminated; all had severe fetal brain injury by feMRI (microcephaly, hemorrhage, neuronal migration anomalies) and extracranial abnormalities. 10 of 14 (71%) pregnancies with CMV were live born; 4 were diagnosed with congenital CMV. Two infants were symptomatic with hearing loss, both had abnormal brain MRI: hypogenesis of the corpus callosum in one, polymicrogyria and intraventricular cyst in the other. The other cases had normal imaging and outcomes. 2 of 4 cases of suspected or confirmed Toxo had feMRI abnormalities of borderline microcephaly and mild bilateral ventriculomegaly. On postnatal brain MRI, the case with mild ventriculomegaly had sequelae of prior germinal matrix hemorrhage and hippocampal underrotation. One infant requires physical therapy, normal outcome in two, and one unknown after birth. The case of confirmed B19V had cerebellar infarction by feMRI and confirmed by postnatal brain MRI. Other than surgery for intermittent esotropia, the infant was asymptomatic.

Conclusions: The use of feMRI enhances neurologic diagnosis and guides discussion of prognosis for women with confirmed or suspected congenital infections. Our findings provide some reassurance that infants with normal to mild brain abnormalities by fetal` and postnatal MRI following in utero exposure to CMV, Toxo, and B19V can have positive outcomes.

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CLINICAL SPECIALTIES

SCHOOL OF MEDICINE AND HEALTH SCIENCES

Is the Number of Arachnoid Granulations a Function of Age and/or Gender?

Introduction: Arachnoid granulations (AG) are small CSF-filled arachnoid membrane outpouchings that protrude into the dural venous sinuses or inner table of the skull. They play an important role in the drainage and resorption of CSF. These structures follow CSF signal intensity on all MRI sequences. On post contrast MRI examination, they appear as filling defects within the contrast filled dural venous sinus.

The relationship between gender or age and the number of AG along the venous sinuses has not been well established. The aim of our study is to test the hypothesis that the number of AG is dependent on these factors.

Materials and Methods: After obtaining an approval from our institutional review board for this retrospective chart review, two neuroradiology fellows independently measured the number of AG along the dural venous sinuses of 144 adult patients with normal or nearly normal brain MRI exams. A standardized MR imaging protocol that included high-resolution pre-contrast T1- and T2-weighted images was available for all subjects enrolled in this study. The inter-reader variability was measured using Cohen's kappa coefficient (Œ∫). A potential relationship between the number of arachnoid granulations and age was examined using Spearman rank correlation coefficients statistical analysis.

Results: The patient age range was between 21- 89 years. Sixty-four were males and 80 were females. The patients were divided into 8 age categories with a duration of 10 years from 20 to 89 years. The number of AG was 27, 32, 17, 23, 34, 9, and 2 for the age category of 20 to 29, 30 to 39, 40 to 49, 50 to 59, 60 to 69, 70 to 79, and 80 to 89, respectively. Pearson's correlation analysis determined there was a negative correlation between the number of arachnoid granulations and age (r2=0.083). Also, reviewer 1 had a substantial agreement with reviewer 2 (kappa=0.95)

Discussion: Our data show that while the number of arachnoid granulations is not dependent on gender, it markedly decreases after 70 years of age. Although the underlying mechanism for this pattern is unclear, it suggests that AG may play a more dynamic physiological role than previously presumed.

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CLINICAL SPECIALTIES

SCHOOL OF MEDICINE AND HEALTH SCIENCES

A PANDEMIC WITHIN AN EPIDEMIC: EVALUATION OF COVID-19 IN THE OBESE POPULATION

Introduction: Obesity is a worldwide epidemic that leads to various complications. Evidence has shown increased morbidity and mortality among obese COVID-19 patients. The primary objective of our study was to compare the need for advanced respiratory support and mortality between obese and non-obese patients hospitalized with COVID-19. The secondary outcome of our study was a comparative analysis of respiratory parameters in the subgroup requiring invasive mechanical ventilation.

Methods: Retrospective review from a multicenter registry of hospitalized patients with COVID-19 admitted between March 2020 and June 2020. Patients were included if they were > 18 years old and admitted to the hospital with laboratory confirmed SARS-CoV-2 infection. Patients were stratified into healthy weight (BMI < 25), overweight (BMI 25 - 29.9), obese (BMI 30 -39.9), and morbidly obese (BMI > 40) categories. Patient characteristics and outcomes were analyzed using Chi-Squared tests for categorical variables and Kruskal-Wallis tests for continuous variables.

Results: Among the 519 adult patients identified, 111 (21%) were a healthy weight, 159 (31%) were overweight, 174 (33%) were obese, and 75 (14%) were morbidly obese. A total of 255 patients (49.1%) required invasive mechanical ventilation. Obesity [OR 1.63, 95% CI 1.04–2.54) and morbid obesity (OR 2.39, 95% CI 1.29–4.42] were independent predictors for mechanical ventilation. The overall in hospital mortality was 26.6%. There was a trend toward increased mortality in the morbidly obese group [26 (34.7%)] compared to patients with a BMI < 40 [112 (25.2%)] (p=0.087). Analysis of ventilation parameters showed sequential increase in end-expiratory (p< 0.05), peak (p< 0.05), and plateau pressures (p< 0.05) across the BMI categories. The median of the highest PEEP recorded among the healthy weight population was 12 (interquartile range [IQR] 10-16), 14 (IQR 12-16) in the overweight, 15 (IQR 12-18) in the obese, and 16 (IQR 14-18) in the morbidly obese (p < 0.0015). There were no differences in the rates of proning (p=0.30), neuromuscular blockade (p=0.05), APRV (0.79), and ECMO (0.58) among BMI categories.

Conclusion: This supports the growing body of evidence that obesity has the potential to serve as an independent predictor for outcomes of COVID-19 patients.

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CLINICAL SPECIALTIES

SCHOOL OF MEDICINE AND HEALTH SCIENCES

Non-pharmacologic interventions for acute post-surgical pain in trauma patients: The feasibility of CBT-based interventions in the acute post-operative period

Poorly-controlled acute post-surgical pain is a risk factor for chronic post-surgical pain. Guidelines now recommend considering additional non-pharmaceutical options for pain management in post-operative care. Introducing cognitive behavioral therapy (CBT)-based techniques in the post-operative period can improve pain management, reduce the number of patients transitioning to chronic post-surgical pain, and reduce the number of patients becoming dependent on opioids for chronic pain management. Interventions derived from CBT are effective in chronic pain management and reduction of chronic opioid use. In this study, we aim to assess the feasibility and acceptability of CBT-based pain management techniques in the acute post-operative period with surgical trauma patients.

Adults 18 – 90 years who underwent surgical intervention with the trauma service and had difficult-to-manage pain despite multi-modal pain management with the acute pain service. A bedside intervention led by a medical student on post-operative day 3, 4 or 5 providing pain education, practicing CBT-derived interventions, and completing a feedback survey. Patients were provided a 2-page document summarizing the session.

We assessed what proportion of screened patients met inclusion criteria and agreed to participate. Appropriateness of selection was assessed based on PASS 20 and PCS questionnaires. A feedback survey assessed patient acceptance of and reactions to the intervention.

Of 58 patients screened, 7 patients (12.1%) met criteria and were approached; 6 patients (85.7%) agreed to participate; 5 of those patients (83.3%) completed the entire session. Two patients received the PASS 20 questionnaire and scored 70 and 90 points out of 100 possible points. Three patients completed the PCS questionnaire and all scored >30 points. Patients felt that the session was helpful, and that the time window was appropriate. Patients noted feeling better able to manage their pain after the session. Most patients stated they would be open to further sessions. Some patients noted they would rather be approached when not actively in pain. Patients did not feel that being approached by a medical student was a detractor.

CBT-based interventions can be carried out by medical students and are accepted by patients. Assessment scores indicate all participating patients had clinically relevant levels of pain anxiety and catastrophizing. Patients generally respond positively to the intervention and appreciate the additional tools for pain management. A future study would be improved by including a post-discharge follow-up session and including students from other disciplines. A definitive trial assessing the impact on pain management and long-term outcomes on opioid dependence is warranted.

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RESEARCH SHOWCASE

CLINICAL SPECIALTIES

SCHOOL OF MEDICINE AND HEALTH SCIENCES

Outcomes Among Patients Undergoing Gender-Affirming Hysterectomy from 2010-2020: a NSQIP Analysis

Introduction: Transgender and gender nonconforming (TGNC) patients face unique social and physical challenges. It is well established that health disparities exist among TGNC patients. Limited data exist on surgical outcomes for TGNC patients undergoing benign hysterectomy. We utilized the American College of Surgeons National Surgical Quality Improvement Program (ACS NSQIP) database, to study reoperation rates after benign hysterectomy in TGNC patients.

Methods: Demographic data and surgical outcomes between 2010-2020 were abstracted from the ACS NSQIP database. Current Procedural Terminology (CPT) codes were used to identify patients who underwent hysterectomy for non-oncologic indications. ICD-9/10 codes were used to identify patients with gender dysphoria. Associations between gender dysphoria and unplanned re-operation were examined using propensity score-adjusted logistic regression. Propensity scores were calculated using the variables of: age, race, BMI, ethnicity, hypertension requiring medication, and diabetes.

Results: 445,997 hysterectomies were performed between 2010-2020, of which 2,011 (0.45%) were for TGNC patients. The percent of hysterectomies for TGNC patients increased between 2010-2020 (21 (1.0%) to 379 (18.6%), p< 0.01). TGNC Patients were younger (mean age 35.6 vs. 49.5), less likely to use anti-hypertensive medications (12.7 % vs. 29.7%), and less likely to have diabetes (4.4% vs. 9.7%), compared to non-TGNC patients, p< 0.001. Body mass index was similar between groups (28.3 IQR[24.2, 33.4] vs. 29.9 IQR[25.5, 35.7]).

The risk of reoperation in this cohort was low overall (6,600 (1.5%)), and similar between groups (6,568 (1.5%) vs. 32 (1.6%), p = 0.747). A propensity-score adjusted linear regression demonstrated no increased risk of reoperation for cisgender compared to gender diverse patients (aOR 1.01 95%CI[0.99-1.01]).

Conclusions: Benign hysterectomy carries a low overall risk of reoperation. There was no difference in reoperation among TGNC patients, even when controlling for differences in health status. Hysterectomy continues to be a safe, medically necessary procedure for TGNC patients.

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CLINICAL SPECIALTIES

SCHOOL OF MEDICINE AND HEALTH SCIENCES

Trends in Natural Decannulation in Patients with Robin Sequence: A Twenty-five Year Retrospective Review

Objectives: Robin sequence (RS) consists of micrognathia and glossoptosis that result in upper airway obstruction (UAO). In RS patients who undergo tracheostomy, long-term goals include decannulation without further surgical intervention (natural decannulation). The objective of this study was to identify long-term trends in rate and length of time to natural decannulation.

Methods: A retrospective chart review was performed on 151 RS patients treated at a large pediatric tertiary center from 1995-2020. Tracheostomized patients were grouped by year of tracheostomy. Demographic data, UAO management, postoperative care, complications, and time to decannulation were recorded.

Results: Thirty-six patients (n=36) met the inclusion criteria (61% syndromic RS). 53% (n=19) of patients were naturally decannulated. Overall median time to decannulation was 66.1 months. Natural decannulation rate was higher in non-syndromic RS patients (93% non-syndromic vs. 27% syndromic; $p < 0.0001$) and during the first study period (1995-2004: 73%, 2005-2014: 36%, and 2015-2020: 43%; $p=0.042$). Median length of hospital stay was higher in patients with syndromic RS (51.5 vs. 29.0 days; $p= 0.017$). A multivariate Cox proportional hazard model failed to demonstrate any significant demographic barriers in getting decannulated. Rate of tracheostomy-specific complications was 54%, with an overall mortality rate of 3%.

Conclusion: Syndromic RS was associated with lower decannulation rates and longer time to decannulation. Decannulation rates were higher in the 1995-2004 subgroup, likely because tracheostomy in recent years has been reserved for the most severe cases and mandibular distraction osteogenesis has become primary surgical treatment in severe RS upper airway obstruction.

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RESEARCH SHOWCASE

CLINICAL SPECIALTIES

SCHOOL OF MEDICINE AND HEALTH SCIENCES

Superior Surgical and Medical Outcomes in Computer-Assisted Knee Arthroplasty Compared to Traditional Procedures

Background: Computer assistance can help surgeons achieve excellent mechanical alignment, but the clinical impact of this technology in different arthroplasty types remains controversial due to conflicting evidence regarding functional outcomes, revision rates, and complication rates. The aim of this study was to compare the 90-day medical complications and two-year reoperations following computer-assisted patellofemoral arthroplasty (CA-PFA), unicompartmental knee arthroplasty (CA-UKA), bicompartmental knee arthroplasty (CA-BKA), and total knee arthroplasty (CA-TKA) to the same surgeries performed with conventional instrumentation.

Methods: A retrospective cohort analysis was done using the Mariner dataset of the PearlDiver patient records database from 2010 to 2018. Current Procedural Terminology (CPT) codes were used to identify patients who underwent PFA, UKA, BKA, and TKA with or without computer assistance for osteoarthritis (OA). All included patients were followed for two years. Univariate and multivariable analyses were performed to evaluate for associations between the use of computer assistance and rates of 90-day postoperative medical complications as well as one and two-year surgical complications encompassing all-cause revision, manipulation under anesthesia (MUA), prosthetic joint infection (PJI), and loosening.

Results: On multivariable analysis, revision within one year was decreased in patients who underwent CA-PFA (OR: 0.541, p=0.031), CA-UKA (OR: 0.798, p=0.019), and CA-BKA (OR: 0.186, p=0.025) compared to the same surgeries with technology assistance. CA-TKA was found to have decreased odds of revision for aseptic loosening at 2-years (OR: 0.789, p<0.001). CA-UKA and CA-TKA were found to have decreased risk of overall 90-day medical complications (OR: 0.838, p<0.001; OR: 0.903, p<0.001, respectively) and major complications (OR: 0.750, p=0.004; OR: 0.822, p<0.001, respectively).

Conclusions: Complication rates and reoperations for all arthroplasty types were equivalent or more favorable when computer assistance was used during surgery. Our results quantify some early benefits to using computer assistance in total and partial knee arthroplasty.

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CLINICAL SPECIALTIES

SCHOOL OF MEDICINE AND HEALTH SCIENCES

Exercise Habits of Patients with Parkinson's Disease during the COVID-19 Pandemic

Exercise is critical in maintaining physical and mental health for people with Parkinson's disease (PD). Our objective was to examine exercise habits in people with PD during the COVID-19 pandemic. Further, we explored the self-reported health-related quality of life, mental health, and coping skills of the population surveyed.

This cross-sectional study involved completion of an electronic survey containing 75 questions exploring exercise habits, the Parkinson Disease Questionnaire-39 (PDQ-39), the Patient Health Questionnaire (PHQ-9), and the Coping Self Efficacy Scale-13 (CSES-13). Patients with PD, aged 18-95, who were members of the local Parkinson's foundation and were independent with activities of daily living were invited to participate.

142 of 160 study participants (age 72.5 years + 7.9; 45.3% male) met inclusion criteria. 52.1% of respondents reported exercising regularly (>3 times/week) pre-pandemic, while 59.3% reported exercising regularly during the pandemic. 23.9% of respondents used technology for exercise pre-pandemic, while 82.9% use technology for exercise during the pandemic, and 48.2% relied on online exercise as their main mode of exercise. Although most respondents preferred in-person exercise, 80.7% reported some stress-relief with online classes and 65.8% reported a positive association with mood. 83% indicated that they would continue online exercise classes once in-person classes became more readily available.

Online exercise resources are important tools for patients with PD during the pandemic and will likely continue to be utilized post-pandemic. Continued optimization and access to online exercise classes for people with PD is warranted.

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CLINICAL SPECIALTIES

SCHOOL OF MEDICINE AND HEALTH SCIENCES

Are Ultrasounds as Safe as Chest Radiographs at Assessing Complications of Endotracheal Intubations?

Introduction: Endotracheal tube (ETT) complications are common in intensive care unit (ICU) settings due to ETT malpositioning and migration. Point-of-care ultrasound (POCUS) has shown promise in predicting accurate ETT position but the safety profile compared to chest x-rays (CXR) remains unknown. We assessed whether a POCUS-guided repositioning protocol was non-inferior to CXRs for adverse clinical outcomes.

Methods: Intubated patients enrolled from 4 multi-disciplinary ICUs over a 1-month period were randomized into two arms: CXR-guided or POCUS-guided daily monitoring of ETT position. In the POCUS-arm, novice sonographers assessed ETT positioning daily (normal range: superior balloon border between the 3rd-7th tracheal rings) and recommended repositioning maneuvers accordingly. The protocol allowed clinicians to use CXR landmarks if they did not agree with POCUS recommendations. The CXR-arm used radiographic landmarks (normal range: ETT tip 5±2cm from carina) without sonography. Exclusion criteria included COVID-19 status, C-spine precautions, prone positioning, anterior neck wounds, or planned extubation within 24 hours. Investigators used Fisher's exact test (α-error 5%) to compare rates of ETT bronchial or vocal cord migration, balloon rupture, unplanned extubation, repositioning maneuvers, and ventilator associated pneumonia (VAP).

Results: 22 patients met inclusion criteria with 11 patients in the POCUS-arm (35 ventilator-days) and 11 patients in the CXR-arm (36 ventilator-days). There was no significant difference in adverse events between the CXR- and POCUS-arms (7.50% v 3.13%; p=0.41). There were 6 instances of patients crossing-over from the POCUS-arm to the CXR-arm but a secondary intention-to-treat analysis showed no impact on significance (7.50% v 3.13%; p=0.41). 3 VAP episodes occurred in the CXR-arm and 1 vocal cord herniation occurred in the POCUS-arm. Repositioning was more common in the CXR-arm than the POCUS-arm (23.5% v 0.00%; p=0.02).

Conclusions: The use of POCUS compared to daily CXRs to monitor ETT positioning appears similar in terms of the adverse clinical outcomes. Further investigation is needed to assess if this non-inferiority remains with higher sample sizes.

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CLINICAL SPECIALTIES

SCHOOL OF MEDICINE AND HEALTH SCIENCES

Post-acute infection of Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) leads to systemic inflammation and podocyte injury.

Introduction: COVID-19 attributed to SARS-CoV2 infection is a world-wide pandemic. SARS-CoV2 has been associated with cardiovascular disease and diabetes. At a cellular level, the infection causes endothelial cell dysfunction (ECD), which is manifested by entities such as microvascular thrombosis. ECD is quite common in type 2 diabetes mellitus (T2DM) where the renal podocyte dysfunction is often an early manifestation of microvascular complication. In this study we explored whether presence of hyperglycemia predisposes to increased SARS-CoV2 infection and whether co-morbid presence of COVID-19 and hyperglycemia predisposes to cardio-metabolic complications such as diabetic kidney disease (DKD). To estimate kidney damage, we evaluated albuminuria and podocyte markers in urine exosomes from SARS-CoV2 patients at 10 days, 6 months and 12 months post COVID-19 infection.

Methods: Blood and Urine samples from SARS-CoV2 patients post-acute phase of infection were procured from GWU core facility. Peripheral blood mononuclear cells (PBMNCs) and urine exosomes were isolated and podocyte protein markers such as Nephrin (Nep) and Podocalyxin (PODXL) were identified by western blot analysis.

Results: Our results showed that all subjects at week 10 had blood glucose above 300mg/dl. Blood derived MNCs showed persistent over-expression of IL-6 and TNFa (4-fold) even at 12 months post infection. Urine exosomal protein Nephrin was 3-fold higher at 6 months (n=8; p=0.02) and at 12 months (n=6; p=0.0001). Similarly, another podocyte marker Podocalyxin, was increased by 2-fold as compared to T2DM subjects at 6 months and 12 months(p=0.02 and 0.004 respectively).

Conclusions: A persistent inflammatory marker over-expression at 12 months in COVID samples indicate possible long-standing renal damage. Increased podocyte specific protein loss at 12 months compared to samples from T2DM subjects with similar GFR also indicates persistent kidney damage which may lead to renal failure and hypertension.

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CLINICAL SPECIALTIES

SCHOOL OF MEDICINE AND HEALTH SCIENCES

Embracing Palliative Measures in the ICU: Do We Need More Practice?

Background: Implementing palliative care in the inpatient setting improves patients' symptom management, quality of life, and reduces length of stay in the ICU. Incorporating discussion of palliative domains any provider can assess could increase overall quality of care in the ICU. The study's objective was to identify the frequency of verbally discussed primary palliative care domains during rounds in an academic ICU setting.

Methods: This was a blinded prospective observational study in an urban academic closed mixed ICU from January-June 2021. An independent observer joined multidisciplinary rounds to log verbal communication of palliative domains for each patient, based on proposed quality measures from the Robert Wood Johnson Critical Care Workgroup. Domains included patient and family-centered decision making, communication within the team and with the patient and family, and symptom management and comfort care. Palliative care topics tracked during rounds using a blinded survey were advance directives, patient's goals of care, conversations with patient's family within the past 24 hours, plans for future conversations with the family, surrogate decision maker, presence and plan for pain, as well as presence and plan for respiratory distress.

Results: 434 patient presentations were assessed during the study period. Decision-making capacity was discussed among 72% of capable patients (174 out of 242). Presence of an advanced directive was discussed on 8.5% of patients (N=37). Goals of care reviewed in 11.5% (N=50). Mention of recent conversation with family members occurred in 31% (N=135). Discussion of pain was variable; pain level was discussed among 28% (N=125) and plans for management discussed 59% (N=258) of the time. Plans for future family meetings were discussed with 15% (N=65). In contrast, presence and plan of respiratory distress was discussed 97% (N=421) and 96% (N=418) of the time respectively.

Conclusion: Excluding decision-making capacity, symptom management (pain and respiratory distress) was overrepresented among palliative domains. A gap in application remains despite previously demonstrated benefits of integrating palliative domains. Increased efforts to bolster knowledge and verbal discussion of these additional primary palliative care topics can potentially close the practice discrepancy.

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CLINICAL SPECIALTIES

SCHOOL OF MEDICINE AND HEALTH SCIENCES

Quantitative Gesture Analysis for Central Line Training

Analyzing gestures within the context of medical procedure training helps trainees better understand critical maneuvers that ensure the successful completion of a procedure. Most real-time gesture feedback involves an instructor making suggestions to alter a trainee's form or position. Few tools have provided quantitative gestural analysis to facilitate medical procedure training. We developed a Python program that uses data processing techniques alongside OpenPose to better understand how to quantify gestures in a healthcare training setting.

Novice healthcare providers were recorded during an ultrasound guided central venous catheterization (US-CVC) training session. Each trainee was paired with one physician instructor, who modeled and helped perform the successful completion of the procedure. For this feasibility study, various gestures throughout the training were semantically analyzed using video data to identify which gestures might be especially useful for the completion of the procedure. A single frame capturing the precise moment at which each of the individuals physically placed the central line needle into the mannequin was then processed by OpenPose. Keypoint data from both arms were further processed to identify critical angles for the insertion of the syringe. Both, left and right, arm angles of the trainees were then compared to the instructor's respective angles to assess whether trainees were mirroring the gestures of the instructor.

7 trainees and 6 instructors were analyzed from the cohort consisting of 10 trainees and 10 instructors. A total of 13 frames were processed by the OpenPose algorithm and a total of 325 keypoints (25 keypoints per individual) were collected. The instructor's left arm angle was positioned at 163.1 degrees (SD = 9.7), while holding the ultrasound probe and their right arm angle was 109.9 degrees, while holding the syringe. The mean of the trainee's left arm angles was 160.9 degrees (SD = 12.7) and the mean of the trainee's right arm was 102.1 degrees (SD = 18.4). For the left arm, the mean difference between trainee and teacher was 2.24 ± 20.31 degrees, (95% CI -16.54 to 21.03 degrees), p=.78. For the right arm, mean difference was 7.84 ± 14.88 (95% CI -5.92 to 21.60), p=.21. Since each trainee was matched to a particular teacher as that trainee's gold standard, we used 2-tailed paired t-tests to examine differences between trainee and teacher angles for each arm. In this pilot data, the trainees' arm angles did not differ significantly from their teachers' angles.

The results of the study suggest that trainees had comparable arm angles to that of the instructor. Our findings start to illuminate the utility of quantitative gesture analysis to better understand the cognition of trainees and overcome the challenges with communicating qualitative gestural data.

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CLINICAL SPECIALTIES

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When is Long Enough? Attending Years Correlates with Shorter Code in Non-Shockable Cardiac Arrest

Introduction: While metrics indicating futility in out of hospital cardiac arrest (OHCA) exist, there is little evidence suggesting when it is reasonable to cease resuscitation efforts. Length of resuscitation in OHCA is likely influenced by age, CPR length prior to arrival, and presenting rhythm. Some studies suggest longer resuscitation attempts have a higher likelihood of ROSC and survival to hospital discharge, however longer futile resuscitation may be a waste of resources. We studied whether attending experience, measured by years out of post graduate training, had a significant correlation with lengths of codes in non-shockable OHCAs.

Methods: We performed a single-center prospective observational study of OHCAs. Resuscitation bays were continuously recorded and OHCAs were analyzed by two reviewers. Patients presenting in a shockable rhythm were excluded. Due to right skew of the code length, data was log-transformed to ensure normal distribution. A linear regression model was run to look at the relationship between code length and attending years of experience, controlling for patient age and EMS rhythm. Data were also analyzed separately for patients who achieved ROSC and those who expired in the Emergency Department.

Results: Between 2017 and 2019, a total of 74 OHCAs presenting in asystole or pulseless electrical activity (PEA) were captured. Mean age of the patient was 59.7 with 50 male and 24 female patients. Attending mean years out of training was 15.7 (median: 17, range: 1 to 34). Average code length was 15:24 (min:sec) with a range from 3:07 to 53:37. The regression model found that for each additional year of attending experience, code length decreased by 2% (Coef. -0.02, p=0.003). Attending years was not a significant predictor of code length for patients who obtained ROSC. For patients who died, each additional year of attending experience was associated with a 2.5% (Coef. -0.025, p=0.001) decreased code length.

Conclusions: For OHCAs presenting in PEA or asystole, attending experience is correlated with a decrease in code length. This association strengthens when ROSC is not achieved. Further studies are needed on when it is appropriate to cease resuscitation, possible creation of a standard attempted resuscitation length, and what factors go into physicians calling a code.

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CLINICAL SPECIALTIES

SCHOOL OF MEDICINE AND HEALTH SCIENCES

Size Doesn't Matter: Determining Association Between BMI and Pulse Check Length in Cardiac Arrest

Introduction: Cardiac arrest is one of the leading causes of mortality in America annually. The American Heart Association recommends limiting pulse check times to less than 10 seconds. Numerous environmental and situational components of CPR have shown to affect pulse check time. However, patient factors that affect pulse check length remain unstudied. As the average body mass index (BMI) increases each year in the United States, we aimed to evaluate if a larger body habitus would increase pulse check length.

Methods: We performed a prospective, observational study through video review at our urban academic hospital. Three resuscitation bays were continuously recorded with audiovisual cameras to capture out of hospital cardiac arrests. Videos were reviewed for length of pulse checks. Documented weights and heights were used to calculate BMI. We used a t-test, Pearson chi squared test, and logistic regression to investigate any association between the obese and normal weight cohorts as well as between a pulse check < 10 sec cohort and greater than 10 sec cohort. For consistency, only the initial pulse check was analyzed.

Results: A total of 97 videos were collected between 2017 and 2019, and 82 of those patients had documented weights and heights to be able to calculate BMI. Mean age was 59.5, 55 were male and 27 female. Average pulse check length was 11.0 seconds. When comparing mean pulse check time for BMI above or below 30, there was no significant difference, 10.7 sec and 11.2 sec ($p = 0.65$). Pearson chi squared test between those with pulse checks less than 10 seconds and those greater than seconds also did not reveal any association with BMI. Logistic regression with pulse check length and age, BMI, or sex further did not reveal any association.

Conclusions: Despite the perception that palpating a pulse in more obese patients may take longer, our study showed no significant association between pulse check times and obesity. More research is necessary to determine what elements of CPR can be adjusted to decrease the time spent checking pulses and increase survivability.

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CLINICAL SPECIALTIES

SCHOOL OF MEDICINE AND HEALTH SCIENCES

Associations Between Substance Use Disorders and Lifetime Ocular Disease: A Retrospective Cohort Study

Purpose: To assess the lifetime associations between various ocular conditions in patients with substance use disorders, including alcohol, cannabis, opioid, and nicotine related disorders, from the time of diagnosis.

Methods: We conducted a retrospective cohort study using TriNetX, a national, federated database that provides aggregate electronic health record data from 80 million unique patient files within 56 healthcare organizations. Patients diagnosed with substance use disorders (SUD) were identified using ICD-10 diagnostic codes and followed for subsequent diagnoses of 27 ocular conditions over the span of a patient's lifetime after initial diagnosis of substance use disorder. The primary outcomes were incidence. Patients with pre-existing ocular disease were excluded from this analysis.

Results: A total of 7,546,278 patients were included with 1,460,831 diagnosed with alcohol use disorders (AUD), 775,891 with cannabis use disorders (CUD), 573,583 with opioid use disorders (OUD), and 4,753,973 with nicotine dependence (ND). 37% (10/27) of ocular diagnoses had the same incidence between each SUD cohort. AUD had the most diagnoses with the highest incidence (48%) and CUD had the most diagnoses with the lowest incidence (63%). AUD had the highest incidence of disorders of refraction and accommodation (3.1%), glaucoma (1.4%), and cataract (1.4%). CUD had the lowest incidence of cystoid macular degeneration (0%), puckering of macula (0.1%), and retinal vascular occlusion (0.1%). OUD had the highest incidence of strabismus (0.3%) and dry eye syndrome (1.5%) and lowest incidence of retinal vascular occlusion (0.1%). ND had the highest incidence of conjunctivitis (2.1%), glaucoma (1.4%), and cataract (1.4%). The incidence of glaucoma, cataracts, macular degeneration, blindness, and disorders of refraction and accommodation were higher among patients with alcohol and nicotine use disorders than cannabis and opioid use disorders. The incidence of dry eye syndrome was highest among patients with opioid use disorders while the incidence of conjunctivitis was highest among those with nicotine use disorders.

Conclusions: This a national-scale study that sheds light on the associations between substance use disorder and the most common ocular diseases. These findings can be useful when examining a patient with a history of SUD.

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CLINICAL SPECIALTIES

SCHOOL OF MEDICINE AND HEALTH SCIENCES

SLAP Repair versus Biceps Tenodesis in Patients Under 40: A Systematic Review, Meta-Analysis, and Cost-Effectiveness Study

Background: Biceps tenodesis is becoming a more widely accepted procedure for index treatment of SLAP tears in older patients; however, there is limited data assessing the efficacy of this procedure in a younger patient population.

Hypothesis/Purpose: To compare SLAP repair with biceps tenodesis for SLAP tears in patients under 40 years old.

Methods: Systematic review of PubMed (MEDLINE), Scopus, and Cochrane CENTRAL databases for studies comparing outcomes after SLAP repair and biceps tenodesis in patients <40 with at least one year of follow up identified 4/720 studies that were eligible for inclusion. A one-month Markov cycle was simulated to reflect 10 years of health outcomes for a younger, active patient population based on transition state values from the meta-analysis and health state utility from existing literature.

Results: 274 patients were eligible for inclusion, divided into 169 after SLAP repair and 105 after biceps tenodesis. Most patients were male (79.8%) and athletes (74.5%). Preoperative and postoperative pain Visual Analog Scale (pVAS) scores decreased significantly in both groups (SLAP repair: mean difference [MD]=4.63, CI=3.84–5.43, p<.001; biceps tenodesis: MD=4.88, CI=2.64–7.13, p<.001) with no significant difference between postoperative scores (p=0.37). Preoperative and postoperative American Shoulder Elbow Surgeon (ASES) Standardized Shoulder Assessment scores similarly improved significantly in both groups with no difference in final scores between groups (p=0.43). Patient satisfaction averaged 8.1/10 (CI=7.7–8.6) after SLAP repair and 8.7/10 (CI=8.0.–9.3) after biceps tenodesis without significant difference in final scores (p=0.15). Rates of return to sport were greater after biceps tenodesis (72.6% versus 63.3%) with marginal statistical significance (p=0.09). Surgical complications were rare (1.4%). There was a significantly increased rate of reoperation after SLAP repair (11.2% versus 1.9%, OR=3.94, CI=1.16–13.41, p=0.03) with biceps tenodesis comprising the majority (78.5%) of specified revision procedures after SLAP repair. Both primary SLAP repair and primary biceps tenodesis yielded an average expected 8.1 QALY over the 10-year period. The average cost was $19,344 for biceps tenodesis and $22,022 for SLAP repair.

Conclusion: Postoperative pain, function, and patient satisfaction were equivalent after SLAP repair and biceps tenodesis in patients under 40. When compared to biceps tenodesis, there are higher rates of reoperation and lower rates of return to sport after SLAP repair. Economic analysis demonstrates comparable QALYs with less overall cost for biceps tenodesis and may be especially important in the context of similarly efficacious outcomes.

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CLINICAL SPECIALTIES

SCHOOL OF MEDICINE AND HEALTH SCIENCES

Role of Imaging in Differentiating between CNS Toxoplasmosis and Primary CNS Lymphoma in HIV/AIDS Patients

Cerebral toxoplasmosis and primary central nervous system lymphoma (PCNSL) are acquired immune deficiency syndrome (AIDS)-defining illnesses. They are also the most common diagnoses in US patients with human immunodeficiency virus (HIV) infection, who present with brain lesions. Due to similar clinical presentations of these entities, imaging plays a key role in diagnosing these patients. Despite advances in neuroradiological imaging techniques, the distinction between these entities is still often based on the extent of disease evident on MRI examinations acquired immediately before and shortly after the initiation of anti-toxoplasmosis therapy for a presumed diagnosis of toxoplasmosis. While the assumption has been that unlike patients with PCNSL, those with toxoplasmosis should show a response to this therapy on follow-up imaging. Yet, the extent of these imaging changes has not been well studied. In this presentation, we exemplify these radiological changes and explain their implications. This understanding can hone the working differential diagnosis and facilitate the establishment of appropriate management for these patients.

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RESEARCH SHOWCASE

CLINICAL SPECIALTIES

SCHOOL OF MEDICINE AND HEALTH SCIENCES

Racial Disparities in the Placement of Intracranial Monitoring: A TQIP Analysis

The Brain Trauma Foundation recommends intracranial pressure (ICP) monitoring in patients with severe traumatic brain injury (TBI). Race is associated with worse outcomes following TBI. The reasons for racial disparities in clinical decision-making around ICP monitor placement remain unclear.

We queried the Trauma Quality Improvement Project (TQIP) database from 2017-2019 and included patients ≥16 years old, with blunt severe TBI. Exclusion criteria was no recorded race, those without signs of life, had length of stay <1 day and AIS=6 in any body region. Variables included demographic, clinical, and outcome characteristics. The primary outcome was probability of ICP-monitor placement. We calculated incidence rate ratios for ICP monitor placement using a Poisson regression model to adjust for confounders.

A total of 260,814 patients were included: 218,939 White, 29,873 Black, 8,322 Asian, 2,884 Native American, and 796 Pacific Islander. Asian and Native American patients had the highest rates of midline shift (16.5% and 16.9%). Pacific Islanders had the highest rates of neurosurgical intervention (19.3%) and ICP monitor placement (6.5%). Asian patients were found to be 19% more likely to receive ICP monitoring [adjusted IRR 1.19 (95%CI: 1.06-1.33), p=0.003], while Native American patients were 38% less likely [adjusted IRR 0.62 (95%CI: 0.49-0.79), p<0.001], compared to White patients, respectively. No differences were detected between White and Black patients.

ICP monitoring utilization differs significantly by race. Further work is needed to elucidate modifiable causes of this difference in the management of severe TBI.

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CREATIVE ARTS

COLUMBIAN COLLEGE OF ARTS AND SCIENCES

Trust the Process: Substance Use Disorder Recovery through Open Studio in Art Therapy

Despite more resources being invested in Substance Used Disorder (SUD) treatments each year, the number of people with SUD stays steady and relapse rates are high. This suggests that the current recovery treatment programs need to be improved. It has been claimed that SUD is associated with destroying mental health, and art therapy interventions have been effectively used in SUD treatment and have improved mental health.

Open Studio is one of the types of group art therapy in which no directives are given, which allows development of cohesion and social skills and promotion of individual growth through observation and interaction in a flexible group setting. This case study was designed to learn whether the SUD recovery treatment can be improved in an Open Studio setting. Social and emotional skills, which include skills to understand and manage emotions, set and achieve positive goals, feel and express empathy for others, build and maintain positive relationships, and make responsible decisions, are needed to successfully recover from SUD. Open Studio, a setting where clients can interact with others, explore creativity, and regulate emotions in a natural environment, makes it an ideal vehicle to develop social and emotional skills. The author will refer to the Social Emotional Learning model to measure improvement in social and emotional skills.

There is insufficient evidence-based research regarding the outcomes of developing social and emotional skills through art therapy. However, the author aims to discover the benefits of developing these skills in a therapeutic setting. The results of this study will provide more information about the impact art therapy, particularly in the Open Studio setting, can have on development of social and emotional skills and its impact on SUD recovery treatment.

Primary Presenter

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CREATIVE ARTS

CORCORAN SCHOOL OF THE ARTS & DESIGN

Please Wait For Assistance

I have always been fascinated by AI-generated voices. From the stern-sounding floor announcement from the elevator in my apartment building, to the comforting lull of the metro when I approach a stop; it's an endearing advancement to bring the analogue age into something more digital, for better or worse.

For this project, I focused on self-checkouts, gathering more than 50 samples of machines across Washington D.C., all the way to Saint Louis, Missouri. By 2025, it is predicted that 1.2 million self-checkout units will be installed worldwide. Maybe by then they'll know when you've placed your item in the bagging area.

I composed and created original musical content using the Ableton Push 2 to generate musical notes, which I then automated to control parameters in order to get my desired soundscape. I wanted to challenge myself to make something creative out of something mundane, normalized, and technological.

In my result, I hope you all agree that these "voices" create something jarring, beautiful, and musical. The concept that music can be anything, regardless of western-classical connotations, is something that continually inspires me in my studies and creations. I encourage all who listen to my piece to be mindful of the many sounds that surround them.

LINK TO SONG: https://soundcloud.com/jess-makler/please-wait-for-assistance

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RESEARCH SHOWCASE

DRUG ABUSE

SCHOOL OF MEDICINE AND HEALTH SCIENCES

Phenobarbital in Alcohol Withdrawal Has Better Outcomes vs Dexmedetomidine Plus Benzodiazepine Alone

Severe alcohol withdrawal syndrome (AWS) can be fatal, even in a hospital setting. Historically, benzodiazepines have been the mainstay of treatment for alcohol withdrawal syndrome. However treatment of AWS with benzodiazepines is associated with respiratory failure, ICU admission and prolonged hospital course. Phenobarbital and dexmedetomidine have been used recently as adjuncts to AWS treatment to reduce benzodiazepine requirement in AWS patients. However comparison between the usages of the two medications has not been thoroughly explored. Here we studied the efficacy of phenobarbital addition in AWS treatment compared to dexmedetomidine and benzodiazepine.

We performed a retrospective chart review of patients with AWS from January 2020 to July 2021 at a single academic medical center. AWS is diagnosed by clinicians and treated based on CIWA. We compared the outcomes of patients with continuous dexmedetomidine infusion and benzodiazepines (DEX+) versus patients who received phenobarbital along with other adjuncts including dexmedetomidine and benzodiazepine (PHENO+). We collected patients' demographic information, comorbid diagnoses, and outcome data.

156 patients who were included in this analysis, 102 treated with dexmedetomidine and benzodiazepine, and 54 had phenobarbital in their treatment plan. The two groups are not significantly different in age and gender composition. Comparing the PHENO+ versus DEX+ groups, we found a significantly shorter hospital length of stay (6 vs. 9 days ($p< 0.05$)) and lower ICU admission rate (35% vs. 100% ($p< 0.05$)). However once admitted, the median ICU LOS for both group is 4 days. The intubation rate was lower in PHENO+ patients (28% vs 47%, $p< 0.05$). However, once intubated, PHENEO+ patients trended to have longer mechanical ventilation days (3.75 vs 2.06, $P=0.067$). The median maximum CIWA score for PHENO+ patients are 17 while DEX+ is 15 ($P=0.53$).

The use of phenobarbital in AWS treatment plan may reduce hospital LOS and ICU admission and intubation rate when compared to AWS treatment plan with dexmedetomidine and benzodiazepine alone. Further prospective studies should be performed to evaluate the utility of phenobarbital in severe alcohol withdraw to improve critical care outcomes.

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RESEARCH SHOWCASE

DRUG ABUSE

SCHOOL OF MEDICINE AND HEALTH SCIENCES

Effectiveness of Opioid Disposal Kits and Education Methods: A Systematic Review of Randomized Controlled Trials

Introduction: More than 70,000 individuals died from opioid overdose in 2017, with over 17,000 deaths attributed to prescription opioid overdose. Notably, of the 9.7 million individuals who misused opioids in 2019, more than 50% received opioids from a friend or family member. Leftover prescription opioids create a reservoir of unused pills that are vulnerable to misuse and diversion. This study aims to determine the effectiveness of two interventions, patient education through verbal or written instruction and opioid-inactivating disposal kits, on opioid disposal rates among patients with leftover prescription medication.

Methods: A systematic review was performed using PubMed, Scopus, and Cochrane. Search terms included "opioids" and "disposal" or "takeback" or "disposal kit" or "opioid diversion" or "buyback." Using Covidence, 476 unique studies were identified. The inclusion criteria included randomized controlled trials involving human subjects done in the United States from January 1999 to August 2021. Primary or secondary outcomes had to include opioid disposal as an end result.

Results: Nine RCTs ultimately fulfilled inclusion criteria which included a total of 1,814 patients (Figure 1). Between included trials, 591 (32.58%) patients were in the control group, 851 (46.91%) had received educational intervention, and 372 (20.51%) received an opioid disposal kit. All groups within studies did not exhibit statistically significant differences in terms of age, and gender when applicable (Table 1). There was a notable high bias risk in blinding of participants and personnel across all studies (Figure 2, 3). One study was not included in disposal rate calculations due to reporting pooled outcomes for intended disposal and disposal rates. The average disposal rate was lowest in the control group 30.5% in the control groups, followed by 30.85% in the education group. The opioid disposal kit group had the highest participation in opioid disposal at 51.88%. There was a 0.36% increase in opioid disposal participation in the education group over control, compared to a 21.39% increase with the disposal bag group (Table 2).

Conclusion: Our findings suggest that provision of opioid disposal bags has the most significant impact on increasing patient participation in disposing of unused opioids up to 6 weeks post-surgically. Patient education had minimal effect on patient behavior. These results suggest opioid disposal bags should be more widely implemented in the clinical setting to improve the disposal of unused prescription opioids and prevent diversion into the community.

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RESEARCH SHOWCASE

EDUCATION

GRADUATE SCHOOL OF EDUCATION AND HUMAN DEVELOPMENT

A Review of Behavioral Interventions to Reduce Off-Task Behavior for Students Who are Deaf or Hard of Hearing

This essay aims to summarize and critique three articles that focuses on improving on-task behavior for students who are deaf or hard of hearing by applying three behavioral interventions: function-based interventions, differential reinforcement of alternative behavior, and modifying the classroom environment. Across three studies, there were a total of 20 participants between the ages of 6 and 11. The essay offers a brief explanation of each intervention, how the studies used the interventions to reduce the undesirable behavior and replace it with appropriate behavior, and a description of each intervention's outcomes. The outcomes of three studies showed a positive relationship between implementing these three interventions and reducing unwanted behavior. The studies demonstrated a strong rating of social validity since the teachers revealed that the interventions were accessible, easy to implement, and had appropriate results for the participants. Furthermore, this essay also compares the interventions through different aspects: participants, setting, study design, the definition of off-task behavior, intervention phases, and social validity. According to the comparison between the interventions, the essay suggests some recommendations to support future research. First, to investigate the interventions among different participants, settings, and times, while the second recommendation is to have solid evidence of the interventions' effectiveness. Finally, this essay represents effective approaches to help teachers deal with their students.

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RESEARCH SHOWCASE

EDUCATION

GRADUATE SCHOOL OF EDUCATION AND HUMAN DEVELOPMENT

Disability and Development: An Inclusive Education Toolkit

This research addresses how to implement inclusive education for children with disabilities within the context of three different countries. In partnership with the non-profit Pencils of Promise (PoP), this research was formatted into a toolkit for PoP to use in schools within their three countries of Ghana, Guatemala, and Laos. PoP currently has 588 schools between the three countries with 14,500 teacher coaching sessions. Findings for this research were organized into themes that included the implementation of inclusion in relation to School Leaders and Education Personnel, Teacher Training, Curricula and Materials, Community Awareness, and Accessibility. Additionally, each individual country was researched on their history of children with disabilities.

With the creation of Sustainable Development Goal 4 to ensure inclusive and equitable quality education and promote lifelong learning opportunities for all, it is critical to examine the quality of education that is provided for children with disabilities globally. Findings highlighted the significance of inclusive education for children with disabilities in academic settings as well as how educators, school officials, and community members use this information they have to carry out inclusion. It provides unique insight into the perceptions of children with disabilities across three different countries. This study adds to the understanding of children with disabilities and further develops the approaches to inclusion within three different country contexts.

This Inclusive Education Toolkit is intended to aid PoP as they work to integrate more inclusive methods in their schools located in Ghana, Guatemala, and Laos. It presents a guide for development and inclusion in a general understanding in order to illustrate essential elements related to inclusive education. The goal of this toolkit is to provide ample background knowledge and resources so that PoP has the support and guidelines necessary to improve educational environments for children with disabilities.

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RESEARCH SHOWCASE

EDUCATION

GRADUATE SCHOOL OF EDUCATION AND HUMAN DEVELOPMENT

Learning Outdoors: Making Generative Oddkin with Cicadas, Children, and Wearable Cameras during the Pandemic

Introduction: This poster draws from a walking research event (cf. Springgay & Zaliwska, 2015) in a garden with middle school students using wearable cameras that was designed to provide children with safer social and educational opportunities during the Covid-19 pandemic. As a driving force the pandemic illustrates "that 'we' are all in this planetary condition together, whether we are humans or others" (Braidotti, 2020, p. 467). This research explores the question how this planetary gathering may be considered an assemblage consisting of attraction, combination, and relation created by forces and affinities despite perceived differences (Tsing, 2015).

Perspectives: The events presented will highlight the ways participants in the study made "generative oddkin" (Haraway, 2016, p. 3) with cicadas and technological apparatuses as co-constructors of being and knowing (Braidotti, 2019). According to Haraway (2016), making generative oddkin means "embrac[ing] situated technical projects and their people" (p. 3). Tsing (2015) describes that transformation through survival is not always about advancing the individual and collaboration leads to contamination; "without collaborations we all die" (p. 28). The work at hand, by way of Braidotti (2019), takes up a vital new materialist philosophy positioning humans as relational pieces in the larger collective of the "media-nature-culture continuum" (p. 113).

Methods: This qualitative study was comprised of nature walks with six groups of kindergarten through eighth grade students and two educators in three public outdoor gardens located in a mid-Atlantic metropolitan area. Four of us plugged into wearable cameras to embody Barad's (2007) theories that consider apparatuses as an entangled part of the research phenomenon. The video footage was analyzed using a diffractive methodology (Haraway, 1997).

Findings: Footage from the four cameras were used to create a three-layered moving video montage. The three-layered film illustrates the blurred subjectivities composed of voices, videos, and theories. For example, the Brood X cicadas are part and parcel of the child-technology-insect nexus and transpose various connotations and relations (Braidotti, 2002, p. 150).

Conclusions: Outdoor learning places and spaces, the Covid-19 pandemic, and the 17-year cicada emergence all serve as conditions of possibilities (Deleuze, 1986/1988) for curriculum. This is life in the ruins of the pandemic and what emerges is "contaminated and nondeterministic, unfinished, ongoing practices of living" (Haraway, 2016, p. 37). Life co-exists and collaboratively survives beside devastation in spatial agnosticism (Deleuze & Guattari, 1980/1987; Sedgewick, 2003; Tsing, 2015).

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RESEARCH SHOWCASE

EDUCATION

GRADUATE SCHOOL OF EDUCATION AND HUMAN DEVELOPMENT

The Voices of Families and Caretakers on the Need for Sexual Health Education for Youth with Moderate/Severe Disabilities

Sexual health education is critical to address when investigating inequalities faced by youth with disabilities. However, it continues to remain one of the most overlooked areas of life for youth with moderate/severe disabilities. In recent years, research has started to identify the need for sexual health education for students with disabilities but without the perspectives of families and caretakers of youth with disabilities. Without the voices of families and caretakers, it is difficult to determine what processes need to be instated for sexual health opportunities for youth with moderate/severe disabilities to occur. This research uses qualitative methods to highlight the unique voices of families and caretakers of youth with moderate/severe disabilities. The results identify 3 key themes: (1) families receiving little to no communication from the school regarding sexual health interventions, (2) a reluctance from school members to provide sexual health interventions and (3) medication as a solution for any sexuality concerns. Addressing how families and caretakers of youth with moderate/severe disabilities perceive and experience sexual health for their child can provide insight on how such education can be improved.

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RESEARCH SHOWCASE

EDUCATION

GRADUATE SCHOOL OF EDUCATION AND HUMAN DEVELOPMENT

Harnessing the Potential of Systematic Searching for Emerging Scholarship

This proposal illustrates the potential of sophisticated, systematic approaches to reviews of literature on emerging research topics. For example, although 95% of U.S. public 4-year colleges enroll students with chronic illnesses, wide variations in terminology embedded within a scant body of scholarly literature leave researchers with little knowledge about who this group represents, their experiences of college (Rau & Lewis, 2019) and their well-being. These challenges in understanding the scope and content of the scholarly base can be at least partially mitigated by a systematic approach to the literature review.

After developing a research question to guide this inquiry, inclusion and exclusion criteria were established to define the boundaries of literature of interest. Due to the paucity of scholarship on the topic, any peer reviewed article written in English between 1990 (when the Americans with Disabilities Act was legislated) and 2021 was considered relevant. A Boolean search was performed using the terms "chronic" AND "illness*" (Title) AND "college" (subject) AND "student*" (any field). These keywords and Boolean operators were selected through preliminary scoping searches which revealed wide variation in terms used in scholarship about chronically ill students. Thus, the terms "chronic" and "illness" were separated to allow for articles that referenced "chronic medical illness", for example. This level of attention to and scoping of search criteria, terms, and dates serves a critical function in capturing relevant, timely literature with widely divergent terminology.

The initial search returned 40 results and a review of titles and abstracts revealed 10 qualifying studies. Next, a process of citation chaining was used to locate missing studies from the initial search, yielding 4 additional articles for a total of 14 studies in the final review. Citation chaining was particularly useful given the emerging nature of literature around this topic. For example, chaining identified one relevant article that was published only one month before the search was performed and thereby not yet included in scholarly databases.

Subsequently, studies were assessed and coded for their relevance to the research question, outcome correlates, methods, and findings. Although the process of the literature review is often taken for granted as a search and synthesize endeavor, the current proposal provides evidence of the critical nature of a systematic search process, particularly when a phenomenon of interest has been little studied, is referenced with broad terminology, or is of increasing interest illustrated by recently emerging scholarship.

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RESEARCH SHOWCASE

EDUCATION

GRADUATE SCHOOL OF EDUCATION AND HUMAN DEVELOPMENT

Making Work Work; Improving Employment Outcomes for Autistic Adults

Autistic people have issues with social skills, behavior, and communication (American Psychological Association, 2013) and have significant hurdles to sustained, paid employment (Hendricks & Wehman, 2009). Autistic people are often unemployed or underemployed; they work fewer hours and earn less money than neurotypical people and peers with other disabilities (Chiang et al., 2013). Autistic people also struggle with having their voices heard in their lives; they are frequently unable to determine their career paths and are directed by others into undesired work and goals. The present study answers:

1. What self-determination capacity variables predict gainful, high-quality employment for autistic students?
2. How do the individual capacities (volitional action, agentic action, and action-control beliefs) of self-determination affect employment outcomes for autistic people?
3. What self-determination skills do autistic people value the most in finding and maintaining high-quality employment?
4. What makes autistic people satisfied with their employment?
5. What do autistic adults say about employment and self-determination that would explain the regression analysis?

Previous research has only measured employment in terms of wages and hours worked. Wages and hours worked are important measures of employment quality but they do not grasp what satisfactory employment is to autistic adults. Much of the available research does not collect the voices of autistic adults when discussing satisfactory employment outcomes. The present study uses mixed methods to gather the voices of autistic adults through surveys and interviews to answer the research questions. The research found seven themes of autism and employment common amongst autistic adults as well as many areas of silence between the survey and interview results. The findings suggest a new conceptual framework for how self-determination can impact employment outcomes and recommendations on how best to improve employment outcomes for autistic adults.

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RESEARCH SHOWCASE

EDUCATION

GRADUATE SCHOOL OF EDUCATION AND HUMAN DEVELOPMENT

Critical Circulation Literacy, Multimodal Composition, and Social Change Making

The beginning of the 21st century was accompanied by a rapid emergence of communicative media that are still transforming how we communicate. This emergence of new technologies has made more visible the misalignment of traditional literacy standards, championed by dominant institutions of society, with the essential skills and mindsets necessary for responsible participation in our modern world. Despite their roots in social efficiency and economic productivity, calls to rectify this misalignment also present opportunities to radically transform literacy education and what counts as literacy in language arts classroom.

Toward this, I draw on post-structuralist literacy and composition scholarship and theories of youth resistance and social change to argue for the need to embed circulation study in day-to-day language arts pedagogy amid the rapid emergence of new media and communication technology. I provides an overview of the need to engage students in thinking around the processes through which texts, ideas, languages, and literacies circulate as they take on cultural value and world-shaping force including critical interrogation and intervention in issues of social and institutional power. I then provides a framework for embedding critical circulation literacy, multimodal composition, and social change-making in ELA pedagogy. Specifically, the framework presents approaches to inquiry that facilitate understanding and interrogation of (1) concepts of genre, mode, and form, (2) the realities and possibilities of multimodal rhetorical and literary assemblage, and (3) the circulation of such assemblages toward social change.

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RESEARCH SHOWCASE

EDUCATION

GRADUATE SCHOOL OF EDUCATION AND HUMAN DEVELOPMENT

Using the CAFA system of assessment question generation: an introduction to its practicalities, benefits and potential.

Typically, written examination questions have been composed by the teachers who teach the individual modules. However, this is time-consuming and introduces issues of security. It is logical to consider whether the digital environment might be able to address both matters.

The wind of digital innovation is blowing in all areas of life. Education is no exception. However, fewer than 10 percent of teachers in the US are familiar with new techniques such as data analysis, computer programming languages, and website design. This limits their ability to use technologies and to become more proficient in the way they set and store examination questions.

The CAFA system, a generative automated item generator being developed by Dr. Choi and Dr. Yoon, is intended to address these issues. CAFA is a knowledge modeling system which allows specific types of question forms to create new questions (often called "items"). It has the potential to be of real use to professional teachers who are trained in Knowledge Modeling.

In this presentation, I introduce the design of a syllabus that I have worked on. I first demonstrate a module that I have created as part of the CAFA suite. This is accompanied by a number of exercises that exemplify how CAFA can be used and its powerful ability to generate different assessment items almost instantly. Teachers are then offered an opportunity to explore the various benefits of CAFA, including an improvement in teamwork, and the ability to organize and manage their knowledge on an ongoing basis. The presentation also encourages teachers to engage in their own CPD by learning how to code and to create their own assessment items, which in turn develops a sense of ownership. This then impacts their students whose learning will improve both educationally and more widely.

CAFA is an innovative and effective way of moving education at all levels into the technological future. The presentation demonstrates how and why it is significant and aims to instill personal and professional confidence in its use. At a personal level, my ambition is to roll CAFA out beyond education to the business world where it has similar potential.

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RESEARCH SHOWCASE

EDUCATION

GRADUATE SCHOOL OF EDUCATION AND HUMAN DEVELOPMENT

Recruiting and Retaining Special Education Teachers from Underrepresented Populations

There are many teachers who have decided to leave the teaching profession especially in the midst of the Covid-19 Pandemic. Many school systems have to decide how to replace teachers who have resigned, retired from the teaching profession early, or transitioned to new careers. Policy needs to be implemented in order to attract new teachers, and retain experienced teachers, especially those who have been resigning within the first five years of their career. Research shows that there needs to be an influx of new general and special education teachers. These new teachers could be selected, and helped to achieve certification, from underrepresented populations including paraprofessionals, teachers having disabilities, and teachers of color.

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RESEARCH SHOWCASE

EDUCATION

GRADUATE SCHOOL OF EDUCATION AND HUMAN DEVELOPMENT

EMPOWER USING ASSESSMENT: USING AIG TO CREATE FORMATIVE ASSESSMENTS

With assessments for learning being touted as beneficial, teachers strive to incorporate formative assessments as part of the instructional process to enhance student's knowledge. Formative assessments aid teachers by providing information about a student's performance and current standing, as well as, providing simultaneous feedback to the student. However, formative assessment has its own challenges in application, a major issue being creation and generation of a large number of test items to feed such continuous formative assessments. Technology having paved its way into every corner of life, assessment is not left behind. In integrating technology and assessment lies the key to the future. With Automatic Item Generation (AIG), the cited issue of infinite items can be addressed. This paper aims to highlight creation and development of formative assessments using Automatic Item Generation (AIG), presenting a two-fold benefit – aiding teachers and students. It specifically provides information in generating item instances using Computer Adaptive Formative Assessment (CAFA), which is an AIG system. The paper looks towards a future with AIG generating adaptive formative assessments easily accessible to students.

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RESEARCH SHOWCASE

EDUCATION

GRADUATE SCHOOL OF EDUCATION AND HUMAN DEVELOPMENT

How School Leaders Make Meaning of Their Experiences Supporting Refugee Students Who Have Experienced Trauma

More than half of refugees worldwide are under the age of 18 years (Koyama & Chang, 2019, p. 137). According to the UN High Commissioner for Refugees (UNHCR), forced displacement has been reaching historic levels. As refugee numbers increase in the United States, there is a need to address how refugee students and their unique experiences, hardship and trauma are being supported in schools. Refugee experiences can be new to educators, trauma experiences can be new as well. There is existing research surrounding the roles of teachers in supporting disadvantaged student populations including refugees, students in poverty and students with trauma (Giboney & Musetti, 2018; Hart, 2009; McNeely et al., 2017). There is also existing research on families in supporting disadvantaged students (Barowsky & McIntyre, 2010; Matthiesen, 2017; Wall & Musetti, 2018). Despite the responsibilities of school leaders, there is almost no existing research on how school leadership plays a role in refugee student wellbeing and success. There is even less research on school leaders supporting refugee students who have experienced trauma (Tsuru, 2018). School leaders have important responsibilities that include policies, procedures, monitoring achievement, interacting with families, and supporting staff. Given the importance of school leadership, the purpose of this research is to address the gap in literature on school leadership and school leaders' roles specifically in supporting refugee students with trauma.

The literature review completed for this study creates a framework for understanding refugee experiences and trauma of refugee children in schools. Through interviews, this basic qualitative study seeks to give a voice to school leaders working with refugee students who have experienced trauma. Understanding the unique experiences of building principals who work closely with this population of students and families can provide valuable insight for other school leaders and support schools in preparing and supporting their staff, families, and communities.

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RESEARCH SHOWCASE

EDUCATION

GRADUATE SCHOOL OF EDUCATION AND HUMAN DEVELOPMENT

COVID-19 and International Students: Examining Perceptions of Social Support, Financial Wellbeing, Psychological Stress and University Response

After the COVID-19 pandemic forced higher education institutions (HEIs) in the United States (US) to transition into online instruction, a particular subpopulation of students was highly impacted: international students. This study is aimed at understanding the impact of COVID-19 on international students' social support, financial wellbeing and psychological stress. This study is guided by the following research questions: (a) In what ways, if any, are the experiences of undergraduate and graduate students similar and different across variables?; (b) How does Covid-19 impact residential students in comparison to those who were living on campus and those who returned home?;(c) How do students' perceptions differ according to the source(s) of funding for their studies? Through 359 responses to a survey conducted at two large universities in the US, this study found that doctoral students reported higher social support in comparison to undergraduate students and that master's students were more satisfied with the university's decision to move to online instruction than bachelors' students. Students with multiple sources of funding reported higher levels of financial wellbeing than students with one source of funding. However, no differences were found between students who stayed on campus and students who were off campus or who returned to their home countries. We also found no statistically significant differences in any of the variables between students who are self-funded and students who are not. This study suggests that different groups of international students deserve more attention from HEIs in times of crisis as the one caused by the effects of the pandemic.

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RESEARCH SHOWCASE

EDUCATION

SCHOOL OF NURSING

Qualitative Exploration of a Perioperative Elective on Recruitment and Retention of New Graduate Nurses

Background: Perioperative nurses care for countless patients in preoperative, intraoperative, and postoperative settings; however, the shortage of these specialized nurses, mainly related to aging demographics and attrition is increasing. Many nursing programs do not include perioperative rotations, further reducing entry into the specialty. Onboarding a new nurse into the perioperative specialty is estimated between $59,000- $95,000 with turnover being both costly and potentially impacting patient care. One strategy to enhance recruitment to the specialty is the formation of academic-practice partnerships (APPs), which can facilitate the integration of perioperative curricula at the undergraduate level and expand perioperative sites for clinical learning. This is imperative as researchers have found pre-licensure exposure to perioperative nursing influences whether new nurses choose this specialty after graduating. The significance of this study to identify factors associated with education, recruitment, and retention is vital to maintain this specialty practice.

Objectives: Explore factors predicting perioperative nursing career choices following graduation among students who completed a perioperative elective

Methods: One-on-one semi-structured interviews were conducted in October through December 2021 via an online platform with 20 recent nursing graduates who had completed the perioperative elective. Interviews were recorded and transcribed verbatim. Preliminary content analysis was conducted on the transcripts. Emerging themes were matched to Schlossberg's Transition Theory, which encompasses four major sets of factors (4S's) that influence a person's ability to cope with a transition. These factors are Situation (what is happening?), Self (to whom is it happening?), Support (what help is available?), and Strategies (how does the person cope?). Triangulation will be performed among the research team members.

Results: Ongoing content analysis indicates that the transition experience of new graduate nurses into their first role, whether or not in the perioperative specialty, can be mapped to Schlossberg's Transition Theory. Representative participant quotes will be displayed within the framework of Schlossberg's Transition Theory.

Discussion: An increased understanding of factors affecting the decision to pursue the perioperative specialty can impact recruitment and retention efforts. Further study is needed to better understand the impact of these on the career choices of new graduate nurses.

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RESEARCH SHOWCASE

EDUCATION

TRACHTENBERG SCHOOL OF PUBLIC POLICY AND PUBLIC ADMINISTRATION

An In-depth Analysis and Proposal for the Reconstruction of the Educational Implementation of Section 504 of The Rehabilitation Act of 1973

Section 504 of the Rehabilitation Act was included to ensure that children with disabilities have opportunities to equally access education. According to Section 504, it is the general educators who are held responsible for making sure that students taught in mainstream classroom settings with distinct needs and behaviors are provided with accommodations. These accommodations are to be stated in an individualized student 504 plan. States do not receive extra financing for students with 504 plans. But the federal government can take funding away from programs, including schools, that do not meet their legal duty to serve kids with disabilities. Federal funds under the Individuals with Disabilities Education Act (IDEA) cannot be used to serve students with 504 plans. The regulations set forth through Section 504 of the Rehabilitation Act require identification, assessment, and the provision of appropriate educational services at each school (Section 504 of the Rehabilitation act of 1973). Yet, generality, ambiguity, and insufficiency of standards or training required to participate in the assessment team for 504 eligibility has led to the differential implementation and success of 504 plans from school to school, but also student to student. School and district-level implementation practices and educational impact evaluations from both quantitative and qualitative data from the National Center of Education Statistics (NCES), U.S. Department of Education's Office for Civil Rights, and varying State Education Departments are used in this paper to create a policy proposal that restructures how Section 504 operates in education. This policy proposal includes both federal and state funding requirements, an increase in proactive enforcement of 504 plans, a system to streamline education around 504 plans, as well as accountability measures to ensure consistency and accuracy of data at all levels: federal, state, district, school.

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RESEARCH SHOWCASE

EDUCATIONAL HEALTH SERVICES

MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

Educational Modules on Equitably Engaging Priority Populations in Clinical Pediatric Research

Historically, the field of medicine has taken advantage of certain communities for clinical discoveries that hardly benefit those studied communities. These groups of people can be identified as priority populations, or those who live in economically disadvantaged neighborhoods, those who experience environmental racism, and those who are profiled and underestimated (Rak, 2019). Clinical research has rarely focused on investigating health disparities among priority populations for the purpose of directly helping these disadvantaged communities.

Children and youth who live in urban or metropolitan areas are a priority population that must be further investigated. Conducting clinical research with this community is a necessary task that has not been implemented in DC. Physicians of the Children's National Hospital recognized this gap and asked the Anti-Racism Coalition (ARC) of the George Washington University School of Medicine and Health Sciences (GW SMHS) to teach healthcare professionals how to properly include children and youth in DC in clinical research.

Under the guidance of ARC member, Dr. Maranda Ward, a literature review was conducted to develop educational modules teaching healthcare professionals about the barriers in researching priority populations and methods to offset them. One particular method, Community Based Participatory Research (CBPR), was found to be a meaningful way to address health disparities and remove structural barriers to engage more disadvantaged communities. 21 CBPR-based articles were reviewed to develop 2 learning modules which count for 2 continuing medical education (CME) credits.

In the first module, barriers in researching priority populations were identified. To offer a methodology to address these barriers, a straightforward CBPR toolkit developed from previous, successful CBPR-based studies was presented. In the second module, recommendations on the implementation of CBPR were provided, as well as specific examples of implementing CBPR in a sustainable and effective manner for children and youth. The modules also consisted of built-in quizzes and videos which aimed to enhance provider learning.

The overarching objective of this project is to promote a collaborative and reciprocal relationship between researchers and priority populations. When research models like CBPR have been implemented in the past, health disparities decreased in disadvantaged communities. Future research will study the feedback and retention of the module content from providers of the GW medical community, including the National Children's hospital. These soon-to-be-published modules will mark a step in eradicating racial and ethnic oppression in clinical research and provide an avenue for empowering priority populations in DC.

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RESEARCH SHOWCASE

EDUCATIONAL HEALTH SERVICES

SCHOOL OF MEDICINE AND HEALTH SCIENCES

Clinico-Anatomical Correlation Method: Utilizing Free Software and Novel Multi Jet Fusion Technology to Create Stand-Alone, Fully Customizable, Colored and Labeled 3D Printed Educational Models

Purpose: While 3D Printing (3DP) has been around for decades, it remains somewhat elusive to anatomy educators and learners as an independent tool. This is in part due to factors such as cost, difficulty in design, and lack of model versatility and utility as developing standalone, colored and labeled models in most instances was not possible. Now, MultiJet Fusion (MJF) technology allows for such models to be created. These standalone models can be tailored to correlate seamlessly with radiologic studies for educational purposes. We hope to demonstrate that the use of complex standalone 3D printed models will allow learners to better conceptualize difficult anatomical structures and relationships as they pertain to important clinical contexts.

Methods/Materials: Blender was utilized via image texturing to create colored and labeled 3D models that were already either 3D reconstructed from cross-sectional imaging or graphically designed, both realistically and conceptually. Models were then printed using MJF technology. A set of clinical case series are shown to highlight the usefulness of the aforementioned custom-made 3D models. Clinico-anatomical correlation examples include Dorello's canal Schwannoma, nasopharyngeal carcinoma as a cause for unilateral mastoid effusion, metastatic lesion in Broca's area, cholesteatoma in the Prussak space, infarct in hand motor activation center in the precentral gyrus.

Results: We provide customized color and labeled 3D renderings of the liver segments and coronary arteries and prints of the brain surface, ventricles of the brain, and a detailed conceptual skull base model that demonstrate their uniqueness in highlighting clinical correlates as they pertain to radiology.

Conclusions: 3DP is a field of technology that continues to innovate, allowing us to develop new use case scenarios. From an educationstandpoint, models are now capable of featuring dynamic color, texture, clear labels, and do not require keys or additional information to learn from them. Our stand alone 3D models are useful learning tools for future and current trainees, especially with the addition of clinical correlates that demonstrate relevant pathology.

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SCHOOL OF ENGINEERING AND APPLIED SCIENCE

Effects of crosslinking density on the acoustic properties of hydrogel scaffolds

Hydrogels are popular materials for various biomedical applications due to their large water content which resembles that of biological tissues. Given the relevance of hydrogels in therapeutic applications, non-invasive characterization of hydrogels is highly desirable for in vivo monitoring. Whereas traditional testing methods are destructive, ultrasound is a safe and readily available tool that could be used for non-invasive characterization. In the present study, gelatin methacrylate (GelMA) hydrogel scaffolds were produced with a range of crosslinking densities by varying both GelMA concentration and ultraviolet light curing time. These scaffolds were evaluated using pulse-echo ultrasound techniques, resulting in measurements for the speed of sound, acoustic impedance, and attenuation coefficient of each hydrogel. Compression testing was also performed. The stiffness of the hydrogels was found to increase with GelMA concentration and ultraviolet light curing time. The impact of stiffness and preparation parameters on the acoustic properties of the hydrogels will be discussed. Further knowledge on the effect of crosslinking density on acoustic properties will inform the use of acoustic techniques in characterizing hydrogels.

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ENGINEERING

SCHOOL OF ENGINEERING AND APPLIED SCIENCE

3D Bioprinting of Flexible Blood Vessels with Biomimetic Multilayers

There has been a growing demand to develop tissue-engineered small-diameter (< 6 mm) vascular grafts for clinical applications due to the limitation of vascular autografts and commercially available artificial grafts. During the past decade, 3D printing has gained enormous attention for generating artificial tissue due to its capability in replicating the complexity and biomimicry of native tissues. Currently, biocompatible polylactic acid (PLA) or polycaprolactone (PCL) has been used to fabricate vascular scaffolds via fused deposition modeling (FDM) based printers. The resulted scaffolds can provide an acceptable degree of mechanical strength to endure high blood pressure. However, they lack the flexibility to regulate blood flow for the vessel's dilation and constriction, and do not have ideal porosity to provide nutrition exchange and oxygen diffusion for the neighbor tissues. Therefore, it still remains very challenging to create an artificial small-diameter blood vessel graft that can fully resemble the native mechanical properties, including elasticity, flexibility, and bio-functionality, for tolerating blood pressures, controlling blood flow, maintaining the vessel wall permeability barrier, and regulating coagulation. In the present study, we 3D printed novel small-diameter vessel grafts with a rubber-like elastomer, in which a biomimetic multilayer blood vessel construct was successfully created in the presence of human-induced pluripotent stem cells (iPSCs) to overcome the aforementioned limitations. The fabricated vessels demonstrated high accuracy and reproducibility by varying size and length. The results of tensile modulus exhibited our printed vessel grafts had superior flexibility compared to a PLA control, and the value was similar to the native vessel. Within the printed elastic tubular grafts, iPSC-derived endothelial cells (iECs) and iPSC-derived smooth muscle cells (iSMCs) were incorporated into fibrin gels to form endothelium and smooth muscle layers. Cell staining and CCK-8 testing results indicated desired viability and proliferation rates of iECs and iSMCs in our printed vessel grafts. Overall, this study provides a new and effortless approach to fabricate novel small-diameter blood vessel grafts with proper flexibility and biomimicry, which holds great potential for clinical transplantation.

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SCHOOL OF ENGINEERING AND APPLIED SCIENCE

Frameworks for Improving our Ability to Measure, Understand, and Communicate System Architecture Properties

In the systems engineering field, there are a growing number of systems that are called the "most complex" or the "most modular." These quantitative assessments are supposed to help designers and engineers make the best decisions during the design process but being able to generate these estimates of system architecture properties require the process that is used to be reliable and objective. This process involves alternative identification, system representation, and measurement which leads to decision-making. Through a series of studies on variation in how we use the measurement pipeline, we have identified that there are substantial impacts on the assessments and decisions made based on choices made throughout the process in representation and measurement. These disagreements are further exacerbated by a high degree of divergence within the field about how to measure and manage system architecture properties like complexity and modularity. This work focuses on addressing the different reasons for the divergence within the literature and improving the quality of management and research into system architecture properties. First, we researched how system architecture representation within a graph-based method (Design Structure Matrix) affected the measurement of complexity and modularity. We varied the level of detail by varying the disciplinary scope and inclusion of single-function components and discovered that there were substantial and often statistically significant effects as these choices were made. Secondly, we developed a benchmarking approach to assess how well complexity measures within the systems engineering literature captured the commonly held beliefs about complexity. We applied six representative measures of the 68 discovered to synthetic system architectures designed to induce complexity change. We found that none of the representative measures used captured all three aspects of the complexity phenomena simultaneously (size, interconnectedness and structuring change) and that there were inconsistent effects as representation changed. Finally, we developed a large set of engineering design representations from a field experiment to help improve testing and building of future theory. This work was informed by previous research work in representation making and used data from an open innovation field experiment with variation in functionality. This data also includes useful information about demographics and features a high degree of replication for shared challenges and enables study into the effects of decomposition. Together, these three research thrusts contribute to a focusing and better definition of the system architecture measurement process that can bring about better measurement, better theorizing, and better management of these phenomena.

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ENGINEERING

SCHOOL OF ENGINEERING AND APPLIED SCIENCE

Undercutting Transit? Exploring potential competition between autonomous vehicles and public transportation in the U.S.

Autonomous vehicles (AVs) have the potential to dramatically disrupt current transportation patterns and practices. One particular area of concern is AVs' impacts on public transit systems. If vehicle automation enables significant price decreases for ride-hailing services, some fear that it could undercut public transit, which could have important implications for the environment and transportation equity. Ultimately, the extent to which individuals adopt automated transportation modes will drive future system-level changes. Research on public preferences for AVs is both immature and inconclusive, especially with regard to competition with transit. Prior U.S. studies on public preferences for AVs have either framed questions in terms of only one transportation mode—complicating comparisons of preferences between modes—or neglected transit as an option entirely. In this study, we design and field a choice-based conjoint survey in the Washington, DC Metropolitan Region to explore potential mode shifts. Rather than gauge preferences for different modes in isolation, conjoint surveys instead allow us to simulate the menu of transportation options available to an individual, typified by the experience of looking up directions via GoogleMaps or via a transportation planning app.

We center our research on two primary questions:

1. What are individuals' preferences for automated (ride-hailing, shared ride-hailing, bus) and non-automated (ride-hailing, shared ride-hailing, bus, rail) modes?

2. How might automated ride-hailing services compete with public transit modes?

We find that fears of a mass transition away from transit to AVs may yet be unrealized, at least in the short term. If automation does bring cost savings, we may see some competition with transit. Respondents primarily preferred automated modes only when those modes had a vehicle attendant onboard, limiting the potential cost savings that AV operators might be able to offer. Additionally, scenario analysis revealed that for trips where good transit options are available, transit remained competitive with automated ride-hailing modes.

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RESEARCH SHOWCASE

ENGINEERING

SCHOOL OF ENGINEERING AND APPLIED SCIENCE

Data Analysis on Religion and Mental Health among NFL Athletes

In recent years, the NFL has begun to focus on mental health in their players. Past literature has established that difficulty with life course transitions can lead to worsened physical, emotional, and behavioral health. This difficulty is especially prevalent among former NFL players, who are transitioning out of a greedy institution and whose lives are constantly being reported on by media outlets and of interest to the general public. One aspect of NFL athletes lives that has not been given much attention is religiosity, even though NFL athletes tend to be more religious than men in the general population and specifically evangelical. This study centers around conducting regression analyses on survey data from the NFL Player Care Foundation Study of Retired NFL Players solicited by the University of Michigan Institute for Social Research. Preliminary findings show that being evangelical has a negative impact on self-rated mental health for white men but not black men. More research is needed on factors that are associated with mental health outcomes among professional athletes.

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RESEARCH SHOWCASE

ENGINEERING

SCHOOL OF ENGINEERING AND APPLIED SCIENCE

Causal Inference Methods for Social Media Research on COVID-19

Social media platforms are popular for COVID-19 research, in part because they offer access to massive amounts of data that would be impractical to collect via traditional methods. Having access to these data allows us to observe what people are saying, how they feel, and speculate on the reasons why they may be hesitant to vaccinate. Unfortunately, it is hard to use these data for exploring causal relationships. On the other hand, survey-based experiments improve our ability to infer causal relationships, but findings may not generalize to real-world settings. The following poster describes two inference methods that improve our ability to make generalizable, causal claims: 1) an interrupted time series analysis to evaluate the effect of automated warnings on reducing anti-vaccine content in a public subreddit, and 2) a field experiment to evaluate the effect of discussing vaccines on reducing vaccine hesitancy within private Facebook groups. Understanding these inference methods can help fellow researchers move beyond correlation analysis, ultimately, improving our understanding of the causal mechanisms that underlie the behaviors we observe on social media.

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SCHOOL OF ENGINEERING AND APPLIED SCIENCE

Improving Credit Card Fraud Detection using Variational Autoencoders & Deep Neural Network

In recent years, the use of credit cards has increased significantly due to digitization and the emergence of cashless transactions. Fraud also has increased drastically, resulting in a huge loss for the financial sector. As a result, credit card fraud detection is becoming increasingly important to financial institutions. For detecting credit card frauds, this paper proposes Variational Autoencoder with Deep Neural Network (VADNN). The proposed method first uses an autoencoder to extract features of low dimensionality from credit card transaction data that has high dimensionality, and then it uses a neural network to classify the data as fraudulent or normal.

The dataset contains large number of credit card transactions of European cardholders; it is highly imbalanced since its normal transactions far outnumber fraudulent transactions. Data resampling schemes like the synthetic minority oversampling technique (SMOTE), adaptive synthetic (ADASYN) are applied to the dataset to balance the numbers of normal and fraudulent transactions but it could bring in noise. To address the noise problem, this paper proposes a variational autoencoder algorithm that not only oversamples minority classes through misclassification, but also denoises and classifies the sampled dataset.

In this research, used Tensorflow library from Google to implement Autoencoder. In the end, precision, recall, and accuracy are calculated based on the confusion matrix. As compared to existing models in the industry, our model outperformed them.

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RESEARCH SHOWCASE

ENGINEERING

SCHOOL OF ENGINEERING AND APPLIED SCIENCE

Evolution of lateral stress in Direct Simple Shear tests

Direct simple shear (DSS) test is a commonly used experiment to investigate the stress-strain-strength response of soils in cyclic loading conditions. In this test, vertical and shear stresses are monitored, however, the evolution of horizontal stress during the test is unknown. The lateral strain of the soil is constrained due to significant stiffness of the rings confining the soil specimen. A key outcome of this constraint is the rotation of principal stresses directions with shearing, which can have a profound impact on the measured response of the soil. This study applies and evaluates an integrated experimental and computational approach for the evaluation of horizontal stresses that develop in DSS tests. The experimental approach uses high-resolution fiber optic sensors embedded in 3D printed confining rings. For this purpose, a stack of confining rings made of acrylonitrile butadiene styrene (ABS) material was 3D printed and a fiber optic sensing cable was embedded in the central ring. The fiber optic sensing cable allows for the measurement of circumferential strains that develop in the central ring during DSS tests. The elastic properties of ABS material were determined from a series of tensile tests conducted on ABS specimens. The derived elastic properties were then used in finite element analysis of the 3D printed confining ring to compute analytical circumferential strains. In the finite element analysis, the soil-ring contact stresses are represented by a Fourier series, and coefficients of the Fourier series are determined by minimizing the differences between the measured and analytical circumferential strains. The computed coefficients provide the distribution of horizontal stresses that develop during DSS tests. This integrated experimental-computational approach was applied in the evaluation of monotonic and cyclic DSS tests on Ottawa F-65 sand. The evolutions of horizontal to vertical stress ratio and Poisson's ratio were determined during soil loading and unloading under incrementally increasing/decreasing vertical stress. Moreover, the evolution of horizontal to vertical stress ratio and rotation of principal stresses were evaluated during monotonic and cyclic shearing of the soil. The results were also used to evaluate the accuracy of the predicted rotation of principal stresses using advanced constitutive models for cohesionless soils.

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ENGINEERING

SCHOOL OF ENGINEERING AND APPLIED SCIENCE

Virtual Reality in the Semiconductor Industry

Virtual reality (VR) technology is beginning to make its way from sci-fi movies to everyday life. While typically marketed towards recreational use, this technology has many commercial uses as well. For example, organizations such as the United States Army, the electrical power industry, the automotive industry, and many others are uncovering its commercial capabilities. One industry that has yet to unlock this technology's potential is the semiconductor industry, which is currently experiencing a supply side shortage. To address this issue, research and development has been conducted to create an VR experience that could benefit academic, private, and government facilities within this industry. So far, the team has created a VR training simulator, where the player navigates and conducts experiments in the George Washington Nanofabrication and Imaging Center (GWNIC). In this VR environment, the player experiences a complete "process flow", by taking a silicon wafer and using the many tools and chemicals within the GWNIC to fabricate a device. Multiple tools within the GWNIC, along with its exact floorplan and layout, have been modeled, animated, and programmed by the team using the animation software Blender, and the Unity video game engine. The goal of this simulation is to give students or employees the chance to complete their training in a VR environment, posing no risk to themselves or others while using harmful chemicals, or damage to the multimillion dollar machines they are learning to use.

This technology can also be used for positive community outreach, allowing those who would not typically have access to these kinds of facilities the chance to experience the excitement this industry brings. The VR experience can be brought to high schools across the nation, giving all students access regardless of their background. With the semiconductor industry struggling to meet global demand, this technology can help facilities train their users, protect their tools, and inspire the next generation of engineers and researchers.

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RESEARCH SHOWCASE

ENGINEERING

SCHOOL OF ENGINEERING AND APPLIED SCIENCE

Electrical Pulse Driven Multi-Level Nonvolatile Photonic Memories Using Broadband Transparent Phase Change Materials

Photonic computing is one of the main answers to the novel and exponentially increasing data processing for artificial intelligence and machine learning. While the benefits given by the intrinsic electromagnetic nature of the optical signals as an energy-efficient way to transmit information are clear, those can potentially be hindered by the opto-electrical and electrooptical transductions, as well as by the repeated access to digital and nonvolatile memory. For photonic computing, photonic memories are one of the most important and yet difficult to realize essential devices compatible with Photonic Integrate Circuits (PICs). In this project, we develop and demonstrate a non-volatile photonic memory based on the phase-change material GSSe (GeSbSe). We chose Ge2Sb2Se5 since it presents a broadband transparent region for telecommunication wavelengths while in its amorphous state. In fact, amorphous state GSSe is characterized by a remarkably low absorption coefficient (〖2.0x10〗 ^(-4)) at 1550 nm wavelengths, enabling near-lossless devices monolithically co-integrated with PICs. This low absorption coefficient is 3 orders of magnitude lower than regularly employed GST at the same wavelength. Meanwhile, when in its crystalline state, the absorption coefficient increases to 0.14, which results in a 700-times high absorption contrast between the two states. Based on GSSE's unique optical property, we developed our multi-state PCM memory. Remarkably, we demonstrated that the optical absorption in the amorphous state is vanishingly small and close to zero when heterogeneously integrated into silicon photonics of 60-□m-long lengths. Moreover, the relatively low variation of the absorption coefficient changes in each state makes it a promising material for very stable high order multistate devices, avoiding the utilization of high input laser power and extremely low noise equivalent power detectors. Assuming a continuous film, for the fundamental TM mode of the waveguide, the phase transition produces a variation of the effective absorption coefficient ∆j equal to 0.015, which corresponds to 0.21 dB/ µm.

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RESEARCH SHOWCASE

ENGINEERING

SCHOOL OF ENGINEERING AND APPLIED SCIENCE

Tridental Resource Assignment Algorithm for Spectrally-Spatially Flexible Optical Networks

The staggering increase in bandwidth demands due to Internet-of-Things, 5G and 6G communications, cloud-based services, data center networks, and game streaming can be fulfilled by spectrally-spatially flexible optical networks (SS-FONs). Space division multiplexing (SDM) technology, along with elastic optical networking (EON), has allowed parallel transmission of optical signals through multicore fibers (MCF) with distance-adaptive multicarrier transmission. The quality of transmission of signals transmitted through MCF degrades due to the intercore crosstalk (XT) between weakly coupled cores. An important resource assignment problem in SS-FONs is the routing, modulation, core, and spectrum assignment (RMCSA) problem for dynamically arriving lightpath requests.

Recent advances in SS-FONs have enhanced service provisioning by leveraging elastic optical transmission with a fine-grained and flexible frequency grid, multiple spatial modes (fiber cores), and a variety of advanced modulation formats (MFs) to increase the capacity of optical fiber. An important lightpath resource assignment problem in SS-FONs is the RMCSA problem. XT between connections on different cores degrades the quality of transmission, and the RMCSA algorithm must ensure that XT constraints are met while maximizing performance. In this paper, we propose an RMCSA algorithm called Tridental Resource Assignment algorithm (TRA), as it balances network capacity, spectrum utilization and spectrum fragmentation that affect network performance. Our resource assignment approach includes both an offline/static network planning component and an online/dynamic provisioning component. In the former, MFs and spectrum utilization are used to compute path priorities for a lightpath. The dynamic provisioning component then allocates the resources on a selected path using TRA. Extensive simulation experiments performed in realistic network scenarios indicate that TRA significantly reduces the bandwidth blocking probability (BBP) in a variety of scenarios by maintaining a good balance between spectrum utilization and XT.

In this work, we propose an efficient RMCSA algorithm called as TRA. The word Tridental refers to the fact that the algorithm considers three factors of spectrum assignment that affect performance. TRA includes both an offline/static component and an online/ dynamic component. The offline component involves the use of a mixed integer linear program (MILP) to obtain path priorities for a lightpath's route. The online component selects the path, core, MF, and spectrum for the arriving lightpath in an efficient manner. The work focuses on solving the problem of optimal resource utilization in optical networks which enhances the network connectivity desired for internet, 5G and 6G communications.

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ENGINEERING

SCHOOL OF ENGINEERING AND APPLIED SCIENCE

Comparing Consumer Preferences for Electric Vehicle Financial Incentives

Plug-in electric vehicles (PEVs) are an important pathway for decarbonizing the transportation sector, yet sales in the U.S. are still relatively low. Financial incentives, such as subsidies, have been shown to have a measurable effect on increasing PEV adoption, but how these incentives are designed can impact their effectiveness as well as how equitably they are distributed. For instance, with today's federal PEV tax credit households with higher incomes and fewer children qualify for a greater portion of the full federal tax credit. Using conjoint surveys (N = 2,508 respondents), we quantify how U.S. vehicle buyers value different features of PEV financial incentives, including the incentive type, timing, and source, to identify incentive designs that are both more valuable to consumers and more equitable in how they are distributed.

In general, we find that both the incentive type (tax credit, tax deduction, sales tax exemption, or direct rebate) and timing (at the point of sale or some period after purchase) significantly impacted its value while the source (government, dealer, or OEM) had little to no impact. We find that car buyers overwhelmingly prefer immediate rebates, on average valuing them by $560, $1,440, and $2,670 more than sales tax exemptions, tax credits, or tax deductions, respectively. These effects are significantly larger for lower-income households, used vehicle buyers, and buyers with lower budgets. We estimate that on average $1.8 billion could have been saved if the federal subsidy available between 2011 and 2019 were delivered as an immediate rebate instead of a tax credit, or $1,250 per PEV sold. Our results suggest that structuring incentives as immediate rebates at the point of sale would deliver a greater value to customers and would be more equitably distributed compared to the current tax credit scheme. Also, implementing a direct rebate for both new and used PEVs could be an effective strategy to encourage a more equitable adoption of PEVs. And finally, our results also support expanding PEV education as current knowledge is lacking. Combining an education and awareness campaign along with changes to incentive policy that aligns with consumer preferences could result in a more effective and equitable incentive by a larger and more diverse population than today's tax credit.

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SCHOOL OF ENGINEERING AND APPLIED SCIENCE

A low-cost, IoT-based Data Acquisition and Instrument Control System for Tissue Engineering and Environmental Diagnostic Applications

A low-cost, wireless data acquisition (DAQ) and instrument control platform is being designed to facilitate measurements and data acquisition in isolated environments with high costs of access. Such a data acquisition system can be placed in incubators used for tissue engineering applications and environmental monitoring of refrigeration and air conditioning systems in server farms and high-performance computing platforms. The above applications are often isolated to maintain sterility or extensive cooling requirements. DAQ systems with wireless capability will allow for instrument control and data transmission eliminating the need for cabled connections for access to sterile or harsh environments.

The objective of this study is to develop a low-cost, wireless DAQ system that incorporates a single-board computer (such as the Raspberry Pi) and implement an internet-of-things (IoT) framework that can be scaled with multiple sensors. This system has the following two potential applications: (i) Pump and sensor control in a temperature and humidity-controlled incubator for cell culture studies and (ii) Remote data acquisition and system diagnostics in refrigeration and air conditioning units. The system will incorporate a Raspberry Pi (Model: 3 B+ or 4) that is controlled by a Python script on an external computer. To allow for remote data storage functionality, we will initially use standard Wi-Fi connectivity settings. This will be expanded to SSH connectivity to a dedicated server instead of connecting to a shared network. We will also employ a data processing API (Google Sheets for smaller data sets, Stata or Pandas for larger data volumes).

For cell-culture applications in incubators, our system incorporates a dosing pump (Model: EZO-PMP, Atlas Scientific) capable of delivering very small dosages (in the micro-liters per minute range) of cell media by varying parameters such as flow rate, pump frequency, and total volume dispensed. These parameters will be customizable to the requirements of cell inoculated scaffolds and culturing protocols. Concurrently, real-time data will be acquired from pH, conductivity, and temperature measurement sensors. For environmental diagnostic applications, barometric pressures and temperatures will be monitored using the same system with appropriate sensors. Data transfer is going to be achieved through UART, SPI, and I2C protocols that allow both reading and writing functionality from sensors and instrumentation.

The ultimate goal of this system is to allow remote monitoring and instrumentation control in tissue engineering and environmental diagnostics for user-defined durations and sampling rates coupled with real-time data acquisition and storage.

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ENGINEERING

SCHOOL OF ENGINEERING AND APPLIED SCIENCE

Dine in or Take out? Trends on Restaurant Service Demand amid the COVID-19 Pandemic

The outbreak of the COVID-19 pandemic has caused unprecedented damage to restaurant businesses, especially for indoor dining services, due to the widespread fear of coronavirus exposure. In contrast, the online food ordering and delivery services, led by DoorDash, Grubhub, and Uber Eats, filled in the vacancy and achieved explosive growth. The restaurant industry is experiencing a dramatic transformation under the crossfire of these two driving forces. However, we are not fully exposed to those changes due to the lack of first-hand data, let alone the potential consequences and implications. To address such needs, this study applies foot traffic data from the Washington metropolitan area to understand the evolving trends of restaurant service demand through the pandemic. We first analyze the aggregate foot traffic volumes to reveal the disruptions to restaurant services across the different stages of the pandemic. A probabilistic learning model is then proposed to decompose the aggregate foot traffic by service modes into those for dine-in and takeout, respectively. The transitions in demand structures are identified for restaurants of various service types, price levels, and locations. In general, our results evidence that the overall restaurant demand still drifted around half of the pre-pandemic level, far from a complete recovery, one year after the mandatory lockdown was ended. But limited-service and budget restaurants, given their comparative advantages in takeout channels, saw a significantly more speedy recovery than full-service counterparts. Meanwhile, restaurants in exurban areas top the race in recovery followed by those in suburban and urban areas.

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SCHOOL OF ENGINEERING AND APPLIED SCIENCE

Interactions between viscous drops in a viscoelastic matrix in shear

Shear-induced pair-interactions between viscous drops suspended in a viscoelastic matrix are numerically investigated examining the effects of elasticity and drop deformability on their post-collision trajectory. Two different trajectory types are identified depending on the Weissenberg number *Wi* and capillary number *Ca*. Drops suspended in a Newtonian matrix (*Wi*=0.0) show a passing trajectory where drops slide past each other and separate in the stream-wise direction. However, increasing the Weissenberg number above a critical value, a tumbling/doublet trajectory is observed where two drops rotate around the midpoint of the line joining their centers, as was also seen previously for rigid particles. The tumbling trajectory is explained by investigating the flow around a single drop in shear. Elasticity generates a larger region of spiraling streamlines around a drop which during a pair interaction traps the second drop giving rise to the tumbling pair. Decreasing deformability (lower *Ca*) and increasing viscoelasticity (higher *Wi*) favor a tumbling trajectory. With simulations sweeping the parameter space, we obtain a phase plot of the two different trajectories as functions of *Ca* and *Wi*. Treating the tension along the curved streamlines due to the non-zero first normal stress difference in the viscoelastic medium as an enhancement to the interfacial tension, we have developed an approximate force balance model for the zone of spiraling streamlines. It qualitatively captures the observed scaling of the critical *Ca* and *Wi* values at the phase boundary.

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RESEARCH SHOWCASE

ENGINEERING

SCHOOL OF ENGINEERING AND APPLIED SCIENCE

Towards a Better Understanding of Solving Complex Problems Through Innovation Contests

Problem-solving, which is core to an organization's success, is undergoing an important shift. More and more, public and private technical organizations are shifting away from solely internal, expert-driven processes. Instead, these solution-seekers use crowdsourcing mechanisms---like innovation contests---to look for innovative outsiders and their expertise. However, our understanding of how these mechanisms work and how to use them largely rests on studies of consumer products or conceptual designs. The dynamics and outcomes of these simpler contexts differ from those of the complex systems we face in engineering. As such, we do not know whether or how the existing theory on crowdsourcing applies to problems faced by technical organizations.

My work addresses this gap by exploring crowdsourcing in engineered systems and building new theory where none exists. Here, I draw on two multiyear fieldworks in NASA's crowdsourcing ecosystem: the Asteroid Grand Challenge and the Centennial Challenges Program. Using these rich data, I make four contributions across four essays, all expanding on existing theory on crowdsourcing. First, I create a framework of the benefits of complex innovation contests: organizations benefit from access to technology and an expanded network, both from participants and industry advisors. Second, I show that a problem-solver's technological trajectory is related to their success in an innovation contest: teams interested in pursuing opportunities in the organization's industry were more likely to win. Third, I describe how problem formulation is a shared task between the problem-solver and the solution-seeker: the former can reformulate the latter's problem to introduce their expertise, resulting in useful solutions. Lastly, I describe how the solution-seeker formulates a complex problem for outsider input: I show how their choices to shape the problem-solvers' solution space are guided by uncertainties about the technology and the problem-solvers's capabilities.

These insights are timely and needed. Increasingly, organizations rely on crowdsourcing activities to help tackle their complex problems. Without these insights and the practical levers they spell out, future endeavors are at risk of under-leveraging the crowd at best or wasting efforts at worst.

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ENGINEERING

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The Nano- and Micro-Structures formed due to Laser Processing Bi_2Te_3, SiGe, and CoSi

Thermoelectric materials provide solid-state energy conversion using the Seebeck or Peltier effect to generate power or pump heat, respectively. A thermoelectric device consists of n- and p-type thermoelectric materials, known as legs, connected thermally in parallel and electrically in series. A favorable thermoelectric material has a low thermal conductivity, a high electrical conductivity, and a large Seebeck coefficient. Researchers have improved the transport properties of thermoelectric materials by influencing the nano- and micro-structures through various manufacturing methods, such as melt spinning or spark plasma sintering. However, these manufacturing methods are labor-intensive, waste material, and create rectangular ingots which severely limit thermoelectric device geometry. Recent advancements in additive manufacturing show that additive methods may provide nano- and micro-structures that can influence the material properties, reduce material waste, and provide freeform geometries. Recently we explored laser powder bed fusion, an additive manufacturing technique, on bismuth telluride, silicon germanium, and cobalt silicide by performing single-melt lines. Single-melt lines with a laser on a powder pellet triggered rapid melting and solidification of the material, resulting in porosity, phase segregation, and columnar grain structure in the material. We characterized the structure of the single-melt lines via optical microscopy, energy dispersive spectroscopy, and transmission electron microscopy. The resulting geometry of the melt region informs the process parameter space for laser powder bed fusion. The composition of the melt pool indicates the presence of oxidation within the samples, which may affect transport properties when a bulk part is fabricated. Nanoscale features from laser processing show the potential for laser processing to influence phonon transport within the material. The results provide insight into the process-structure-property relationship of thermoelectric materials processed via laser powder bed fusion.

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SCHOOL OF ENGINEERING AND APPLIED SCIENCE

Streaming Gradient Tracking using Non-negative Matrix Factorization

Hardware-based neural networks promise complexity reductions in the vector-matrix multiplications at the core of deep neural networks, but their large spatial complexity persists. This spatial complexity, together with the limited graph topology and noisy device physics of many hardware-based systems, make efficient weight updates challenging. Prior research shows that compressing network gradients using streaming decomposition algorithms can offer a significant reduction in memory and compute overheads, but the method most suitable for parallel hardware updates remains to be determined. Non-negative matrix factorization (NMF) - a class of algorithms offering sign-separated decompositions - can minimize oscillatory updates in noisy weights, potentially leading to improved training performance over other decomposition methods. The present work explores different NMF-based matrix compression algorithms and their applicability in producing a streaming, low-rank approximation of backpropagated neural network gradients for hardware-based systems.

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SCHOOL OF ENGINEERING AND APPLIED SCIENCE

Blood Flow Induced Onset of Cardiovascular Diseases – The Effect of Entrance Flow Development on Wall Shear Stress in a Carotid Artery Bifurcation Model

Cardiovascular diseases are a major health problem of today's society. Many cardiovascular diseases are caused by the long-term exposure of vascular endothelial cells to pathological blood flow. Flow over, and the associated shear stress acting on the endothelial cells is always present and physiologically necessary. Nevertheless, alterations in magnitude, and spatial and temporal variation of shear stress, can lead to a pathological response resulting in diseases such as atherosclerosis. Atherosclerosis primarily affects large and medium sized blood vessels that have complex geometry, such as bifurcations, and is manifested by the local deposit of cholesterol and lipids (plaques) on the arterial wall. Most investigations of cell responses to blood-flow-induced shear stress are conducted under steady uniform inflow, i.e. at constant velocity across the vessel. In contrast, many fluid dynamics studies of the flow fields are conducted with a fully-developed, pulsatile inflow. Many state-of-the-art studies link numerically-determined wall shear stresses to cell responses, while neglecting this important difference in inflow conditions.

The impact of the entrance flow development on the spatial wall shear stress distribution is studied using computational fluid dynamics (CFD). The investigated human carotid artery bifurcation vessel geometry has rigid walls where a no-slip wall boundary condition is applied. Flow rates reach a peak systolic Reynolds number (Re) of 1600, while the average Re is 300. ANSYS® FLUENT was used to solve the Navier-Stokes equations employing a finite volume method using a pressure-based solver under (1) steady and (2) physiological pulsatile laminar flow conditions. Both uniform and fully developed inlet profiles are studied for each case. The flow field within the vessel was significantly dependent on the applied inflow. Under steady flow, the velocity magnitude varies up to a relative difference of over ±15% between uniform and fully-developed inflow for Re=300, and over ±25% Re=1300. The relative difference in wall shear stress between uniform and fully-developed inflow is over 10% for a Re=300. This difference was further shown to be doubled, when doubling the Reynolds number. The relative difference in wall shear stresses is most significant around the bifurcation, being most distinct at the internal carotid artery sinus wall. This sinus area was further found to experience lower than normal absolute wall shear stresses, making it particularly prone to atherosclerotic plaque formation.

This numerical investigation reveals a significant influence on wall shear stresses of entrance flow development, having the highest impact at low stress, atherosclerosis-prone regions.

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RESEARCH SHOWCASE

ENVIRONMENTAL AND OCCUPATIONAL HEALTH

DUAL PA/MPH PROGRAM

Association Between Perceived Neighborhood Crime and Physical Activity: A Systematic Review on Adults Living in Urban Environments

Background: Physical activity (PA) is an important determinant of long-term health outcomes. Characteristics of the built environment (e.g., green spaces, street connectivity, residential density, transportation systems, etc.) have been widely recognized as being associated with higher levels of PA. However, it is important to consider how the broken windows theory in relation to crime, as part of the built environment, and/or perception of crime has an impact on PA.

Objectives:This systematic review explores the hypothesis that high perceived neighborhood crime among adults (18-65) is associated with low levels of physical activity in urban environments.

Methods: The Navigation Guide Framework was adopted to conduct literature reviews in PubMed, PsycInfo, ProQuest Criminology Collection, and ProQuest Environmental Science. After applying inclusion (e.g., studies within the last 15 years, adults (18-65), self-reported exposure measurements, etc.) and exclusion (e.g., children, rural environments, obesity as a measure of PA, etc.) criteria, 24 studies were fully reviewed. 11 final studies were included in this systematic review, where methodological quality and strength of the evidence was further determined.

Results: The majority (72.7%) of the studies found a negative association between perceived neighborhood crime and physical activity. High perception of safety from crime was related to more engagement of moderate and/or vigorous PA. Multiple studies found women to be a high-risk group of this relationship, reporting higher perceived insecurity from crime compared to men.

Discussion: Further studies that use more objective measurements of crime and physical activity can help strengthen the evidence of this relationship between the presence and perception of neighborhood crime and PA. Strengthening this evidence can better contribute to the effectiveness of land use planning to make PA more accessible for various populations. Implementing physical changes for a safer built environment through land use planning can decrease perception of crime and ultimately lead to higher levels of PA.

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RESEARCH SHOWCASE

ENVIRONMENTAL AND OCCUPATIONAL HEALTH

MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

A Review of Opioid Related Deaths Among Injured Workers in the US

Background: In the US, Drug overdose deaths have increased 28.5% from April 2020 - April 2021, and have reached > 100,000 deaths annually. Additionally and prior to COVID related decreases, it was estimated that 156 per 10,000 full-time equivalent workers would sustain a work-related injury in a given year.

Objective: The objective of the systematic review was to understand how workplace injuries may result in an increased risk of opioid related death (OROD) among workers in the United States.

Methods: Following the Navigation Guide Framework, literature searches were conducted in SCOPUS, PubMed, and PsychINFO seeking original studies investigating workplace injuries and opioid related death, whether by suicide or death by overdose. Of the 306 studies were screened for title and abstract, 20 were selected for a full-text review and five studies met the inclusion criteria. The final set was evaluated for risk of bias in each individual study, as well as the quality and strength of evidence.

Results: Five studies met the initial inclusion criteria; however one was excluded following the evaluation. The final set of four studies received ratings ranging from "Low" to "High". Each of the risk rating criteria were attributed to an aspect of an included study which is representative of the range of study designs included. The body of evidence was rated "Moderate" quality. Each of the cohort study designs (retrospective and semi-ecological, open cohort) found an association of workplace injury with an increased risk for OROD. The ecological study design found a high rate of workplace injury among a deceased cohort who died of OROD.

Conclusion: A final determination of "Limited Evidence of Toxicity" was given for the set of literature reviewed. However, the evidence of toxicity based on this body of literature can only be attributed to more severe workplace injuries, resulting in lost-time. Additional research is needed to make a stronger conclusion between workplace injury and OROD.

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RESEARCH SHOWCASE

ENVIRONMENTAL AND OCCUPATIONAL HEALTH

MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

Systematic Review of the Joint Toxicity of Microplastics and Pesticides on Freshwater Organisms

Background: As microplastics and environmental pollutants like pesticides continue to pose potential dangers to freshwater ecosystems, it is important to understand how they might influence one another's toxicity.

Objective: This systematic review examines how the toxicity of polyethylene/polystyrene microplastics is influenced by the presence or absence of organochlorine/organophosphate pesticides in freshwater fish/anurans, invertebrates, and algae.

Methods: Following the Navigation Guide framework, literature searches were conducted in Scopus, Web of Science, ProQuest, and Google Scholar. Of the 1365 articles found across the databases, eleven studies met the inclusion criteria and were assessed for strength of evidence and potential risk of bias.

Results: Nine of the eleven studies indicated strong evidence of the ecotoxicity of microplastics being modified by the presence of pesticides. While the primary outcome of interest (mortality) was not consistently affected, consistent and significant sub-lethal effects were seen across most of the body of evidence. All studies also demonstrated sound methodology and laboratory settings which controlled for any factors of concern.

Discussion: The topic of this review is still relatively understudied and should be further investigated and possibly expanded to examine this association in other species. Results of these studies collectively could have implications for a wide range of aquatic ecosystems and water quality overall.

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RESEARCH SHOWCASE

ENVIRONMENTAL AND OCCUPATIONAL HEALTH

MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

Racial and Ethnic Disparities in Cancer Risk Attributed to Vehicle Pollution in the United States: A Systematic Review

Background: Hazardous air pollutants (HAPs) emitted from on-road sources, including cars, trucks and buses have been associated with an increased risk of cancer. Research shows that certain communities experience greater exposures to HAPs, as many residents live in close proximity to roadway traffic due to persistent social, demographic and economic factors.

Objectives: This systematic review examines racial/ethnic differences in cancer risk attributable to exposures from on-road sources of HAPs. The study aim was to investigate the question, "Do hazardous air pollutants from vehicular exhaust disproportionally affect cancer risk for Hispanic and non-Hispanic Black Americans when compared to white non-Hispanic Americans?"

Methods: Using the Navigation Guide Systematic Review methodology, a literature search was conducted using PubMed, Scopus and ProQuest Environmental Science Collection databases. The search was limited to peer-reviewed and scholarly journals. Of the 214 unique studies, thirteen studies met the pre-specified inclusion criteria and were assessed for risk of bias, quality of evidence and strength of evidence.

Results: The majority of the studies found that Hispanic or non-Hispanic Black racial status was significantly statistically associated with greater on-road HAP cancer risk when compared to non-Hispanic whites. Many studies also found that cancer risk decreased as the proportion of white residents increased.

Discussion: These consistent findings have environmental justice implications, as there is a disproportionate risk of cancer for Hispanic and Black Americans attributed to HAPs exposure. This health disparity could be a result of spatially segregated housing patterns and practices, placing Hispanic and Black communities in close proximity to roadways and vehicle traffic.

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RESEARCH SHOWCASE

ENVIRONMENTAL AND OCCUPATIONAL HEALTH

MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

Occupational Health risks in the Diatomaceous Earth Industry

Background: Diatomaceous earth (DE) is a form of natural amorphous silica composed of the fossilized remains of diatoms. DE has a wide variety of industrial uses such as being a filler agent in toothpaste to being used as a non-toxic insecticide in agriculture. Natural amorphous silica alone is regarded to be inert however, occupations that extract amorphous silica are often co-exposed to crystalline silica via inhalation.

Objective: This systematic review uses the PECO framework to examine the association between occupational exposures in the diatomite industry and the risk of developing a chronic illness or loss of lung function.

Methods: Following the Navigation Guide Framework, I found 43 studies in PubMed using the search terms diatomaceous earth AND workers AND silica. A manual search looking at highly-referenced articles yielded 4 additional studies. Out of the 47 studies, 12 met the inclusion criteria and were systematically assessed for their quality of evidence and methodology.

Results: The majority of studies found that occupations working in the manufacture or mining of natural amorphous silica resulted in a higher risk of contracting a lung-related disease, as well as a slight decrease in pulmonary function. Length of exposure was also significantly associated with the risk of developing a lung-related illness. The quality of the included studies are high, however many authors are analyzing the same Californian cohort.

Discussion: Further studies should observe populations in the diatomaceous earth manufacturing industry outside of California to confirm results and minimize confounding of cohorts followed in Lompoc DE mines. New studies should analyze the effectiveness of protective measures that minimize crystalline silica exposure via inhalation in the DE industry.

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RESEARCH SHOWCASE

ENVIRONMENTAL AND OCCUPATIONAL HEALTH

MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

Associations Between Glyphosate and Glufosinate and Preterm Birth: A nuMoM2b Nested Case Control Study

Preterm birth (PTB) affects 1 in 10 pregnancies overall and 1 in 7 pregnancies among Black pregnant persons in the US. PTB is an important public health issue because it is associated with increased maternal and neonatal morbidity and mortality and its incidence has increased over recent years. Glyphosate is the main ingredient in Roundup®, a herbicide utilized in agricultural, commercial, and domestic applications. Recent improvements in biomarker analysis have demonstrated near-ubiquitous global exposures to glyphosate and its persistent environmental degradate, aminomethylphosphonic acid (AMPA). Less is known about exposures to the closely related herbicide glufosinate and its environmental degradate, 3-[hydroxy(methyl)phosphinoyl]propionic acid (MPPA). This study examined prenatal exposure to glyphosate, glufosinate, AMPA, and MPPA and odds of spontaneous PTB (sPTB), defined as spontaneous delivery prior to 37+0 weeks gestation, in a nested case–control study within the Midwestern study sites of the Nulliparous Pregnancy Outcomes Study: monitoring mothers-to-be (nuMoM2b) cohort study, which was conducted between October 2010-September 2013. Using gas chromatography tandem mass spectrometry, the herbicide biomarkers were measured in stored first trimester (between 6+0 and 13+6 weeks gestation) urine samples. Associations were estimated between biomarker concentrations and sPTB using multivariable logistic regression. Out of 106 pregnancies (51 cases and 55 controls), there were glyphosate detections in 71.8%, AMPA detections in 79.3%, glufosinate detections in 0.0%, and MPPA detections in 12.3% of samples. Geometric means (95% CI) were 0.187 (0.154, 0.228) µg/L for glyphosate, 0.245 (0.204, 0.293) µg/L for AMPA, and 0.087 (0.077, 0.098) µg/L for MPPA. There was a statistically significant association between sPTB and hydration corrected AMPA biomarker concentration (Adjusted Odds Ratio 1.95, 95% CI 1.07, 3.56). The associations between sPTB and hydration-corrected glyphosate concentration (AOR 1.06, 95%CI 0.74, 1.51) and MPPA concentration (AOR 0.92, 95%CI 0.75, 1.12) were not statistically significant. This study demonstrated a statistically significant association between sPTB and exposure to AMPA. Extensive use of glyphosate-based products over the past several decades has resulted in widespread population exposures that have been under-studied due to limited biomarker analysis. Recent developments have resulted in a number of studies implicating an association between glyphosate-based products and gestational impacts. This study contributes to the growing literature that exposure to glyphosate-based herbicides during pregnancy is associated with preterm birth. The existing studies, including this one, have been small and they signal the need for a more expansive approach to research on the health impacts of herbicide exposure.

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RESEARCH SHOWCASE

ENVIRONMENTAL AND OCCUPATIONAL HEALTH

MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

The Built Environment and Walkability a Comparison of Urban and Rural Areas: A Systematic Review

Background: According to the World Health Organization, physical inactivity is the fourth leading cause of death. Walking, for utilitarian or recreational purposes, is an effective and easy way to be physically active. The built environment can influence walking behaviors and therefore assist in improving the health of communities.

Objectives: This systematic review examines the association between the built environment and walking behaviors in urban and rural environments. The goal of this review is to determine what aspects of the built environment promote walking for either utilitarian or recreational purposes.

Methods: The Navigation Guide Framework was used to specify the study question, select the evidence, and rate the quality and strength of the evidence. After completing a literature search through several databases, six papers were selected that met the inclusion criteria.

Results: The six studies that were identified had similar results in attitudes and perceptions toward built environment characteristics that promoted walking behaviors in both urban and rural environments. All of the studies have a risk of recall bias due to the study design of the literature.

Discussion: It is recommended that further studies are required to confirm the association between the built environment and walkability. Future studies should aim to reduce bias, specifically, recall bias.

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RESEARCH SHOWCASE

ENVIRONMENTAL AND OCCUPATIONAL HEALTH

MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

Children's Post Traumatic Stress Disorder (PTSD) Following Hurricanes in the United States: A Systematic Review

Background: Natural disasters in the United States are becoming more common and more devastating. Hurricanes are consistently one of the most frequent and costly natural disasters in the United States. Natural disasters are defined as severe weather that can threaten human health and cause extensive damage to property and/or community infrastructure. These events can cause distress, post traumatic stress disorder (PTSD), anxiety, and general depression, of which children are the most vulnerable. PTSD is a psychological condition that occurs after experiencing or seeing a terrifying event and can include nightmares, severe anxiety, and flashbacks.

Objective:The purpose of this systematic review is to examine if there is a link between hurricanes and PTSD in children.

Methods: The Navigation Guide methodology was used to conduct a systematic review of the current literature surrounding the effects of hurricanes on children's PTSD in the United States. The literature was searched and evaluated for risk of bias, quality of evidence, and strength of evidence.

Results: The current literature indicates a probably high risk of bias, moderate quality of evidence, and ultimately has limited evidence that hurricanes increase the risk of PTSD in children in the United States. These studies have limitations due to the unpredictability of hurricanes, difficulty defining exposure, and changes in diagnostic criteria for PTSD over time.

Discussion: There were strong studies that were able to collect data before a hurricane, and compare it to data following the storm, and studies using these methods should be a model for future research. The current literature surrounding the effect of hurricanes on children's PTSD is limited, however it does indicate a trend toward an increase in PTSD following hurricanes. Some studies have shown a temporal relationship between when the hurricane happens and severe PTSD symptoms persisting for longer than those with moderate or low symptoms, but these rates slowly decrease with time. This is an important avenue of future research, and the association between hurricanes and children's mental health should be studied further to determine how to prevent children from experiencing distress and anxiety following these events.

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RESEARCH SHOWCASE

ENVIRONMENTAL AND OCCUPATIONAL HEALTH

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Airborne Hazards for Deployed Service Members and Their Association with Chronic Obstructive Pulmonary Disease (COPD): A Systematic Review

Background: Since September 11, 2001, U.S. and Allied forces have been in conflict and in combat in Southwest Asia, primarily in Iraq and Afghanistan. These deployments have introduced new airborne hazards to the troops stationed within these areas. These include but are not limited to sand, dust, diesel fuel, smoke, and exposure to open air burn pits. There is a growing source of literature linking these exposures to respiratory health issues including Chronic Obstructive Pulmonary Disease (COPD).

Objectives: A systematic review has been designed to look for the association between airborne hazards at combat locations within Southwest Asia, and COPD. This will answer the question; "Has exposure to airborne hazards found in combat zones within Southwest Asia been positively associated with Chronic Obstructive Pulmonary Disease among service members?"

Methods: An exhaustive search through SCOPUS and PUBMED was conducted for journal articles addressing this topic. The articles were looked at for risk of bias, quality and strength of the evidence, study design, and appropriate outcomes.

Discussion: A total of six articles met the inclusion criteria out of the original results. Upon review, the evidence does support the claim that combat deployments to Southwest Asia may increase the prevalence of COPD among service members.

Conclusion: The lack of personal exposure data is a limitation to all these studies, while some had access to environmental exposure data, it was limited to certain bases and even certain branches of service (Army and Air Force) and none of the information was gathered at the individual level. Future studies should incorporate personal dosimetry to gather appropriate data and not rely on base wide or self-reported data.

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RESEARCH SHOWCASE

ENVIRONMENTAL AND OCCUPATIONAL HEALTH

MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

Prenatal Exposure to Hydraulic Fracturing Wells in the Marcellus Shale Region, and Subsequent Birth Outcomes: A Systematic Review

Background: Unconventional gas production through the use of hydraulic fracturing (fracking) has changed the United States energy landscape over the past 20 years. Pennsylvania and the surrounding region contains the Marcellus Shale, which is 9,000 feet below the ground and is rich in natural gas. In 2005, the region increased from zero wells to 3,689 wells in 2013. Fracking has the potential to bring contaminated water, air, noise pollution, and increased traffic to communities with wells.

Objectives: The Navigation Guide was used to conduct a systematic review to answer the study question: "Does exposure to hydraulic fracturing wells in the Marcellus Shale region impact birth outcomes". Specifically, birthweight and gestational age were studied.

Methods: A set of search terms and exclusion criteria were applied to the PubMed, Scopus, and Google Scholar databases. Covidence was used to merge the search results and conduct a hand review of the abstract, titles, and eventually full text. Six articles were chosen to be included in the systematic review and make up the body of evidence. Each article underwent an assessment of the risk of bias and the quality of evidence. The body of evidence was then given an overall quality rating and a rating on the strength of the evidence presented, as to whether or not proximity to hydraulic fracturing activity had an impact on infant birth outcomes.

Discussion: The evidence suggests there is a positive correlation between prenatal exposure to fracking activity and poor infant birth outcomes. In the six studies included in the systematic review, there was a "probably low risk" of overall bias. Given the environmental and socio-economic factors that can be associated with hydraulic fracturing activity, there was some difficulty ruling out potential confounders. Additionally, the closeness of a mother's home to a fracking well or other activity played a large role in whether or not the positive correlation was seen, suggesting that the effect was only for the closest homes.

Conclusion: There is "limited evidence of toxicity" to support the claim that proximity to fracking activity in the Marcellus Shale region negatively impacts infant birth outcomes. More studies should be conducted with different birth cohorts and registry data to make a stronger claim of toxicity.

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RESEARCH SHOWCASE

ENVIRONMENTAL AND OCCUPATIONAL HEALTH

MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

Environmental Justice Implications of Unconventional Natural Gas Development: A Systematic Review of Disproportionate Health Outcomes in Non-White Individuals Exposed to Fracking

Background: The recent rapid rise of unconventional natural gas (UNG) development, otherwise known as hydraulic fracturing or fracking, has generated concern due its associated pollution burden and toll on public health. Several environmental exposures linked to adverse health outcomes have been documented in communities exposed to UNG developments, such as air pollution, noise pollution, accidents and injuries, ground and surface water contamination, and psychosocial stress. Recent population studies have focused on adverse health endpoints associated with UNG development such as birth outcomes, hospitalizations, heart attacks, and asthma, but have primarily not investigated the disproportionality of adverse health outcomes among non-white individuals exposed to fracking.

Objectives: This systematic review explores the environmental justice implications of UNG development to determine if it is associated with disproportionate adverse health outcomes in non-white individuals. Therefore, this study seeks to answer the question, when compared to white individuals, do non-white individuals who are exposed to unconventional natural gas development have an increased risk or burden of adverse health effects?

Methods: Using the Navigation Guide framework, literature searches were conducted in PubMed, SCOPUS, and ProQuest Environmental Science Collection which captured 2,970 original records for title and abstract screening.

Results: The 159 studies identified for full text review have preliminary indications of positive associations of disproportionate adverse health outcomes among non-white individuals exposed to hydraulic fracturing operations.

Discussion: This systematic review revealed that few studies (<5) were implemented to specifically assess disproportionate health risks or burdens among non-white individuals exposed to UNG development. Therefore, there is a critical need for further research to equitably assess the causes of disproportionate health risks or burdens among non-white individuals exposed to fracking.

Conclusion: Further research is necessary and crucial to set a foundation for data-driven targeted interventions to address health disparities and achieve environmental justice in communities exposed to UNG development.

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RESEARCH SHOWCASE

ENVIRONMENTAL AND OCCUPATIONAL HEALTH

MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

Accuracy of PurpleAir Monitors in Extreme Climates: A Literature Review

Background: The most widely used low-cost monitor in the United States is from PurpleAir Inc. Performance of these devices is affected by climate conditions, such as humidity and temperature.

Methods: Following the SICO statement framework, this literature review investigates how low-cost PurpleAir (PA-II, PA-II-SD) monitors perform under extreme climate conditions compared to federal equivalent method (FEM) monitors. Extreme climates were defined according to Koppen-Geiger's classification system and literature was systematically reviewed based on an adapted version of the Cochrane GRADE criteria (last search, February 2, 2022).

Results: 11 studies met inclusion criteria. The studies demonstrated sufficient accuracy (mean $r^2 > 0.75$) between PurpleAir and FEM monitors. 7 of the studies conducted tests in hot-humid climates, 3 in cold-arid, 2 in hot-arid, and 1 in cold-humid climates. Overall, there is moderate evidence available to evaluate the accuracy of PurpleAir monitors compared to FEM reference monitors; however, some climates do not have enough evidence or large enough sample sizes to draw a conclusion.

Conclusions: Extreme climates do have an impact on PurpleAir monitor accuracy, but readings may be improved through climate-specific correction factors. PurpleAir monitors are not accurate enough to replace research-grade or federally-equivalent methods, though they are relatively accurate enough to express trends in particulate matter and complement data from other sources.

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RESEARCH SHOWCASE

ENVIRONMENTAL AND OCCUPATIONAL HEALTH

MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

Exposure to per- and polyfluorinated alkyl substances and biomarkers of ovarian steroidogenesis: a systematic review of the epidemiologic literature

Background: Exposure to synthetic chemicals such as per- and polyfluoroalkyl substances (PFASs) may disrupt proper endocrine functioning by hindering the production, regulation, and functioning of essential hormones. PFAS exposure is ubiquitous and has the potential to disturb ovarian steroidogenesis, which plays a pivotal role in the overall health of the female reproductive system.

Objective: We conducted a systematic review using the Navigation Guide methodology to assess the association between PFAS exposure and biomarkers of ovarian steroidogenesis in females: anti-Mullerian hormone (AMH), estradiol (E2), follicle-stimulating hormone (FSH), luteinizing hormone (LH), progesterone (P), sex hormone binding globulin (SHBG), and testosterone (T).

Methods: We utilized the Navigation Guide approach which involved the identification of a study question, selection of evidence from PubMed and Scopus databases, an assessment of the risk of biases across studies, and an overall rating of the quality and strength of the evidence. Across databases, a total of 650 records were found. After screening records based on pre-specified inclusion and exclusion criteria, a total of 13 studies were eligible for this systematic review.

Results: After review of included studies, the direction of the effects and significance levels were inconsistent in identifying the impact of PFASs on AMH, E2, FSH, LH, P, SHBG, and T. Across studies, there was a high risk of confounding bias, and concern regarding outcome misclassification. According to the Navigation Guide, there was limited evidence to suggest an association between exposure to PFASs and biomarkers of steroidogenesis in females; therefore, the body of evidence was deemed ‘low quality’.

Discussion: Although there was insufficient evidence to determine a direct association, the evidence base remains underdeveloped. Consideration of additional variables is necessary to minimize the effect of confounding and to better understand the association. Future prospective research must be conducted to solidify the evidence base and to ultimately inform environmental health policy.

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RESEARCH SHOWCASE

ENVIRONMENTAL AND OCCUPATIONAL HEALTH

MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

Assistive devices and Musculoskeletal Disorders (MSD) for Nurses: A Systematic Review

Millions of nurses suffer from Musculoskeletal Disorders (MSD) at a significantly higher rate than workers in other industries. Most nurses were injured while assisting patients in different ways that required significant force, mainly resulting from repositioning, uplifting, and moving patients, however, the use of assistive devices in maneuvering patients is often ignored. Nursing work risk of injury is expected to aggravate with the aging workforce and the accrescent obesity epidemic globally, which may also increase the weight of patients needed to be lifted.

The objective of this project is to examine if the use of assistive devices will decrease the chance of developing MSD for nurses.

Following the Navigation Guide methodology, a comprehensive literature review was conducted on PubMed, CINAHL, and ProQuest Nursing and Allied Health Database, each study were evaluated for risk of bias, quality, and strength of evidence were also rated.

Of the 266 studies, 13 studies met the inclusion criteria and were assessed in the final review for methodological quality and strength of the evidence. The majority (92.3%) of the papers demonstrated a positive association between the use of assistive devices and decreasing chance of developing MSD for nurses. We concluded the risk of bias across studies was low and we assigned a 'moderate' quality rating to the overall quality and strength of evidence.

Based on the first application of the Navigation Guide methodology, we concluded there is sufficient 'moderate' evidence that the use of assistive devices will decrease the chance of developing MSD for nurses, and they are generally effective. Although obtaining and utilizing assistive devices may be expensive, the reduction in nurses' compensation costs associated with injured nurses and nurses' job satisfaction would easily outweigh the costs of assistive devices.

Additionally, changes at the workplaces are needed with the implementation of necessary programs and interventions.

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RESEARCH SHOWCASE

ENVIRONMENTAL AND OCCUPATIONAL HEALTH

MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

Prenatal Exposures to Air Pollution and Maternal and Fetal Thyroid Function: A Systematic Review

Exposure to ambient air pollution is one of the top risk factors contributing to the global burden of disease. Pregnant women and their developing fetuses are populations particularly susceptible to adverse health outcomes associated with air pollution exposures. During pregnancy, the thyroid plays a critical role in fetal development, producing thyroid hormones that are associated with brain development.

This systematic review was conducted to identify recent literature that investigates how prenatal exposure to air pollution affects maternal and fetal thyroid function.

Utilizing the Navigation Guide Framework, I systematically reviewed articles from Proquest, PubMed, Scopus, and Cochrane Reviews. Studies evaluating gestational exposures to air pollution and outcomes related to maternal and fetal thyroid function were included for analysis.

The evidence demonstrates that prenatal exposure to air pollution affects maternal and fetal thyroid outcomes, ranging from hypothyroidism to altered triiodothyronine (T3), thyroxine (T4) and thyroid-stimulating hormone (TSH) ratios. Results of this review are conclusive in finding an association between prenatal exposure to air pollution, specifically exposure to $PM_{2.5}$ and PM_{10}, and outcomes related to adverse thyroid function.

The findings from this review add to the growing body of literature on how air pollution affects pregnant women and their developing fetuses. Future research should focus on establishing a critical window of exposure to air pollution and associated impacts on thyroid function.

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RESEARCH SHOWCASE

ENVIRONMENTAL AND OCCUPATIONAL HEALTH

MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

Occupational Exposure to BTX Group Organic Solvents (Benzene, Toluene, Xylene) and Hearing Loss and/or Hearing Disorders: A Systematic Review

In this review, I investigated the evidence for how, if at all, occupational exposure to solvents in the BTX Group (benzene, toluene, xylenes) affects the rates of hearing loss and/or hearing disorders in workers.

In this review, multiple studies published across several decades and multiple countries were collected from the PubMed database in three rounds of searches and analyzed. The selected studies covered a range of occupations where workers were exposed to BTX solvents. These studies were assessed and rated based on quality and strength of evidence.

There is inadequate evidence to suggest that there is a causal relationship between occupational exposure to BTX group solvents and hearing loss and/or hearing disorders. Results are consistent across studies, however, solvent exposure is routinely a single exposure category combining a mixture of solvents, at least one of which is a member of the BTX group. As a consequence, the health outcomes of interest cannot be solely attributed to BTX solvent exposure.

A link between exposure to BTX solvents and hearing problems is suggested, however the studies assessed in this review do not provide sufficient evidence to conclude a definite one. There is too much confounding from the other solvents present. Future research should focus on single chemical occupational exposures rather than a solvent mixture in order to form a more definite conclusion. However, due to the nature of the work being performed, such a study is unlikely to be possible. Most organic solvent exposure is not from a single chemical, it occurs in a mixture.

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RESEARCH SHOWCASE

ENVIRONMENTAL AND OCCUPATIONAL HEALTH

MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

Systematic Review on Burn Pit exposure in the US Deployed Service Members in Southwest Asia and Emphysema

Burn pits have been used for years as a waste disposal practice by the US service members while deployed in Southwest Asia. Inhalation of smoke emissions has been implicated as a cause of chronic lung conditions such as emphysema.

This systematic review was conducted using the Navigation guide method, literature searches were conducted in PubMed and Google Scholar. Individual articles were assessed for risk of bias, overall quality and strength of evidence.

A total of 110 articles was identified with seven meeting inclusion criteria. The articles were based on surrogate measurements and self-reported data, some combined with added records for assessments. Environmental exposure data is often difficult to obtain along with self-reported data being clinically confirmed and were addressed in each study. The strength of evidence across studies was mixed due to bias and confounding. Overall, studies suggested a possible increased risk of emphysema post-deployment from locations having burn pits compared to unexposed service members stationed in the US or deployed elsewhere.

Further research is needed to better understand and evaluate interactions between individual burn pit exposures and chronic respiratory outcomes including emphysema. This can possibly be achieved by considering the inclusion of biological indicators pre-military and post-deployment for assessing the influence of environmental exposures in absence of individual exposures. Finally, having medical data information outside Veterans Affairs medical centres can better validate the health outcomes.

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RESEARCH SHOWCASE

ENVIRONMENTAL AND OCCUPATIONAL HEALTH

MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

A nuMoM2b Heartland-Specific Pregnancy Exposure and Result Study: Associations between Glyphosate, Aminomethylphosphonic Acid (AMPA), 3-[hydroxy(methyl)phosphinoyl]propionic acid (MPPA), and Gestational Diabetes Mellitus

Gestational diabetes mellitus (GDM) rates in the United States have increased by 30% in the last decade. This condition not only increases both maternal morbidity and mortality, but also predisposes the child to a variety of metabolic conditions later in life. While the rise of obesity and corresponding rise in type II diabetes mellitus within the United States accounts for much of this increase, there is concern that environmental exposure to herbicides may be contributing. The objective of this study was to examine the association between GDM and urine biomarker levels of the herbicides glyphosate (GLY) and glufosinate (GLUF) and their corresponding degradation products, aminomethylphosphonic acid (AMPA) and 3-[hydroxy(methyl)phosphinoyl]propionic acid (MPPA), within themulti-center, NIH-funded Nulliparous Pregnancy Outcomes Study: Monitoring Mothers-to-Be (nuMoM2b) cohort.

A nested case-control study was performed using nuMoM2b pregnancy data and samples. Urine samples collected in the first trimester and subsequently cryopreserved were analyzed for GLY, GLUF, AMPA, and MPPA through a collaboration with the Heartland Health Research Alliance (HHRA). A 1-to-1 match of GDM cases to randomly selected healthy pregnancy controls was used. Multivariable logistic regression was used to estimate associations with gestational diabetes and exposure to the herbicides and their corresponding degradation products.

Geometric means (95% CI) were 0.17730 (0.1554, 0.2022) µg/L for glyphosate, 0.2418 (0.2121, 0.2757) µg/L for AMPA, and 0.08534487 (0.0796, 0.09145) µg/L for MPPA. Of the 250 participants included in the study (125 cases and 125 controls), 69.9% of cases and 66.94% of controls were above the LOD for glyphosate (p=0.7146), 76.61% of cases and 79.84% of controls were above the LOD for AMPA (p=0.54) and 8.06% of cases and 17.60% of controls were above the LOD for MPPA (p=0.0246). Logistic regression completed on weighted quintiles demonstrated an adjusted odds ratio between GDM and glyphosate of 1.001 (95% CI: 0.813, 1.232), while AMPA (OR 0.919, 95% CI: 0.749, 1.127) and MPPA (OR 0.564, 95% CI: 0.254, 1.250) demonstrated negative adjusted odds ratios. The estimates were not statistically significant.

Preliminary analyses suggest no statistically significant association between urine GLY, AMPA, or MPPA levels and gestational diabetes. This analysis may be limited by a small sample size, and as herbicides such as glyphosate continue to be applied in ever increasing amounts, further study of the potential impact of herbicide exposure on pregnancy outcomes will continue to be important.

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RESEARCH SHOWCASE

ENVIRONMENTAL AND OCCUPATIONAL HEALTH

MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

Food Deserts and Cardiovascular Outcomes: A Systematic Review

Links between food insecurity and poor cardiovascular outcomes have been found. Despite this the reviews on specific elements of food insecurity and cardiovascular outcomes have not been done.

Thus, this systematic review examines the association between food deserts and poor cardiovascular outcomes.

Following the Navigation Guide Framework 10 articles were examined after searching the PubMed, CINHAL and Web of Science databases. The majority of articles generally found an association between food deserts and various poor cardiovascular outcomes including poor cardiovascular health, hospitalization from cardiovascular disease and heart attack. This however changes if the element of poverty is adjusted for. When only the geographic element of food deserts was inspected the majority of articles found no statistically significant association.

Further studies are needed to answer how the geographic element of food deserts interact with the economic element. In addition, more studies are needed to examine the cardiovascular outcomes on those most marginalized that are living in food deserts.

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RESEARCH SHOWCASE

ENVIRONMENTAL AND OCCUPATIONAL HEALTH

MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

Smoke and COVID-19: Quantifying the Association between Smoke Exposure and Excess COVID-19 Hospitalization and Death in Selected East Coast Cities

Fine particulate matter ($PM_{2.5}$) in smoke from landscape fires (including agricultural burning, wildfires, and prescribed burning) is detrimental to human health. One potential impact of climate change is creating more favorable conditions for fires, potentially increasing fire $PM_{2.5}$ in the United States (US). Most health studies of landscape fire smoke look at non-communicable disease outcomes from $PM_{2.5}$, and there is a literature gap considering the impact landscape fire smoke $PM_{2.5}$ has on infectious diseases. Additionally, prior studies have concluded that landscape fire smoke has a larger effect in the Eastern US, due to population density, than the West even with lower smoke $PM_{2.5}$ levels in the East. This paper explores the relationship between landscape fire smoke and infectious disease through investigating the effect smoke $PM_{2.5}$ had on COVID-19 deaths and hospitalizations in three East Coast cities from March 2020 to December 2020.

Our paper analysis is divided into three sections. In the first section, we calculate a health impact assessment of $PM_{2.5}$ in Atlanta, GA, Washington, DC (DC), and New York City, NY (NY), for COVID-19 deaths. We account for lags by looking at both individual days with elevated $PM_{2.5}$ as well as the following week. In the second section, we replicate the initial analysis by calculating another health impact assessment utilizing hospitalization data for DC and NYC. The final portion of the study we will use R to create geospatial comparison of excess attributable deaths and hospitalizations between the three cities.

We find that Atlanta has the highest $PM_{2.5}$ levels out of the three cities between March 2020 to December 2020. Expectedly, due to its large population, NYC has the highest number of COVID-19 deaths. We expect to see elevated $PM_{2.5}$ exposure linked to higher rates of death and hospitalizations in the three cities upon further analysis.

Moving forward more studies are needed to close this gap in literature. Overall, we expect Atlanta to have the highest excess attributable deaths due to their elevated smoke $PM_{2.5}$ while we expect Washington, DC to have the highest excess attributable hospitalizations.

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RESEARCH SHOWCASE

ENVIRONMENTAL AND OCCUPATIONAL HEALTH

MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

Aspergillus Fungi Display Emerging Multi-Drug Resistance to Anti-fungal Medications in California Clinical Isolates

Invasive *Aspergillosis fumigatus* isolates have displayed emergent resistance to multiple triazole antifungal medications in rural California. At the George Washington University Antibiotic Resistance Action Center, our overarching hypothesis is that economically disadvantaged Hispanic migrant farm workers are at the greatest risk for becoming exposed to triazole-resistant aspergillosis in the US. We also hypothesize that the prevalence of multi-azole resistant *Aspergillus* species will increase with increasing use of triazoles for long term antifungal treatment in pesticides and prescriptions. Clinical azole-resistant aspergillosis has been associated with resistant *Aspergillus* strains in soil and agricultural niches. Multi-azole resistance in *Aspergillus* exacerbates the length and severity of opportunistic infections in humans, and drug-resistant *Aspergillus fumigatus* makes up 1-6% of cases per year since 1999. In this study, clinical *A. fumigatus* and other *Aspergillus* species were collected and screened for susceptibility to three triazoles. Of the *Aspergillus* samples collected from July 2020 through November 2021, 384 isolates have been tested for antifungal susceptibility and 20 are resistant to one or more antifungal drugs (5.2%). These results suggest that prevalence of single and multi-drug triazole resistance in clinical *Aspergillus* infections in rural California may have increased, as hypothesized. Phenotypic and genomic characterization of drug-resistant *Aspergillus* from our collection of clinical specimens will allow for epidemiological analysis to be performed in collaboration with Kaiser Permanente. We will use this data to examine the genomic resistance mechanisms as well as relationships among socioeconomic factors, geographical location including proximity to farms, and prevalence of azole-resistant aspergillosis.

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RESEARCH SHOWCASE

ENVIRONMENTAL AND OCCUPATIONAL HEALTH

MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

The Association between Lead Exposure and Crime: A Systematic Review

Prior research has demonstrated a potential association between lead exposure and criminal behavior late. The intent of this review is to summarize all available evidence pertaining to lead exposure and criminal behavior.

Eligible studies published prior to June 2021, available in English, peer-reviewed, and classified as cohort, cross-sectional, case-control, or individual quantitative measure were included. Studies measuring the outcomes of crime, delinquency, violence, and aggressiveness were likewise included. The following databases were used for our search: ProQuest Environmental Science Database, PubMed, Toxnet and the Public Affairs Information Service (PAIS). The final literature search was completed on August 25th, 2021. An augmented ROBINS-E tool was utilized to assess the risk of bias in each study. Two reviewers individually and independently assessed the risk of bias for each study and then completed conflict resolution as appropriate.

We identified 15 eligible studies, 13 of which demonstrated an association between lead exposure and criminal behavior. The 15 available studies represented 8 different cohort studies, 4 cross-sectional studies, and 1 case-control study. The number of study participants varied widely, from a minimum of 87 to a maximum of 70,861 participants, with ages ranging from 0-74 years old. 13 of the 15 studies utilized blood lead levels as the exposure assessment modality, with only 1 study utilizing bone lead levels and 1 utilizing dentine lead levels. 7 studies collected multiple lead measurements over a period of years, while the remaining 8 studies collected only a single sample. 5 studies utilized official criminal conviction records to assess outcome, 7 utilized different self and parental questionnaires, and 3 utilized both questionnaires and conviction records.

Limitations of this review include inconsistency in the results reported as well as in the covariates/confounders included across studies. Although associations between increased lead exposure and increased crime were present across the majority (87%) of the studies, the outcomes were often not comparable due to either differences in exposure or outcome assessment measurement modalities.

More evidence that standardizes both contextual and causal variables, as well as outcome measurement variables, is necessary to fully understand the strength of the association between lead exposure and crime in vulnerable populations. Despite these limitations, this review show evidence that leans towards a relation of lead exposure and crime and lays the groundwork for future research.

The authors report no conflict of interest or funding source.

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RESEARCH SHOWCASE

ENVIRONMENTAL AND OCCUPATIONAL HEALTH

MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

Exploring Differences in Rates of Sperm Abnormalities among Men of Different Racial and Ethnic Identities

Analyses of sperm quality have shown a constant decline over 50 years across countries in North America, Europe and Australia, and such declines can have serious implications for not just fertility but for other chronic diseases. Prior research on sperm abnormalities, including aneuploidy (an extra or missing chromosome), has focused almost exclusively on White men. The goal of this analysis was to examine whether frequency of aneuploidy is higher among urban men in the US who identify as Black or Hispanic.

Data from 206 participants who were recruited from the George Washington University Medical Faculty Associates (MFA) clinics and the greater Washington, DC community through community-based recruitment efforts were analyzed for this study. There were 159 participants with complete aneuploidy data. Across and within each racial group, approximately 70% of the participants were recruited from MFA Clinics, while 30% were recruited from the community.

All semen samples were collected and processed by experienced technicians blinded to the sociodemographic and health characteristics of the participants. World Health Organization guidelines were used to measure morphology and concentration. Participants had the opportunity to self-report multiple identities and ethnicity. Race was categorized as Black, White and All Other Races (this included American Indian or Alaskan Native, Asian, Native Hawaiian or Other Pacific Islander, Some Other Race). Hispanic ethnicity was included as a separate dichotomous variable. Not all participants answered both race and ethnicity questions resulting in missingness in some analyses. In our analyses that treated ethnicity as a separate variable, there were 19 participants missing either race or ethnicity data points. Of those with complete data, 57.1% were White while 27.1% identified as Black and 15.7% identified as another race. In total, only 3% of the participants identified as Hispanic using this method. In secondary analyses that included Hispanic as a variable, there were only 4 participants missing race or ethnicity data, resulting in 155 observations for analysis (27.1% Black, 51.6% White, 7.1% Hispanic, 14.2% Any Other Race).

In bivariate analysis, participants recruited from the community had a higher mean (2.10% vs. 1.79%) and median (2.01% vs. 1.57%) percent total disomy compared to patients recruited from MFA Clinics. Unadjusted analysis showed, participants of Any Other Race had the lowest mean (1.66%) and median (1.53%) percent total disomy, while Black participants had a higher mean (1.94% vs. 1.90%) but lower median (1.67% vs. 1.75%) percent total disomy compared to White participants. These differences do not appear to be statistically significant. Likewise, there did not appear to be a statistically significant difference in percent total disomy by Hispanic ethnicity when treated separately.

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RESEARCH SHOWCASE

ENVIRONMENTAL AND OCCUPATIONAL HEALTH

MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

Prenatal Exposure to Agricultural Pesticides and Prevalence & Risk of Childhood Autism: A Systematic Review

The Navigation Guide's systematic review methodology was adapted and applied to identify and assess literature on maternal pesticide exposure and risk of childhood Autism. A systematic review was conducted to determine if there is a correlation specifically between agricultural pesticide exposure during pregnancy periods and children developing autism. While pesticide use remains high, autism diagnoses have also increased by 10% and boys are being diagnosed at a significantly higher rate.

I conducted a systematic review through the Navigation Guide methods to answer the question, "Does prenatal up to first year of life exposure to agricultural pesticides have a neurological effect on children increasing their risk of childhood autism?" and to rate the strength of this evidence in this body of literature.

The steps of the Navigation Guide were applied to identify relevant literature through ProQuest using thirty-one databases; studies were systematically selected based on pre-specified inclusion criteria. The analysis of the qualified literature included six studies. With each piece of literature accepted, an assessment of the risk of bias, quality of evidence, and strength of evidence was evaluated. Then studies were compared across all selected bodies of literature and an overall appraisal was concluded.

Six studies fit the inclusion criteria and compared the exposure of agricultural pesticides and risk of childhood autism found in California populations. The evidence suggests that there is a positive correlation between pesticide exposures and the risk of childhood autism. The amount of pesticides a mother is exposed to may increase her unborn child's risk of developmental delays or autism. These studies are limited by location and complete knowledge of biological pesticide concentrations. There is limited, but sufficient evidence that there is a positive relationship between agricultural pesticide application proximity to residents homes and offsprings' developmental delay outcomes; specifically Autism.

Through application of the Navigation Guides' systematic review methodology, it can be concluded that there is "sufficient evidence of toxicity" between the relationship of residential proximity to applied agricultural pesticides, and the prevalence and risks of childhood autism cases.

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RESEARCH SHOWCASE

ENVIRONMENTAL AND OCCUPATIONAL HEALTH

MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

Tetracycline Resistance in *E.coli* Isolates from California Patients with Urinary Tract Infections

Escherichia coli (*E. coli*) isolates found in clinical samples collected from patients with urinary tract infections (UTIs) in California have displayed resistance to the antibiotic tetracycline. Since its development in the 1940s, tetracycline has been widely used as a growth promoter in animal husbandry. Tetracycline is no longer used to treat *E. coli* infections in humans, yet resistance is common, suggesting that resistance has been induced during treatment of other pathogens in humans or animals. The George Washington University Antibiotic Resistance Action Center's primary goal has been to examine agricultural antimicrobial drug use as a major driver of antimicrobial resistance. The passing of California Senate Bill 27, which took effect on January 1, 2018, imposed new restrictions in antibiotic use. The new law now requires livestock producers to obtain prescriptions for antibiotics also used by humans as well as prohibits antibiotic use for growth promotion. We hypothesize that the prevalence of tetracycline resistance in *E. coli* bacteria that causes foodborne illness in humans will decrease with the decreasing use of antibiotics in the meat industry in California. In this study, *E. coli* isolates from clinical samples were screened for tetracycline susceptibility using the disk diffusion method. So far, 249 of 771 isolates collected in 2021 were resistant to tetracycline (32.3%). Meanwhile, 50 of the 209 isolates collected in 2017 were resistant to tetracycline (23.9%). From here, we will continue to test the remaining 2,020 samples to track changes in the prevalence of tetracycline resistance over time. Using previously gathered data where we isolated and sequenced the genomes of resistant *E. coli* found in California raised meat, we can then compare genetic elements between *E. coli* found in UTI patients and meat samples. This will allow us to track resistance of the foodborne subset of clinical isolates over time.

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RESEARCH SHOWCASE

ENVIRONMENTAL AND OCCUPATIONAL HEALTH

MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

How Modern Anthropogenic Environmental Factors Drive Spillover Potential of Bat-borne Zoonosis: A Systematic Review

Bats are an ideal host of zoonotic disease due to their proximity to humans, ability to migrate great distances, long lifespan, and tendency to gather in crowded colonies. As populations expand and resources become increasingly scarce, anthropogenic land-use changes and the impacts of climate change will become more prevalent. These anthropogenic environmental factors can increase human-bat contact rates and drive the spillover potential of bat-borne zoonosis.

This systematic review examines the association between anthropogenic environmental factors and spillover potential of bat-borne zoonosis.

Literature searches were conducted in SCOPUS and PubMed pursuant to the Navigation Guide Framework. Included studies underwent several screening processes including an initial title screening, an abstract review, and a full-text review to determine their applicability to the inclusion criteria.

The majority of papers demonstrated a positive association between anthropogenic environmental factors and spillover potential of zoonotic diseases among bats. Deforestation was heavily studied among bats and zoonotic disease spillover and remains a key determinant of zoonotic disease emergence. Other relevant anthropogenic environmental factors included urbanization, agricultural intensification, ecosystem fragmentation, and the effects of climate change.

Research aimed at understanding these chief environmental drivers of novel zoonotic disease emergence and transmission allows potential for earlier prevention and prediction of future novel zoonotic disease spillover from bats to human populations. Past reviews have failed to include both novel research on SARS-CoV-2 spillover as well as an in-depth analysis of all potential anthropogenic environmental factors that drove past outbreaks. Future research could use these environmental factors to identify "hot spots" using machine learning and Geographic Information Systems (GIS) as a prediction tool for future outbreaks. Resources and supplementary surveillance activities could then be directed to these localities for prediction, and if applicable, prevention of further zoonotic disease spread. Additionally, strong evidence emphasizing the zoonotic disease risk from anthropogenic environmental factors could drive policies aimed at sustainability and ecosystem protection.

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RESEARCH SHOWCASE

ENVIRONMENTAL AND OCCUPATIONAL HEALTH

MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

A Systematic Review of Pre- and Polyfluoroalkyl Substances (PFAS) and the Effects on Bone Mineral Density and Osteoporosis

Many countries have a growing and aging population, however there is limited literature on the association between environmental contaminants and long-term bone health that can impact quality of life.

This project utilized the Navigation Guide systematic review methodology to determine whether per- and polyfluoroalkyl substances (PFAS) affect bone health, specifically bone mineral density (BMD) and Osteoporosis.

A comprehensive literature search was conducted to identify human epidemiological studies on the association between exposure and outcome using prespecified criteria. Each study was independently rated for risk of bias across 7 factors. Overall the studies were rated for quality and strength of human evidence.

Majority of studies showed a consistent negative association between exposure and outcome, however confounding could not be ruled out with reasonable confidence. Major concern was the uncertainty in accounting for body size as either a confounder or effect modifier.

Utilization of the Navigation Guide in this systematic review concluded that there is "limited" human evidence of lowered BMD and osteoporosis.

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RESEARCH SHOWCASE

ENVIRONMENTAL AND OCCUPATIONAL HEALTH

MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

Factors That Increase the Risk of Occupational Injury Among Meatpacking Workers

The meatpacking industry has long reported high rates of occupational injury, including lacerations and musculoskeletal disorders. Workers are exposed to a number of risk factors that may increase their potential for occupational injuries.

The objective of this systematic review is to examine what factors are associated with higher risk of occupational injury among meatpacking workers.

Following the navigation guide framework, literature searches were conducted in Pubmed and SCOPUS. Of the 190 studies screened, 35 were selected for full text screening. After full text screening was completed, 7 studies met the inclusion criteria and were assessed for quality of evidence, strength of evidence, and risk of bias.

Studies included in this systematic review examined a variety of factors related to occupational injury including demographic factors, work/rest schedules, job category and duties, repetitive motion, depression and psychological distress, and transient risk factors. The main outcomes assessed in selected studies were laceration, risk of musculoskeletal disorders, and general occupational injury. The majority of studies found positive associations between risk factors studied and occupational injury.

Current research has found associations between many different factors and risk of occupational injury among meatpacking workers. However, studies vary in design, exposure assessment, and outcome assessment. Strength of association also varies between studies. Further research is needed to confirm study results and increase the strength of evidence for the link between risk factors and occupational injury among meatpacking workers.

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RESEARCH SHOWCASE

ENVIRONMENTAL AND OCCUPATIONAL HEALTH

MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

Surma Use in Asian Children and Blood Lead Levels: A Systematic Review

Surma, or Kohl, is a cosmetic product that has been used for centuries throughout Asia and Africa. In holistic medicine, it is believed to be antibacterial, so it is used in everyone from babies to full grown adults. Due to lack of regulation, surma has been found to contain lead, which can lead to health complications in development in high quantities.

This systematic review aims to answer the research question “Does surma use in Asian children cause elevated levels of blood lead?”.

Through the use of the Navigation Guide Framework, a systematic literature review was conducted in Pubmed, SCOPUS, and Web of Science. Ultimately, 89 studies were screened for inclusion and exclusion criteria, and repeated articles were removed, resulting in thirteen studies to be reviewed. The quality and the strength of the evidence were then analyzed.

A majority of studies reviewed found a relationship between surma use and increased blood lead levels. Others found that a significant amount of surma samples did contain lead.

These findings consistently indicate that there is a significant positive correlation between surma use and blood lead concentration in Asian children. Interventions would be useful in order to prevent negative health outcomes to the children of these populations, however cultural sensitivity is an important consideration.

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ENVIRONMENTAL AND OCCUPATIONAL HEALTH

SCHOOL OF MEDICINE AND HEALTH SCIENCES

For Whom Does the Bell Toll? 1-Year follow up on ED responders' burnout during the COVID-19 Pandemic

The COVID-19 (COVID) pandemic has caused incalculable damages throughout the U.S., with over 34-million infections and 600,000 deaths as of July 2021. Many medical personnel on the frontline, especially within emergency departments, experienced immense burnout. Although the extent of the burnout at the beginning of the pandemic has been reported in the literature, there is a paucity of data on how that has evolved over time. We aimed to survey providers a year into the pandemic on stress and burnout in the setting of new vaccine availability.

Two online surveys were distributed among healthcare providers at a tertiary academic center between 2020 and 2021. The initial survey was composed of questions evaluating the level of burnout and risk perception. The latter had the same questions for comparison, as well as questions regarding vaccination status and the Professional Quality of Life Scale (PROQOL). Chi-squared tests were used to compare the results.

There were 63 responses in 2020 and 78 responses in 2021. 94% received the COVID vaccine in 2021. Measures of risk perception, specifically "Feels job is imposing great risk" and "Afraid of falling ill with COVID" saw statistically significant decreases (87% to 62%, p= 0.001; 76% to 45%, p<0.001, respectively). Meanwhile, while the point estimate for "feeling extra stress at work" and "thinking about resigning" also decreased, neither were statistically significant (85% to 76%, p=0.148; 11% to 9%, p= 0.673, respectively). The PROQOL results from 2021 showed most responders experienced either moderate or high levels of Burnout and Post-traumatic stress, but also Compassion Satisfaction (85%, 62%, and 96%, respectively).

During the 1-year study period there were significant improvements in terms of risk perception, though burnout and stress remained high. The reduction in risk perception may be related to vaccination, given the high rate of vaccination among this group and temporal correlation. However further research is necessary to support this relationship, as well as identify other potential factors to help reduce burnout in future pandemics.

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RESEARCH SHOWCASE

EPIDEMIOLOGY AND BIOSTATISTICS

DUAL PA/MPH PROGRAM

COVID Politics: An Ecological Analysis of the Relationship Between Government Response and Vaccine Hesitancy

Vaccine hesitancy has been a recurrent issue, but the magnitude of hesitancy is at unprecedented levels in regard to the coronavirus (covid-19) vaccine. Globally, the United States has a relatively high acceptance of the vaccine, but there are large geographic discrepancies in vaccine acceptance within the country. Research indicates factors contributing to hesitancy include income status, education level, and political affiliation, but there is not specific research on government policies and messaging in relation to vaccine hesitancy. This study will explore if the regional public health and legislative response to the coronavirus pandemic is associated with differences in rates of vaccine hesitancy.

This is an ecological secondary analysis of data from the Household Pulse Survey (HPS) administered by the United States Census Bureau and the U.S. State and Territorial Public Mask Mandates From April 8, 2020 through August 15, 2021 by State by Day data set collected by the Centers for Disease Control (CDC). Two independent variables are used to measure state repsonse: employment status and mask regulation. Employment status is categorized as working on-site or working remotely; unemployed individuals are not included as reasons for unemployment may vary widely. State mask mandate requirements are categorized as weak, moderate, or strong. The dependent variable of interest is vaccine hesitancy. The state rate of vaccine hesitancy is determined by the proprotion of the population that reports they are highly or moderately unlikely to receive the coronavirus vaccine. Differences between proportions of vaccine hesistant individuals among states will be evaluated using Pearson's chi-square test, McNemar's test, and inverse weighting techniques using Statistical Analysis Software Version 9.4.

Preliminary results show that states with high vaccine hesitancy (at least 70% of population vaccine hesitant) include Mississippi, Louisiana, Oklahoma, Wyoming, and North Dakota. In all states with high vaccine hesitancy, government mask regulations were categorized as weak, and at least 50% of the states' population was categorized as working on-site for employment status. These patterns will be tested for statistically significant differences in vaccine hesistancy among states with weak regulations versus strong government regulation.

This study identifies key patterns in state variations in policy and vaccine hesitancy. These patterns and any significant differences found will help identify potential predictors of vaccine hesitancy. In turn, possible predictors may be utilized for future hypothesis formulation and provide a basis for studying individual-level associations.

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RESEARCH SHOWCASE

EPIDEMIOLOGY AND BIOSTATISTICS

MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

The Impact of MEK-inhibitors on Neurofibromatosis Type 1 Associated Metabolism

Neurofibromatosis Type 1 (NF1) is an autosomal dominant neurocutaneous syndrome caused by genetic inactivation of one copy of the tumor suppressor gene NF1. Loss of NF1 results in increased activity of Raf/MEK/ERK (MAPK) signaling leading to an increased risk of cancer and metabolic dysfunction. MEK-inhibitors (MEKi) have recently been approved for the treatment of inoperable plexiform neurofibromas or low grade gliomas (LGG) in patients with NF1, but their impact on restoring metabolic homeostasis is unknown. Here, we specifically investigated the longitudinal effects of MEKi treatment on global metabolism using Nf1 murine models and compared to metabolomic data in human patients to confirm our findings. Differential analysis of metabolomic data was conducted using Tweedieverse, an R package omics tool, to analyze individual metabolites. Omics pathway enrichment analysis to analyze pathway-level changes was performed using Deepath. Metabolites such as branched chain amino acids and triglycerides were increased after MEKi treatment in mice. Fatty acid metabolism (acyl carnitine and acyl glycine) pathway was enriched between patients with MEKi treatment and non-treatment group. This enrichment was also found in long-term experiments in mice after MEKi treatment. This research furthers our knowledge in metabolic changes in NF1 patients in response to MEKi treatment and helps inform other effects that patients experience when treating this tumor.

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RESEARCH SHOWCASE

EPIDEMIOLOGY AND BIOSTATISTICS

MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

Descriptive Epidemiology of COVID-19 in New Hampshire Correctional Facilities

Correctional facilities face many challenges in preventing the spread of COVID-19. These facilities are at a higher risk of outbreaks due to close contacts, confined spaces, and the potential for new arrivals and staff members to introduce the virus to the setting. The objective of this study was to describe the epidemiology of COVID-19 in New Hampshire correctional facilities in order to enhance planning and response strategies. The study population included New Hampshire correctional facility residents and staff (n=5,297 total including n=3,677 residents and n=1,620 staff) from 15 facilities (10 county jails, 4 state prisons, and 1 federal prison) and included all cases reported between April 3, 2020 and March 19, 2021. Data were collected from case reports stored in the New Hampshire Electronic Disease Surveillance System (NHEDSS). A total of 1,038 COVID-19 cases were identified, including 765 residents (21% of residents infected) and 273 staff (17% of staff infected). Among all cases, 1,000 (96%) were associated with facility outbreaks. Across all facilities, the mean age of resident and staff cases was 41. A total of 5 hospitalizations (0.5%) and 4 deaths (0.4%) were reported. During the study time frame, a total of 14 outbreaks were documented across 11 facilities, with several facilities having experienced multiple outbreaks. The average size and duration of outbreak was 71 cases, lasting 56 days. Of the outbreak associated cases there was an average attack rate of 19% overall, 25% for residents, and 15% for staff. Like other congregate settings, correctional facilities have been impacted significantly by COVID-19. It is important for COVID-19 cases to be identified quickly and for preventative measures to be consistently applied as they are critical to protecting the health of residents and staff of correctional facilities alike.

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RESEARCH SHOWCASE

EPIDEMIOLOGY AND BIOSTATISTICS

MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

SARS-CoV-2 Variant Surveillance in the GWU Community: Utilizing a TaqMan qRT-PCR assay and Next-Generation Sequencing of the Spike Gene

Despite over 75.8% of the US population having received at least one dose of the mRNA vaccine against SARS-CoV-2 (COVID-19), the pandemic continues to be a problem to tackle. New variants continue to emerge due to a high viral mutation rate particularly on the Spike gene. This has resulted in higher transmission rates and/or disease severity, as well as breakthrough infections in the fully vaccinated. To rapidly identify emerging variants in a cost effective manner, we utilized a TaqMan assay first designed to screen for Alpha. Once Omicron appeared, we repurposed the assay and screened for the N501Y mutation and HV69-70 deletion, which distinguishes between Delta and Omicron variants as these mutation combinations do not overlap.

Inactivated RNA extracts from SARS-CoV-2 positive nasal specimens (CT≤28) were received from the GWU Public Health Lab and screened for the N501Y mutation and HV69-70 Spike gene deletion using the TaqMan qRT-PCR assay. Targeted next-generation sequencing of the Spike gene was then performed on samples with inconclusive TaqMan results followed by bioinformatics data analysis using DRAGEN COVID Lineage (Illumina) and NextClade (NextStrain) to identify variants.

Since the start of surveillance of the GWU community, different variants have come and gone peaking at different time periods. Alpha was first observed in January 2021. By July, Delta appeared and became dominant in 4 months (49.5% of 483 TaqMan-screened SARS-CoV-2 cases). The first Omicron variant was identified in a sample from 11/29/2021. Within three weeks (11/29 to 12/20), Omicron dominated (77.3% of 277 TaqMan-screened SARS-CoV-2 cases). With each new emerging variant, less time was needed to become predominant, indicating that a gradual rise in infectivity could be parallel with the amount of mutations the viruses undergoes. The persistent emergence of new variants with greater infectivity allowed it to supersede previous ones, strongly suggesting that continuous surveillance should be a priority within our community.

By performing SARS-CoV-2 genomic surveillance, the proportions of the different variants circulating in the region can aid public health officials in making evidence-based decisions that will mitigate further case increases, identify and describe the distribution of new variants, perform clade tracking and contact tracing. The available mRNA vaccines continue to provide protection against these new variants; however, as further mutations occur, there is a higher risk that our acquired antibodies may not recognize the target antigen.

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RESEARCH SHOWCASE

EPIDEMIOLOGY AND BIOSTATISTICS

SCHOOL OF MEDICINE AND HEALTH SCIENCES

Longitudinal Course of Mental Health in AD and it's Predictors

Atopic dermatitis (AD) is associated with eczematous lesions, chronic pruritus, skin pain, sleep disturbance, all of which may negatively impact mental health and lead to depression. However, little is known about the predictors and longitudinal course of depressive symptoms in patients with AD over time.

The objective of this project is to determine the predictors of and longitudinal course of depressive symptoms in adult patients with AD.

A prospective, dermatology practice-based study was performed (n=490). AD severity (EASI) and Patient Health Questionnaire (PHQ)-9 were assessed at baseline and follow-up visits approximately every 6 months.

At baseline, 286 (58.37%) had minimal depression, 113 (23.06%) had mild depression, 55 (11.22%) had moderate depression, 24 (4.90%) had moderately severe depression, and 12 (2.45%) had severe depression. Overall, the majority of patients had fluctuating levels of depressive symptoms. Patients with severe depression at baseline mostly had fluctuating (40.00%) and sustained improvement (40.00%) of depressive symptoms over time. The depressive symptoms found to be more persistent than fluctuating over time were feeling bad, difficulty concentrating, poor appetite, poor interest in activities, thoughts of self-harm, and slow movement. Patients with severe AD were significantly more likely to experience depression over time. Predictors of depression over time included moderate and severe facial erythema (adjusted β [95%]: (1.352 [1.021-1.682]), (2.052 [1.599-2.505]) respectively); mild and severe flexural erythema (adjusted β [95%CI]: (.577 [.333-.820]), (4.112 [3.535-4.688]); mild, moderate and severe pain (adjusted β [95%CI]: (2.640 [2.181-3.099]), (4.144 [3.716-4.572]), (5.776 [5.382-6.169]) respectively); mild pityriasis (adjusted β [95%CI]: 3.603 [3.049-4.158]); age of 65+ years (β [95%CI]: -2.088 [(-2.215)-(-1.962)]); Hispanic, African American, and other non-white race (β [95%CI]: (1.887 [1.636-2.138]), (1.021 [.846-1.196]), (.181 [.035-.326]) respectively); and patients with Medicaid, Medicare, and Uninsured/self-pay (β [95%CI]: (2.216 [1.834-2.598]), (1.534 [1.098-1.970]), (-2.201 [(-2.789)- (-1.613)]) respectively).

Overall, patients with AD had fluctuating levels of depression. However, a subset of depressive symptoms were found to persist over time. Severity of AD signs and symptoms had strong associations with poor mental health and depressive symptoms over time.

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RESEARCH SHOWCASE

EPIDEMIOLOGY AND BIOSTATISTICS

SCHOOL OF MEDICINE AND HEALTH SCIENCES

The Economic Effects on Acute Care Surgery in a New York City Public Hospital During the COVID Pandemic

Since the start of the COVID-19 pandemic, less acute care surgical procedures have been performed and consequently hospitals have experienced significant revenue loss. We aim to investigate these procedures performed before and after the start of the COVID-19 pandemic, as well as their effect on the economy.

This is a retrospective analysis of patients who underwent cholecystectomies and appendectomies during March–May 2019 compared to the same time period in 2020 using Chi-square and t-tests.

There were 345 patients who presented with appendicitis or cholecystitis to Elmhurst Hospital Center during the March–May 2019 and 2020 time period. There were three times as many total operations, or about 75%, in 2019 (261) compared to 2020 (84). There was a decrease in the number of admissions from 2019 to 2020 for both acute cholecystitis (149 vs 43, respectively) and acute appendicitis (112 vs 41, respectively). The largest decrease in the number of admissions in 2020 compared to 2019 was observed in April 2020 (98 vs 9, $P < .01$) followed by May [69 vs 20, $P < .01$], and March [94 vs 55, $P < .01$]. Corresponding to the decrease in operative patterns was a noticeable six-time reduction in revenue for the procedures in 2019 ($187,283) compared to 2020 ($30,415).

We observed almost a triple reduction in the number of cholecystitis and appendicitis procedures performed during the 2020 pandemic surge as compared to the 2019 pre-pandemic data. Elmhurst hospital also experienced four times the loss of revenue during the same time period.

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RESEARCH SHOWCASE

EXERCISE AND NUTRITION SCIENCES

MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

Impacts of the COVID-19 Pandemic on Children's Sugary Drink Consumption: A Qualitative Study

The coronavirus (COVID-19) pandemic has caused striking alterations to daily life, with important impacts on children's health. Spending more time at home and out of school due to COVID-19 related closures may exacerbate obesogenic behaviors among children, including consumption of sugary drinks. This qualitative study aimed to investigate effects of the pandemic on children's sugary drink consumption and related dietary behaviors. Children 8–14 years old and their parent (n = 19 dyads) participated in an in-depth qualitative interview. Interviews were recorded, transcribed verbatim, and independently coded by two coders, after which, emergent themes and subthemes were identified, and representative quotations selected. Although increases in children's sugary drink and snack intake were almost unanimously reported by both children and their parents, increased frequency of cooking at home and preparation of healthier meals were also described. Key reasons for children's higher sugary drink and snack intake were having unlimited access to sugary drinks and snacks and experiencing boredom while at home. Parents also explained that the pandemic impacted their oversight of the child's sugary drink intake, as many parents described loosening prior restrictions on their child's sugary drink intake and/or allowing their child more autonomy to make their own dietary choices during the pandemic. These results call attention to concerning increases in children's sugary drink and snack intake during the COVID-19 pandemic. Intervention strategies to improve the home food environment, including reducing the availability of sugary drinks and energy-dense snacks and providing education on food parenting are needed.

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RESEARCH SHOWCASE

EXERCISE AND NUTRITION SCIENCES

MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

Feasibility and Acceptability of a 12-week Low Calorie Sweetener Restriction Intervention on Glycemic Variability in Children with Type 1 Diabetes

This project aims to examine the feasibility and acceptability of a randomized controlled trial designed to investigate effects of 12-weeks of low-calorie sweetener (LCS) restriction on glycemic variability among children with type 1 diabetes.

In-depth qualitative interviews were conducted with 13 parents of children (aged 6-12 years) with type 1 diabetes following completion of the 12-week intervention. Parents were asked seven open ended questions regarding their study experience and any challenges to participation they encountered. All interviews (n=13) were recorded and were subsequently transcribed verbatim, coded, and analyzed using qualitative thematic methods.

Most parents reported that their children did not find adherence to the LCS restriction intervention to be difficult. While study adherence was not perceived as difficult overall, a key challenge reported by parents was completion of food logs throughout the study. Food logs were described as the hardest aspect of study participation. Parents explained that it was difficult to keep track of what their child ate. Other challenges identified by parents were difficulty avoiding the many products that contain low-calorie sweeteners and that their child did not like being limited to drinking only water. Benefits of study participation were also described, including reports that the child drank more water during the study and that the food logs encouraged more thoughtful eating habits. Furthermore, some parents reported that study participation provided them with an opportunity to have more oversight of their child's blood sugar levels and encouraged their child to be more accountable with respect to their diabetes management.

A novel intervention involving 12-weeks of low-calorie sweetener restriction is feasible and acceptable among our sample of children with type 1 diabetes. The reported challenges of study participation, most notably completion of food records, underscore the need to carefully consider the burden associated with some aspects of the study protocol when designing future studies in this patient population.

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RESEARCH SHOWCASE

GLOBAL HEALTH

MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

Tribal Differences around Gender and Maternal Health Norms in 2 Communities in Ghana

Ghana remains one of the countries with high rates of maternal anemia, and malnutrition for children under 5. While many public health interventions have aimed to equalize the disparity intra-national differences remain, tribal and ethnic affiliation continues to contribute to health disparities. In this study, the matrilineal (ancestry through women) tribe Akan that reside in part in Ashanti, and the patrilineal (ancestry through men) tribe Volta that in part reside in the Ghanaian state of Volta, are compared to explore the relationship between tribal affiliation and maternal health and gender norms. As the Akan tribes have a matrilineal descent, assumptions exist about increased female empowerment in the communities and more female health-forward norms. Using the theory of normative social behavior, descriptive norms, or an individual's belief about the perception of a certain behavior, and injunctive norms or an individual's belief on approval of a behavior.

Descriptive and injunctive norms of thirteen maternal and child health and attitudes around gender inequality and decision-making were measured through questionnaires (n=601). Using linear and categorical regression comparison between the two tribes and the measures described was conducted.

The patrilineal Ewe believed more members of their communities practiced recommended nutritional health behaviors; this relationship was magnified with the injunctive norms as the Ewe consistently showed a significantly higher means of perceived approval. Yet, the results from the same comparison, now with gender norms, showed that the patrilineal Akan were significantly more likely to hold gender equitable beliefs, especially in the sub-measures of nutrition and gender stereotyping.

Female empowerment tends to play a large role in public health interventions, but within the Akan where women are more socially powerful, there is less use of West recommended healthcare. Akan women have a strong collectivist child-rearing method, and the elders of the community take decisions for the child. The Akan are more religious around indigenous cultures compared to the Ewe, and strong female figures in the Akan community consider prayer and traditional foods first before using Western medicine.

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RESEARCH SHOWCASE

GLOBAL HEALTH

MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

Impact of Early Enteral Feeding on Critical Outcomes for Preterm and Low Birthweight Infants: A Systematic Review and Meta-analysis

Clinicians debate the optimal feeding time for low birthweight and preterm infants, for fear early initiation may cause mortality and adverse outcomes. We sought to synthesize information about the effects of early feeding compared to delayed in the first few days of life.

We searched Medline, Scopus, Web of Science, CINAHL until April 2021 for randomized control trials (RCTs). Primary outcomes included mortality, morbidity, growth, neurodevelopment, feed intolerance, and duration of hospitalization. Data were extracted and pooled with random-effects models. We assessed quality of evidence using the GRADE method.

We identified 22 RCTs and included 14 trials with 1505 participants in our primary analysis comparing early (< 72 hours) to delayed (≥72 hours) feeding initiation. Early initiation likely decreased mortality at discharge/28 days (1292 participants, 12 trials, RR 0.69, 95%CI 0.48 to 0.99, moderate certainty evidence) and duration of hospitalization (1100 participants, 10 trials, mean difference -3.20 days, 95%CI -5.74 to -0.66, moderate certainty evidence). Early feeding may also decrease risk of sepsis and weight at discharge. Based on low certainty of evidence, early initiation may have no effect on necrotizing enterocolitis, feed intolerance, and days to regain birthweight. Analysis of all 22 trials in this study showed similar results.

Early feeding initiation may reduce the risk of mortality and lower the duration of hospitalization. Our findings have important implications for costs to the healthcare system and adds to evidence supporting early breastfeeding initiation in all settings, including infants born and managed at home.

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RESEARCH SHOWCASE

GLOBAL HEALTH

MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

Mixed-methods Evaluation of a Multi-component Adolescent Gender Program in Afar, Ethiopia: A Clustered Randomized Control Trial Evaluating "Act with Her-Ethiopia"

“Act with Her-Ethiopia” (AwH-E) is a curriculum-based program led by near-peer mentors for both girls and boys. This paper uses both quantitative data from in-person surveys and qualitative evidence to determine the impact and understand the findings of the pilot implementation of AwH-E in the Afar region of Ethiopia.

The quantitative analysis uses regression analysis to estimate the impact of the program on five main outcomes (desire to get married after 18 years of age, aspiring for a professional job, having a source of information on puberty, and an index of knowledge on puberty, index of household gender norms) while controlling for individual and household level demographic variables. A treatment on the treated analysis that used the average number of sessions attended in each kebele, mimics the intent-to-treat analysis. For the qualitative analysis, interviews were transcribed and were coded using MAXQDA, using a codebook developed by the researchers. For the mixed-methods analysis, an iterative process was used, with qualitative data providing understanding of the quantitative findings.

Of the 499 adolescents surveyed at baseline, 82.4% of respondents were successfully tracked and surveyed during the second round of data collection. The study did not find significant differences between adolescents in communities with AwH-E and adolescents in the control communities for the first four outcomes (desire to get married after 18 years of age, aspiring for a professional job, having a source of information on puberty, and an index of knowledge on puberty). However, a positive impact seen for both the index of gender household roles and in the standardized index for girls indicating a small, positive effect across the domains. Findings also indicate greater positive impact in areas with more intense programming for both boys and girls and provide lessons learned for working in remote areas of Ethiopia.

These positive findings support the need for further programming among pastoralist populations and highlight the need for appropriate adaptation of program materials to be culturally relevant. This research enhances the current understanding of the impact multicomponent community and school-based clubs have on adolescent wellbeing. The small positive impacts found in this study are encouraging given the implementation challenges and limited exposure to the program in the Afar region. The findings from this study emphasize the need for culturally responsive programs for early adolescents. Such programs are vital in supporting boys and girls during this vital period of development.

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RESEARCH SHOWCASE

GLOBAL HEALTH

MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

In an Increasingly Digital World: Examining Adolescent Digital Technology and Internet Access, Use, and Practices in Jordan Prior to and During the COVID-19 Pandemic

Globally, more adolescents are gaining access to digital technology and the internet, creating unique opportunities and vulnerabilities for their development. Most research on young people's access, use, and associated practices with these technologies has been focused on older adolescents or concentrated in European or North American countries. Much less is known about the experiences of young adolescents (aged <15) or adolescents experiencing forced displacement. Drawing on longitudinal survey data collected prior to and during the COVID-19 pandemic, this study examined these domains among Syrian and Palestinian refugees and vulnerable Jordanian adolescents aged 10-19 years living in urban refugee camps and host communities in Jordan. Data were descriptively analyzed, and outcomes of interest were tested for differences across adolescent characteristics including gender, age, residence location (camp/host), refugee status, formal school enrollment, and disability status. Results show that despite many adolescents using digital technology and the internet, significant differences exist in their access and use. Girls, younger adolescents, and refugees are particularly disadvantaged in their access both prior to and during the pandemic. How adolescents engage with digital technology was also found to be gendered and/or age specific. For instance, older adolescents were more likely to text and be using social media than younger adolescents, and boys were more likely to play games online than girls. In an increasingly digital world, all actors need to work toward addressing digital disparities to ensure all adolescents have equitable opportunities for development and can realize their rights offline and online.

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RESEARCH SHOWCASE

GLOBAL HEALTH

MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

The Many Facets of Violence: Understanding the Patterns and Impact of Polyvictimization on Adolescent Health and Well-being in Ethiopia

This study uses quantitative data from the Gender and Adolescence, Global Evidence Study (GAGE) in Ethiopia to analyze the association between polyvictimization and adolescent health and mental health, and the mediating role of social support in mitigating the harmful impacts of polyvictimization. We hypothesized that adolescents experiencing polyvictimization would experience worse physical health and mental health than those experiencing no forms of victimization or individual forms of victimization alone, and that resilience would mediate the relationships between polyvictimization and adolescent outcomes. This study used the GAGE conceptual framework, which focuses on the interconnections between adolescent capabilities, contexts, and change pathways.

Survey data were collected from 7,541 adolescent boys and girls and their adult female caregivers in three regions of Ethiopia, comprising a mix of rural and urban communities. The adolescent respondent sample is comprised of a younger cohort aged 10-12 and an older cohort aged 15-17 at the time of baseline data collection in 2017-2018; data from this analysis are from round two of the survey carried out in late 2019-early 2020 among the younger cohort (n=4,321). Multi-stage random sampling was carried out with additional purposive sampling of school adolescents or adolescents with disabilities.

Polyvictimization was assessed by creating a summative measure of physical, emotional, sexual, school-based, peer, and gender-based violence items. Physical health was assessed via self-report and mental health was assessed using the General Health Questionnaire-12. Covariates included individual, household, and community level variables. Mediation was tested by assessing if there was a significant indirect association between polyvictimization and the dependent variables through resilience.

Preliminary evidence shows a mediating effect of resilience on adolescent outcomes. Polyvictimization reduced resilience, which in turn reduced adolescent physical and mental well-being.

This is the first study to explore the relationships between polyvictimization, adolescent health and mental health outcomes, and the mediating role of resilience among adolescents in LMICs. The results can be used to inform policies and targeted programming to effectively intervene during adolescence.

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RESEARCH SHOWCASE

GLOBAL HEALTH

MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

Trapped Populations or Non-migration by Choice: A Systematic Review Identifying the Barriers to Migration in the Face of Climate Change

Large populations living in vulnerable areas are subjected to a number of risk factors including the effects of climate change. Yet, these populations are faced with barriers which remove the option of migration. This study intends to focus on why these populations choose to stay and factors making them trapped.

This systematic review examines the association between climate change and the barriers and reasoning to why people choose not to migrate.

Following the Navigation Guide framework, literature searches were performed in the ProQuest and PubMed databases. Following up this search using a snowball sampling method, other qualitative studies were identified as having similar methods and met the inclusion criteria.

Overall, the 10 qualitative studies included showed that most vulnerable populations would choose to migrate if given the economic and social viability. Yet, due to liquidity constraints, most populations cannot afford to move and are trapped in place. In certain cases, there are also cultural and social barriers that exist that convince populations to stay in place.

For people in high-risk areas of climate change, the health, economic, and mortality consequences of non-migration will begin to outweigh the reasoning to stay. Policy needs to direct focus and efforts towards trapped populations which are too vulnerable to migrate. Further study is required in more diverse areas as each population has distinct economic, social, and cultural realities. We need to further understand these associations to develop methods for tackling this foreboding issue.

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RESEARCH SHOWCASE

GLOBAL HEALTH

MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

The Patient Voice: A Qualitative Evidence Synthesis of Women's Experiences of Cervical Cancer in Sub-Saharan Africa

Sub-Saharan Africa (SSA) leads the world in cervical cancer morbidity and mortality. However, there is limited research on cervical cancer patients' experiences with accessibility, affordability, and availability of treatment and diagnosis in SSA (Kizub et al., 2020; Park et al., 2018). Additionally, the literature is directed primarily towards screening and prevention rather than understanding the lives of women with cervical cancer in Africa (Kaila and Maree, 2018). The patient experience is a vital to identify women's needs and the impacts of their illness, which promote changes in policy and programming to address negative experiences and meet women's needs. A recent qualitative evidence synthesis suggests that the overall experience of cervical cancer in SSA is one of suffering (Maree et al., 2021). However, the Maree et al. (2021) study is the only known qualitative synthesis on this topic within the scope of SSA. Further syntheses are needed to close this gap in cervical cancer literature.

This project performed a qualitative evidence synthesis, using content analysis, to integrate and compare findings from qualitative studies with the goal of discovering new interpretations and common patterns of patient experience. The steps of content analysis as described by Bengtsson (2016) are: 1) decontextualization: identify meaning units, 2) recontextualization: include content and exclude "dross", or waste, 3) categorization: identify homogenous groups, and 4) compilation: draw realistic conclusions and new interpretations.

In total, 2788 articles were screened, 92 underwent full text review, 29 underwent quality review, and 18 were included in the analysis. Common themes across the studies were 1) suffering, 2) loss, 3) anguish, and 4) isolation. The new interpretation that emerged from women's experiences of cervical cancer in SSA was isolation across social, spiritual, and informational dimensions due to cervical cancer.

Qualitative evidence synthesis provides a rich analysis of women's experiences of isolation due to this devastating illness. Further qualitative research and syntheses are needed, particularly on palliative care and the psychosocial experiences of women to gain new understanding, which can be used to develop strategies to improve cancer care and the quality of life of women living with cervical cancer in SSA. Recommendations include incorporating qualitative findings into national health policies and health programming in SSA.

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RESEARCH SHOWCASE

GLOBAL HEALTH

MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

Conflict and Climate Change in the Northern Nile Region: A Case for Increased Surveillance of Water-Sensitive Diseases

As climate change intensifies, geographic regions that are heavily reliant on scarce natural resources become increasingly vulnerable. The Northern Nile Region's hydropolitical tensions, mostly arid climate, and downstream position make it uniquely susceptible to the effects of climate change and variability. Despite the regional vulnerability to water-sensitive diseases, water conflict, and rainfall variability and the documented relationship between all three, surveillance for key diseases is severely lacking, and existing data are difficult to find. This study attempts to form a more comprehensive understanding of the relationship between climate, conflict, and diseases and to highlight the need for enhanced disease surveillance in the Northern Nile Region.

Indicators from the Armed Conflict Location and Event Data Project (ACLED) were used to create a conflict index for the 56 subnational units in the Northern Nile Region. Standardized anomalies were calculated for monthly conflict events and conflict fatality over a 10-year reference period. Africa Rainfall Climatology (ARC) data obtained from the National Oceanic and Atmospheric Administration Climate Prediction Center (NOAA/CPC) archives were similarly analyzed. Interannual and intra-annual patterns in conflict severity and rainfall variability were assessed and mapped using ArcMap software. Outbreak data for schistosomiasis, cholera, and malaria were identified using ReliefWeb and Program for Monitoring Emerging Diseases (International Society for Infectious Diseases) databases.

Several key trends were discerned. In general, conflict trends increased across the region from 2012-2021, and rainfall levels became less predictable. Intra-annual analyses did not indicate obvious correlation between conflict and rainfall, but long-term analyses did. Periods of high conflict correspond to periods of increased rainfall variability, indicated by high-magnitude standardized anomalies above or below zero (± 3). Outbreaks of water-sensitive diseases correspond to periods of heavy rainfall.

Our findings indicate long-term conflict and rainfall are correlated and outbreaks of water-sensitive diseases follow heavy rainfall events. Previous studies support the notion that climate variability can exacerbate conflict and heighten the risk of infectious disease outbreaks. The Northern Nile Region is especially vulnerable to climate change and is at heightened risk of increasing conflict and disease. A One Health approach can be employed to address this regional burden in two ways: National health leaders must enhance health system capacity for water-sensitive disease surveillance, and efforts to prioritize human health and wellbeing in the face of climate change.

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RESEARCH SHOWCASE

HEALTH POLICY AND MANAGEMENT

MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

The Impact of Socioeconomic Differences in COVID-19 Health Inequalities in Albania

The COVID-19 pandemic showcased the vulnerability of the healthcare system in Albania. Although more than half of the population resides in poor areas, most medical facilities are located in one of the wealthiest areas, the capital, Tirana. The impact of this geographic distribution was evident during the pandemic as less affluent regions experienced inadequate healthcare service delivery. Compared to Tirana, these regions received substantially fewer COVID-19 tests and reported fewer hospitalizations due to a lack of medical facilities, resources, and an adequate health workforce. Furthermore, it is essential to consider the relationship between income, resources, and education as potential drivers of health inequities at the individual and structural levels. This critical analysis aims to emphasize the importance of strengthening the Albanian healthcare system and addressing the prevailing inequalities disproportionally affecting its residents.

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RESEARCH SHOWCASE

HEALTH POLICY AND MANAGEMENT

MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

Value-Added and In-Lieu-Of Services to Address the Social Determinants of Health in Medicaid Managed Care

Addressing social determinants of health (SDOH) is vital to ensuring a healthy community. These factors, such as income, stress, racism, access to food, and more, influence myriad health and wellness outcomes. Many people whom SDOH most negatively affect are beneficiaries of Medicaid. This federally and state-funded program insures millions of Americans living in or near poverty. Most Medicaid beneficiaries receive care through managed care arrangements in which a private organization contracts with a state to administer a portion of its Medicaid program.

The objective of this project is to determine how federal regulations permit and inhibit state and managed care organization (MCO) efforts to address SDOH among their Medicaid beneficiaries.

An analysis of federal regulations, state plans, state plan amendments, and state contracts with MCOs was conducted.

Federal regulations grant wide latitude to states and MCOs to provide services addressing SDOH, including through value-added and in-lieu-of service authority. In some cases, regulations inhibit service provision with financial disincentives. Yet, many states and MCOs offer a wide range of SDOH-focused services to their Medicaid beneficiaries.

The federal government could elicit more SDOH-related interventions in the Medicaid program by counting these services as direct medical expenses. Even without reform, states and MCOs can still effectively address beneficiaries' SDOH.

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RESEARCH SHOWCASE

HEALTH POLICY AND MANAGEMENT

MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

Evaluating Pandemic Related Burnout Within the Emergency Department

As the COVID-19 pandemic spread throughout the world, healthcare workers were faced with an increased risk of occupationally acquired infections, higher patient volumes, pervasive media coverage, concerns about personal and familial safety, concerns about access to appropriate personal protective equipment, and increased patient morbidity. As the pandemic nears two years in existence, few studies have evaluated compliance with safety precautions in the face of healthcare worker fatigue and burnout.

This study investigated the impact of the COVID-19 on the mental health and burnout levels of ED staff in two urban medical centers, Morristown Medical Center (Morristown, New Jersey, USA) and George Washington University Medical Center (Washington, DC, USA). Additionally, the survey evaluated the impact of burnout levels on compliance with universal precautions to protect healthcare workers.

ED staff who were employed full-time, part-time, or per-diem, including clinical staff such as physicians, nurses, and health aides along with administrative staff were eligible to complete the survey. The survey was administered online via Qualtrics which was emailed to providers. Participants were recruited through email distribution lists for both hospitals to ensure targeted inclusion.

91.3% reported feeling more stress at work during COVID than before COVID emerged in March 2020. A majority of respondents either had high (26.1%) or moderate burnout (43.5%). Burnout level is significantly associated with PPE usage level.

This study can inform future policy to better allocate staff and resources to ensure better healthcare worker safety, both physically from an infectious agent and mentally from the stressors of lifesaving work during a pandemic.

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RESEARCH SHOWCASE

HEALTH POLICY AND MANAGEMENT

SCHOOL OF MEDICINE AND HEALTH SCIENCES

Stalled Progress: Medical School Dean Demographics

The COVID-19 pandemic has exacerbated and uncovered the health disparities present in our communities and has increased the push for health equity across the country. With a majority-minority nation on the horizon for 2044, the need for physicians who represent our population demographics is increasingly important. Historically, minority populations have been restricted from opportunities and promotions in their medical training, memberships, and professional activities, which subsequently excluded them from participating and impacting decisions at the institutional level. Minority physicians are also important in solving the issues revolving around the shortage of primary care physicians. Black and African American physicians do not account for the majority of active physicians in the United States, yet a plurality of Black or African American physicians practiced primary care in 2018. Primary care physicians play an essential role in the prevention of hospitalizations and the management of chronic conditions, and evidence demonstrates more primary care physicians are associated with better health outcomes.

Medical schools have an important directive: to train the next generation of physicians. Faced with a primary care physician shortage, increasing numbers of under-represented faculty leaving academic medicine, and low representation of women in leadership positions, medical schools have a duty to implement solutions to alleviate these issues. Efforts have been made to create more diverse medical school classes, but those efforts are not mirrored in senior faculty demographics. The demographics of medical school deans in comparison with the United States' demographics and the current composition of active physicians was analyzed. We looked at the specialty, race/ethnicity, and gender of medical school deans in 2019. We identified that only 11% of deans were underrepresented minorities, 16% of deans were primary care physicians, and 18% of deans were women. When compared with the makeup of physicians in the United States and the population, these numbers are unrepresentative of national demographics.

The diversity of senior leadership matters to students. Medical schools should hire deans and senior leadership that represent a diversity of specialties, genders, races, and ethnicities. Future physicians need to acquire skills to care for increasingly diverse groups by learning about the unique needs of minority populations and by including social determinants of health, cultural humility, and systemic racism in medical curricula. By hiring deans with a variety of race/ethnicities, specialties, and genders, schools set an important precedent that could lead to more pipeline programs, increased underrepresented faculty retention, and more primary care physicians.

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RESEARCH SHOWCASE

HEALTH SCIENCES

CHILDREN'S NATIONAL MEDICAL CENTER

Perceptions of Surgical Stress Among Healthcare Professionals of High-risk Infants with Congenital Heart Disease

In the United States, 40,000 babies are born annually with congenital heart disease (CHD). As the leading cause of death in an infant's first life, CHD accounts for ~40% of birth-related defects here. These vulnerable infants require high-risk surgeries to survive. Surgical repair of these malformations carries high levels of morbidity, including postoperative cardiac arrest and mortality. Although a limited number of studies note certain patient demographics and underlying medical conditions increasing the risk of cardiac arrest, complete understanding of modifiable risk factors remains unknown. Cumulative stress is a potentially modifiable, yet unexplored, risk factor in postoperative cardiac arrest. Using qualitative methods in this pilot study of neonates undergoing high-risk cardiac surgery, we aim to identify and explore sources of stress, infant stress cues, and response as perceived by interprofessional health care professionals.

Selye's General Adaptation Syndrome, a theory of stress and stress response, guided identification, and exploration of sources of stress in high-risk infants with CHD across the care continuum from birth to postoperative management. Using purposeful sampling of healthcare professionals on high-risk infants with CHD in the cardiac intensive care unit and operating room were approached regarding participation in the interview process (n=6). Data were collected through one-on-one semistructured a priori interviews. Themes were extracted by sorting text segments with similar content into categories, then distilled into common themes across participants.

Following data collection and analysis, two major themes were identified: hostile medical environment and the art of clinical practice. Hostile medical environment encompasses the multiple psychological and physiological stressors encountered by infants and their parents, including impaired bonding between infants and parents. The art of clinical practice is defined as the integration of clinical knowledge, clinical judgment, and expert clinical practice applied to comprehensive patient care, which is purposefully matched to patient needs with the goal of optimized outcomes.

Healthcare professionals identified multiple stressors facing these high-risk infants, providing rich descriptions of overlying physiological, psychological, and environmental sources of stress which culminate into a hostile environment. Participants also spoke to the art of clinical practice; integration of clinical knowledge, clinical judgment, and expert clinical practice applied to comprehensive patient care, which is purposefully matched to patient needs to mitigate and manage stress in high-risk infants. These findings are important as identification of stressors and proactive management of infant stress response may enhance outcomes.

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RESEARCH SHOWCASE

HEALTH SCIENCES

COLUMBIAN COLLEGE OF ARTS AND SCIENCES

3-D Confocal Imaging to Identify Vestibular Ganglion Pathology in Syndromic, Congenital Vestibular Disorders

Pediatric cases of syndromic, congenital vestibular disorders (CVDs) present vision and balance symptoms that diminish their quality of life. Computed tomography scans reveal that these CVD children develop a sac-like inner ear with the semicircular canals missing or truncated. To better understand the pathology, this lab developed a chick model that replicates the sac-like inner ear phenotype by surgically rotating the developing inner ear or "otocyst" in two-day old chick embryos (E2). The model is called the ARO/s chick, since it requires Anterior-posterior axis Rotation of the Otocyst to generate a Sac-like inner ear. After hatching, ARO/s chicks encounter balance and coordination deficits that mimic the symptoms observed in CVD pediatric cases and confirm the suitability of the chick model to study the cellular aspects of CVD pathology. This study focuses on vestibular ganglion (VG) neurons whose peripheral vestibular axons transmit signals from hair cells in the vestibular endorgans to the brain. Children with CVDs have reduced number of VG neurons. Likewise, the number of VG neurons in E13 ARO/s chicks is reduced 32% on the rotated side (3,734 ± 151) compared to the intact side (5,559 ± 270) in serial, 20 µm, Nissl-stained tissue sections (n=3). By E13, the inner ear and vestibular nuclei neurons have formed distinctive features, so the age provides an important intermediate stage to study. To further investigate the number of neurons in the intact VG, we placed biocytin in the inner ear of normal and E13 ARO/s chicks in acute head preparations. The anterogradely-labeled VG neurons were fixed and cleared before imaging on a Leica SP8 confocal microscope. Confocal images of the entire VG, individual peripheral vestibular nerves, and the lateral brain surface were segmented using Imaris software to produce accurate 3-D models of the structures. VG neuron cell bodies were counted in 20 µm, confocal optical sections every 60 µm in parallel sections throughout the VG and added together to obtain total VG neuron counts (7,302±48.5) (n=2) in E13 normal chicks. Analysis of VGs in additional normal and ARO/s chicks is ongoing. We also found that clusters of VG neuron cell bodies are associated with individual peripheral vestibular nerves in H5 chicks, but not at E13. Therefore, 3-D images of VG neurons and their peripheral vestibular nerves will be acquired at H5 to determine whether VG neuron loss in CVDs occurs in particular vestibular nerves or nerve.

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HEALTH SCIENCES

COLUMBIAN COLLEGE OF ARTS AND SCIENCES

A Comprehensive Global Data Model for Exploring Cancer Biomarkers

Biomarkers represent essential tools indicating biological processes evaluated at the molecular, cellular, and physiological levels. These indicators are commonly applied in basic, clinical, and regulatory sciences to evaluate normal biological and pathogenic responses to exposure and therapeutic interventions. Biomarkers, therefore, comprise a fundamental nexus of biomedical investigation with expanding interest across medical disciplines. The FDA-NIH Working Group developed BEST (Biomarkers, EndpointS, and other Tools) as a resource for standardizing biomarkers to retrieve useful experimental and functional information based on the context of use. Additionally, advances in -omics technologies allow for using molecular biomarkers as principal instruments of biomedical inquiry, decision-making, and treatment. With these advancements, significant biomarker knowledge is made available. However, translation into clinical applications and knowledge discovery remains challenging due to the lack of harmonized comprehensive modeling of biomarker data.

Accordingly, we propose a standardized disease biomarker model (data.oncomx.org) to address the lack of harmonized and useful data. Using BEST guidance, our team initiated the development of a cancer-centric Biomarker Data Model (BDM) template populated with published biomarkers from major cancers, COVID-19, and comorbidities such as diabetes mellitus. The project involves heterogeneous data resources compiling represented in diverse formats based on biomarker content. Here, we expand the cancer biomarkers collection by curating published literature for cancer biomarkers that have not been FDA approved. The project thus aims to include additional data types (e.g., UniProtKB/Swiss-Prot accession, Disease Ontology ID, Uberon Anatomy Ontology, PubChem, and others) to provide a more precise, robust, and comprehensive formal biomarker ontology to support advanced machine intelligent cancer biomarker data exploration required for improved diagnostics and drug development.

Our work has resulted in the manual curation of more than 500 publications reporting mutation or differential expression in cancer translated into monitoring, susceptibility/risk, diagnostic, prognostic, predictive, pharmacodynamic/response, and safety biomarkers. Currently, our platform encompasses over 300 unique biomarker entries (5 from the US FDA and 16 from the Early Detection Research Network or EDRN), comprising 35 panel biomarkers. Currently, the project has resulted in biomarker mapping to over 200 cancer-related genes presenting 8 gene mutations, 223 differential protein expression, 16 microRNA types detected, and a panel of 50 glycans. Future directions include integrating additional data types such as cell types, chromosomes, and other measurable entities to expand the model.

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HEALTH SCIENCES

COLUMBIAN COLLEGE OF ARTS AND SCIENCES

Human Allogeneic NK Cells Modified to Express a TGF-beta Dominant Negative Receptor and IL-15 Display a Strong Anti-Tumor Activity in an NSG Mouse Model of Human Mesothelioma

Advanced cancers of the peritoneal cavity, such as mesothelioma, have limited treatment options available. Cell therapies offer a novel approach for the treatment of these recalcitrant cancers. However, tumor heterogeneity, the immunosuppressive tumor microenvironment (TME), and the dense tumor stroma in solid tumors are challenges that need to be addressed when developing new cell therapeutics. Here, we investigated the anti-mesothelioma activity of PBMC-derived allogeneic NK cells genetically modified to: (i) express a TGF-b dominant negative receptor II (DNR) that confers resistance to TGF-b in the TME and (ii) secrete IL-15 to enhance NK cell survival, activation and cytolytic activity. We showed that the DNR/IL15-expressing NK cells could abrogate TGF-b signaling, as demonstrated by the absence of Smad2/3 phosphorylation after 45min TGF-b treatment. The IL-15 component provided superior anti-tumor activity to the NK cells in 5-day co-culture experiments against the H226 and H2452 mesothelioma cells, with a 70% and 100% reduction in percent live cells remaining in culture that were tumor cells, respectively, compared to the nontransduced conditions at a 1:1 E:T ratio. Killing of H2452 was also achieved at 1:5 and 1:10 E:T ratios, with a 64 and 31% reduction in tumor cells of percent live cells remaining, respectively, compared to the nontransduced conditions.

Finally, our *in vivo* studies of an H226 intraperitoneal xenograft model in NSG mice demonstrated complete tumor clearance within 2 weeks of DNR/IL15-expressing NK-cell administration with only 1.25E6 NK cells given 7 days after tumor injection. In contrast, non-transduced and DNR only-expressing NK cells had only a negligible effect on tumor progression. Though anti-tumor activity was profound, survival was limited due to acute toxicity. This adverse effect has not consistently been reported by other groups evaluating NK or T cells modified to express IL-15, suggesting that our observations could be model-specific. Studies are therefore ongoing to evaluate whether prophylactic treatment can mitigate this toxicity without dampening the anti-tumor effect elicited by the DNR/IL15 NK cell therapy. Taken together, our results demonstrate that genetically modifying allogeneic NK cells to express a novel DNR and IL-15 may present a promising new treatment approach for intraperitoneal, TGF-b-expressing solid tumors.

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HEALTH SCIENCES

COLUMBIAN COLLEGE OF ARTS AND SCIENCES

The Potential use of Google Reviews to Assess Patient Satisfaction in the Emergency Department

Hospitals measure patient satisfaction using industry-standard survey instruments that consume significant financial resources and provide results in a delayed manner. A potential source of economical and real-time patient satisfaction data exists in online business review websites such as Google reviews; however, there is a paucity of research exploring the application of Google reviews for the measurement of patient satisfaction.

This investigation assessed the feasibility of harnessing Google reviews to measure patient satisfaction related to encounters involving Emergency Departments.

This was a cross-sectional study of Google reviews of a sample of Emergency Departments collected between April 7, 2021 to April 14, 2021 from each state of the U.S. Google reviews data was web scraped and natural language processing derived topic and sentiment features. Descriptive statistics were applied to the entire sample of Google reviews as well as groups aggregated by state and region. Multivariate linear and logistic regression explored the association of Google review topic features with overall Google Ratings, and 1-star and 5-star ratings, respectively.

A total of 13,833 Google reviews were analyzed across 255 Emergency Departments with a median of 30 (IQR 13.5 – 54.5) Google reviews per Emergency Department. The overall median Google rating by U.S. state was 2.6 (IQR 2.4 – 2.9). A majority (74%) of Google reviews contained free text amenable to natural language processing, and sentiment analysis revealed a majority of the reviews were categorized as either "Negative" or "Positive." Topic analysis revealed the most frequent topics included "Wait", "Physician", and "Other Staff." Multivariate logistic regression analysis found that the topics "Wait" and "Financial" were significantly associated with 1-star ratings and the topics involving staff were significantly associated with 5-star ratings.

Google reviews offer a feasible approach to the measurement of patient satisfaction in the ED. Future research is needed to optimize the natural language processing of Google reviews and devise strategies to stimulate greater volumes of Google reviews.

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HEALTH SCIENCES

COLUMBIAN COLLEGE OF ARTS AND SCIENCES

How do Autistic Adolescents Learn About other Autistic Peers?

In everyday social interactions, we use pre-existing notions and social feedback to learn about others. Individuals with Autism Spectrum Disorder (ASD) have marked social deficits that include learning about others' mental states. In previous studies, we showed that autistic adolescents differ from typically developing (TD) peers when learning about TD peers.

In this study, we are investigating how individuals with ASD learn about preferences of peers with ASD. We enrolled 119 participants typically developing adults in an online study. Participants were given two hypothetical peers whose preference profiles were adapted from ratings provided by a large cohort of adolescents with autism. One peer's preferences was more typical (i.e., similar to the average preference profile of the large autistic group). The other profile was atypical (dissimilar to this average profile). During the task, participants were shown stimuli consisting of a variety of items (foods and activities), and were instructed to rate the peer's preference for that item on a 1-6 scale. After they placed their rating, they were given feedback as to the peer's actual rating. Feedback was given on each trial and participants could update the estimates for the next following items based on this feedback. Importantly, participants never saw the same item twice. Following the preference learning task, participants provided their own preference ratings for each item. We used a linear mixed model to test whether participants updated their expectations about a peer's preferences through trial by trial feedback and whether updating differed when learning about the typical and atypical peer. Our preliminary analyses show an interaction effect of profile (typical / atypical) and time whereby prediction errors, the difference between ratings and the peer's feedback) decreased more when participants learned about the mean autistic profile compared to the atypical autistic profile. This indicates participants exhibited more learning for autistic peers with average compared to atypical interests.

In the next step, we will investigate whether participants relied on prior knowledge on the task. So far our study suggests that autistic children were able to learn about other more similar autistic children. Follow up analyses will investigate their learning strategies in more detail to reveal how similarity influences social learning. These findings can advance our understanding of social learning in ASD and potential differences between how autistic teens learn about and interact with autistic versus TD peers.

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HEALTH SCIENCES

COLUMBIAN COLLEGE OF ARTS AND SCIENCES

ANareCST – A Composition Based Random Forest Classifer of Anterior Nares Samples

Microbial communities living in the anterior nares of healthy adults can be categorized into 7 community state types (CSTs). Each CST has a specific pattern of prevalence and proportional abundance of key taxa that was determined using hierarchical clustering of the pairwise distances between samples. We quickly realized that there was a need to make the classification scheme universal and easily applicable across studies. We developed ANareCST – a composition-directed classifier that uses the Random Forest model to assign CST labels to newly sequenced 16S rRNA amplicon-based samples. The model was trained on the original 16S rRNA read count dataset (N=178) that was used to determine the CST classes. Only the most informative features i.e taxa (N=7) were retained in the dataset. Class imbalance between CSTs was resolved using Normalization techniques and Bootstrapping. The modified input was divided into training, testing and validation sets with a split ratio of 70:15:15. The Random Forest model was trained on the data with and without hyper parameter tuning using Grid Search CV. The resultant F1 score for our model was 87%. Next, we will demonstrate ANareCST's ability to classify samples with known CST labels with high accuracy. The prototype is built in python by making use of statistical packages like sklearn for model analysis and development.

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RESEARCH SHOWCASE

HEALTH SCIENCES

COLUMBIAN COLLEGE OF ARTS AND SCIENCES

Family Communication, Resilience, and Eating Disorders in the time of COVID-19 Among College Students: A Qualitative Approach

Research has shown a dramatic increase of eating disorders among young people during the COVID-19 epidemic. Understanding how the pandemic (re)shaped college-aged students' eating behaviors and family communication patterns may provide an improved practical understanding of how to cultivate a healthier social support system for college students with eating disorders both during and after major disruptive events, such as a pandemic. The current study seeks to achieve an in-depth understanding of how college students with eating disorders make sense of their lived experiences and (re)construct resilience as they navigate challenging times with their family members during the COVID-19 pandemic. 15 qualitative interviews are conducted to explore and describe the lived experience of college students with eating disorders The themes and codes derived from our analysis will provide insights into the "disempowerment traps" that perpetuate college students' disordered eating behaviors at individual, family, community, and system levels, as well as the role of communication in (re)constructing their resilience when navigating challenging times. Study results will generate helpful knowledge to mitigate eating disorders among college students, and provide them a healthier mental health environment even after the COVID-19 pandemic.

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RESEARCH SHOWCASE

HEALTH SCIENCES

COLUMBIAN COLLEGE OF ARTS AND SCIENCES

Differential Responses to Inhibition of p38 Isoforms in Melanoma Cell Lines with Distinct Oncogenic Driver Mutations

Melanoma accounts for only 1% of cutaneous malignancies, but is responsible for the majority of skin cancer-related deaths. Research aimed at developing personalized medicine is directed towards identifying new potential targets for oncologic therapies, and the p38 mitogen-activated protein kinase (MAPK) family is one potential target. Comprised of four distinct isoforms (*p38□, p38□, p38□, p38□*), p38 regulates stress-related cellular processes, and is also involved in control of skin tumorigenesis in the isoform- and context-dependent manners. However, the role of the individual p38 isoforms in cutaneous melanoma, particularly in the context of clinically relevant oncogenic driver mutations, remains incompletely understood. Here we analyzed the impact of p38 isoform-specific inhibition on melanoma cell lines harboring oncogenic *BRAF* or *NRAS* driver mutations. Cell cycle analysis demonstrated that in the *BRAF*-mutant (MT) A375 and WM164 cell line, both SB203580 (SB, a p38□/p38□ inhibitor) and C62 (pan-p38 inhibitor) caused G1 phase cell cycle arrest and a decrease in percentage of cells reaching S phase following 48 hours of treatment with these agents. In contrast, in the *NRAS*-MT SK-MEL-2 cell line treatment with SB, but not C62, resulted in a decrease in percentage of cells in G1 phase, as well as led to S phase cell cycle arrest. Furthermore, C62, but not SB, treatment increased the viability of the *NRAS*-MT SK-MEL-2, WM1361A, and WM1366 cell lines, but not that of the *BRAF*-MT A375 and WM164 cell lines, 48 hours post-treatment. Notably, in *BRAF*-MT 1205LU cell line, co-treatment with BRAF kinase inhibitor vemurafenib and SB sensitized the cells to vemurafenib-induced cytotoxicity, while co-treatment with vemurafenib and C62 resulted in an opposite effect. In *NRAS*-MT WM1361A and WM1366 cell lines, combination treatment with MEK inhibitor trametinib and SB or C62 resulted in a partial reversal of trametinib-induced inhibition of cell viability. In addition, Western blot analysis using SK-MEL-2, A375, and WM164 cell lysates collected 48 hours post-treatment with C62 demonstrated marked increase in activated phosphorylated ERK 1/2 (pERK1/2), whereas SB treatment increased pERK1/2 levels in A375 cell line only. Altogether, our findings suggest dissimilar and highly context-dependent roles for p38 isoforms in control of cell proliferation, cell signaling, and resistance to targeted therapies in cutaneous melanoma.

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HEALTH SCIENCES

COLUMBIAN COLLEGE OF ARTS AND SCIENCES

Nef Mediates Myelin Impairment in EcoHIV-infected Mice

HIV-associated neurocognitive disorder (HAND) is a spectrum of cognitive impairments that remain a common consequence of HIV infection. While the advent of combined antiretroviral therapy (cART) has substantially reduced the most severe forms of HAND, milder forms continue to affect 30-50% of HIV-positive individuals. Clinical and experimental studies have implicated preferential white matter damage in HAND pathogenesis, but the mechanisms underlying HIV-associated demyelination remain unknown. Our lab has previously shown that the HIV protein negative factor (Nef) impairs cholesterol efflux from macrophages in the periphery by downregulating and inactivating a critical cholesterol transporter, ATP-binding cassette A1 (ABCA1). Since oligodendrocytes require cholesterol for the synthesis, formation, and potentially the maintenance of myelin sheaths in the central nervous system (CNS), the current study examined the effects of Nef on myelin integrity using a chimeric murine model of HIV (EcoHIV). Adult C57BL6 mice were intracranially injected with EcoHIV; animals injected with virus lacking the Nef coding region (EcoHIVΔNef) or saline vehicle served as control. Immunohistochemical analysis of EcoHIV-injected white matter showed decreased myelin basic protein (MBP) immunoreactivity consistent with myelin lesions that were not observed in controls; this effect was attenuated in EcoHIVΔNef-injected animals. Furthermore, differences were observed in GFAP+ astrocyte and IBA1+ microglia/myeloid cell infiltration and activation between EcoHIV- and EcoHIVΔNef-injected animals. Further work will examine the molecular mechanisms Nef-mediated myelin impairment in the EcoHIV disease model.

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RESEARCH SHOWCASE

HEALTH SCIENCES

COLUMBIAN COLLEGE OF ARTS AND SCIENCES

Large Field of View High-Resolution Scanning Electron Microscopy to Evaluate Neuronal Synapses Throughout the Hypothalamus

The hypothalamus is an essential autonomic and endocrine control center in the brain and plays a critical role in maintaining homeostatic function. Numerous studies have documented an association between dysregulation in the hypothalamus, particularly the paraventricular nucleus of the hypothalamus (PVN), and a wide array of diseases. However, the majority of studies to date have focused primarily on molecular and/or cell signaling changes during disease progression. Importantly, information processing within the central nervous system (CNS) is also regulated by dynamic structural and anatomical interactions. While electron microscopy (EM) can provide nanometer resolution of brain structures, such as neuronal synapses, an inherent limitation of traditional EM is the small field of view and random sampling within a region of interest (i.e. PVN). Thus, we sought to develop an EM approach that would allow for the evaluation of anatomical structures across a large region of the hypothalamus. Brains from adult male C57B1/6J mice were collected and prepared for scanning electron microscopy (SEM) of the PVN. Large field of view high-resolution backscatter SEM was used to first construct a map of the entire brain section and generate interactive, zoomable maps of the PVN at a low magnification (~1000x). This image was then used to navigate precisely to the PVN and a high-resolution image (~80,000x) encompassing ~30-40% of the entire nucleus was acquired. Using this approach, all neuronal structures and subsynaptic features were readily identifiable. Thus, we next implemented a remote cloud computing strategy to begin evaluating *all* neuronal synapses within the PVN. Specifically, manual identification and tracing of neuronal synapses (Arivis software) was performed. Using this approach, preliminary findings indicate the ability to identify and characterize over 5,000 PVN synapses from a single animal. Ongoing evaluations are characterizing each synapse based on a number of criteria such as size, type, and mitochondrial inclusion, creating a unique database of PVN synaptic structures within individual samples. Additional studies are further using this approach to evaluate changes in synaptic morphology/input that may occur in the PVN during obesity. Collectively, these findings present a technique that allows for the precise identification of neuronal synapses within an overall structural and functional map of the PVN, which could provide valuable insight into hypothalamic regulation in both healthy and disease conditions.

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RESEARCH SHOWCASE

HEALTH SCIENCES

COLUMBIAN COLLEGE OF ARTS AND SCIENCES

GLP-1 Agonists Improve Depression Scores in Diabetes

Depression is a widespread condition that develops due to a multitude of etiologies. There exists a bidirectional relationship between depression and diabetes as the presence of either condition will exacerbate the other. Obesity, a common comorbidity to type 2 diabetes mellitus (T2DM), is often associated with depression. Glucagon-like-peptide-1 receptor agonists (GLP1A) act on the hypothalamus and may play a positive role in improving depression, by improving satiety and acting on brain centers responsible for anxiety & depression.

We hypothesized that when comparing the PHQ9 depression scores of obese patients with diabetes, subjects on a GLP1A medication (Liraglutide or Semaglutide) will have a lower PHQ9 depression score when compared to another novel T2DM medication such as Sodium-dependent glucose cotransporters-2 (SGLT2) inhibitors (primarily Empagliflozin), where Empagliflozin is deemed to be the active comparator to the GLP1A group.

Both GLP1A and SGLT2i group of meds cause comparable weight loss and have comparable positive cardiovascular outcome data in T2DM subjects. We conducted a retrospective chart analysis in 54 T2DM subjects (half on GLP1A, n=27 and another half on SGLT2i, n=27). All subjects compared were on either medication at a stable dose for at least one year. Compared subjects had HbA1c < 9.0, eGFR > 30, age 30-90 years. The mean BMI and HbA1C were similar in the compared groups. The study was conducted at Veterans Affairs Med Ctr (VAMC), Washington DC, where approx. 80% were men primarily of African American descent.

The mean PHQ9 score on the GLP1A takers was 9.89±1.27 vs non-GLP cohort had a mean PHQ-9 score of 15.09±1.28 (p=0.0058). When only men were considered, the mean PHQ9 for those on GLP1A was 9.61±2.04 compared to the mean of 15.37±1.45 among non GLP1A (p=0.0237). Next, we divided the cohort into obese and non-obese subjects. Among obese subjects (≥ 30 BMI) the GLP1A users had a mean PHQ9 score of 9.94±1.38 vs 15.28±2.02 (p= 0.0318) in SGLT2i class, showing a positive trend towards a beneficial effect of GLP1A use over SGLT2i. In a separate analysis we observed that were less subjects on GLP-1A with higher levels of depression (that is PHQ9 score 10 to 27) 51.9%, compared to SGLT-2i, at 77.8%.

It appears that GLP1A therapy in T2DM subjects with depression may be associated with lower depression scores especially among men in a VAMC cohort, indicating a possible positive role of GLP1A in improving depression in T2DM.

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HEALTH SCIENCES

COLUMBIAN COLLEGE OF ARTS AND SCIENCES

Implementation of Machine Learning for Glycan Image Recognition on GlyGen Database

Glycans refer to the carbohydrates (oligosaccharides and polysaccharides) attached to proteins, lipids and also RNA. They are known not only as a source of energy but also play essential roles in metabolism, inflammation, cancer, pathogen infection, cellular communication and more. With the increasing attention of glycobiology in the research field, it is important to have an integrated glycoinformatics database for ease of use. GlyGen (https://www.glygen.org/) is one of the resources that integrates and harmonizes information from publications and trusted databases such as UniProt, GlyTouCan, ChEBI and PubChem. However, the challenge remains between mapping glycan images from articles to the corresponding accessions from databases. To overcome this challenge, deep learning was utilized due to its success in image pattern recognition including medical image analysis, optical image studies and more. We adapted this technique to map glycan images to GlyTouCan accessions.

Glycan images in publications and databases are usually present in Symbol Nomenclature for Glycans (SNFG) format. A pipeline was developed using transfer learning of deep learning for glycan image recognition. In this study, transfer learning retrains a pre-trained network that originally recognizes different images to recognize different classes of glycans. We created 137 distorted images from each of the 33,081 glycan images from GlyGen, resulting in a total of 4,532,097 initial images for training. After testing and comparing 20 different pre-trained networks from Deep Network Designer Toolbox on MATLAB using 10 glycan classes (1370 images) on local machines, four of the networks obtained higher than 95% validation accuracy. Furthermore, we scaled up the testing to 100 glycan classes and DarkNet-19 outperformed all the other networks with the highest accuracy. Therefore, we trained the entire dataset with the DarkNet19 algorithm on High-Performance Computing with four GPUs running in parallel. As a final result, we achieved over 90% accuracy on the top result and over 99% accuracy in the top 5 results matched to the GlyTouCan accessions. The data used for training can be accessed and further evaluated from GlyGen website at (https://data.glygen.org/GLY_000339).

With the implementation of glycan image recognition, researchers can simply search for a glycan of interest by uploading an image from any resource. Currently, the algorithm only supports SNFG images. This application produces promising results and is expected to increase the searchability of GlyGen. A beta version of the software is available at https://data.glygen.org/upload.

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RESEARCH SHOWCASE

HEALTH SCIENCES

COLUMBIAN COLLEGE OF ARTS AND SCIENCES

The Role of Artificial Intelligence and Automation in the Diagnosis and Management of Otitis Media

Otitis Media (OM) is one of the most prevalent pediatric infectious diseases often comprising two common diagnoses: acute otitis media (AOM) and otitis media with effusion (OME). The current guidelines on managing OM have emphasized the need to accurately diagnose fluid presence in the ear, and the latest methods for OM diagnosis are often inaccurate or under-utilized. This frequently results in over-usage of antibiotics for AOM or misdiagnosis of middle ear effusion in OME. Emerging technologies including leveraging artificial intelligence (AI) and automation to improve OM diagnosis are likely to play a significant role for clinicians into the future. As a specific example, optical coherence tomography (OCT), capable of imaging body cavities and tissue, has recently been introduced as a promising technology for the accurate diagnosis of OM. This study was conducted to capture the current state of advances in automation and technological innovations in OM diagnosis.

A qualitative systematic review of PubMed, Scopus, and Google Scholar was conducted to analyze the role of AI and automation in the diagnosis and management of OM.

Across studies, use of AI has shown promising progress toward more accurate diagnosis of AOM. Clinicians can use AI and obtain reliable imaging focused on AOM and OME, aiding in both management and diagnosis. Applications of OCT have provided for high-quality detection, diagnostics, and monitoring prognosis of OM. Smartphone attachments employing acoustic reflectance have recently demonstrated great potential for cost-effective and remote OM diagnosis. Although smartphone otoscopes are available for remote use by parents, there remains risk for discrepancies when compared to data acquired by physicians.

Through the development of an automated diagnostic algorithm for OM, AI and automation technologies would provide several benefits to OM patients worldwide. This cost-effective approach can account for early detection of OM in pediatric patients, assist parents in deciding whether their children need professional help, and aid clinicians in managing OM with potentially more reliability than current technologies.

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RESEARCH SHOWCASE

HEALTH SCIENCES

MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

Prioritizing Important Regions of Sequencing Data for Function Prediction

Rapid advances in sequencing technologies profiling enable the measurement of millions of omic features. Genomics data holds great promise in understanding the causes, characteristics, and potential interventions for diseases because of the specificity of DNA snapshots and mutations from individuals. There are many challenges with this data, including non-independent observations, large noise components, nonlinearity, collinearity, and high dimensionality suitable for machine learning techniques to capture nonstructural patterns.

In recent years, these large datasets have made it possible for researchers to implement machine learning algorithms to study the genotype-phenotype association and develop models with high-performance metrics. However, in most cases of approaching health data problems with machine learning algorithms, the interpretability of the models is as vital as the quality of the fitted model. In this study, we present a unified and generic approach that not only compares the metrics of multiple machine learning algorithms and reports the best-fitted model but also assists in identifying the most important positions (features) in the genomic sequence data that contribute mainly to identifying phenotypic traits or variants. This generic approach uses the best-fitted model and based on that, highlights only those positions in the sequence data that have the highest impact in estimating the phenotype.

We have developed, deepBreaks, a computational method, to identify important changes in association with the phenotype of interest using multi-alignment sequencing data from a population. We validated deepBreaks in diverse applications of sequencing datasets, revealing new significant genotype-phenotype associations, experimentally validated associations, and a set of novel findings from related microbial strains, coronavirus families, SARS-COV-2 strains, and opsins. deepBreaks is open-source software, and the Python implementation is available online at http://github.com/omicsEye/deepBrekas.

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RESEARCH SHOWCASE

HEALTH SCIENCES

MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

Identifying Effect and Cause of Different Medications on COVID-19 Disease

The disease COVID-19 is caused by SARS-CoV-2, a coronavirus that first appeared in December 2019. COVID-19 is a dangerous virus that has killed millions of people throughout the world and left others with long-term health problems. As a result, it's critical to understand and gain significant insights from existing data regarding this deadly virus, as well as how the five distinct medications (Aspirin, Dexamethasone, Heparin, Remdesivir, and Tocilizumab) affect it. We used the N3C data enclave, which is an encrypted platform that contains data for COVID-19 patients from around the United States. We were able to look at the in-hospital mortality rates as well as the health consequences of taking these drugs without and within 24 hours of admission. Our findings demonstrate that using these drugs early in the course of a patient's illness can lower fatality rates and aid in the treatment of disease severity. To attain this objective, to eliminate confounding bias and balance features between these groups, the inverse probability of treatment weighting was applied. The primary outcome was 28-day in-hospital mortality, with pulmonary embolism (PE), myocardial infarction, and cerebral hemorrhage as secondary events. Inverse probability treatment weighting was used to compensate for confounding, and risks of in-hospital mortality were computed using marginal structural Cox and logistic regression models.

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HEALTH SCIENCES

SCHOOL OF MEDICINE AND HEALTH SCIENCES

Washington DC Regional ECMO Outcomes in COVID-19

COVID-19 mortality has disproportionately impacted racial and ethnic minorities in the United States. This disparity is particularly notable in Washington D.C. where African Americans make up 44% of the population, but 51% of COVID-19 infections and 75% of COVID-19 mortalities. Anecdotally, we saw high numbers of severe COVID-19 cases among young Hispanic adults and decided to explore this phenomenon by analyzing demographic characteristics for all COVID-19 patients who received VV-ECMO in Washington D.C.

We performed a multicenter retrospective chart review of all COVID-19 patients who received VV-ECMO support from March 2020 to March 2021 at the two hospitals that provide ECMO in Washington D.C. Patient selection was uniform across both institutions, with basis in the original CESAR and EOLIA selection criteria. To future explore socioeconomic status (SES) as a corollary to ECMO cannulation, we merged patient zip codes with zip code median household income from the American Community Survey.

There were 38 patients with COVID-19 who received VV-ECMO in Washington DC. Median age was 45 years and ages ranged from 28 to 65 years. 61% of patients were male and 71% were single. 57.9% of patients were Hispanic and 29.0% were non-Hispanic Black. 44.7% of patients were insured through Medicaid and another 13.2% were insured through a locally-funded public insurance designed for low-income persons ineligible for Medicaid. 63% of patients lacked primary care physicians. 94.7% were from D.C. area. 83.3% of patients from the D.C. area lived in zip codes with a median household income that is below the median household income for the city ($85,203).

Only 11% of adults in Washington D.C. identify as Hispanic. Hispanics made up 19% of COVID infections in the city, but 58% of COVID-19 VV-ECMO cases. This suggests that, in our region, Hispanics may be over-represented among young and middle-aged adults with severe COVID-19 infections, which is why they are more likely to require ECMO support. These data highlight the great need to focus on this vulnerable population, with continued efforts to combat misinformation about the vaccines and partner with trusted persons in the community.

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HEALTH SCIENCES

SCHOOL OF MEDICINE AND HEALTH SCIENCES

Centering Community Voices in The Black Male Dementia Caregiver Burden Study

Black Americans have historically faced exclusion and exploitation at the hands of medical and research institutions, fueling mistrust and hesitancy to participate in biomedical research. Additionally, the COVID-19 pandemic, which has disproportionately impacted Black Americans, has presented further challenges to the recruitment of underserved and underrepresented research subjects. The Black Male Dementia Caregiver Burden Study aims to advance Black men's brain health by analyzing the cognitive, physical, and physiological effects that caregiving has on Black male caregivers.

Our ongoing study is currently in the recruitment phase. The purpose of this project is to build sustainable relationships and partnerships with Black community organizations in order to recruit Black men for the study.

Our study utilizes a Community-Based Participatory Research (CBPR) approach. The CBPR approach was chosen because it centers Black voices by fostering trust, agency, and advocacy. We identified community members and organizations, such as Historically Black College and University (HBCU) Alumni Networks, dementia/brain health advocacy organizations, and DC crisis centers, all of whom have strong ties and followings among Black men, particularly Black men who are caregivers of loved ones with dementia. To build community partnerships, we conducted community presentations, in-person tabling, focus groups, testimonials, and media outreach.

The use of outreach strategies rooted in the CBPR model resulted in significant increases in the recruitment of Black men, as well as evidence of trust and mutual support among community members and organizations. When asked how they found out about our study, new participants cited the following: advertisements in a historically Black newspaper, presentations and podcasts by the Principal Investigator at Black community organizations, local news segments that featured the study, and "word of mouth" of current and former participants.

Findings from these efforts informed and tailored our ongoing recruitment strategies. The success of several recruitment strategies for this study offers support for the CBPR model in the recruitment and engagement of underserved and underrepresented research subjects. We believe that the implementation of recruitment techniques grounded in CBPR fostered productive dialogue with community organizations and, most importantly, established trust between the researchers and Black male research participants. Evidence from the recruitment phase of the Black Male Dementia Caregiver Burden Study may inform efforts to address the persistent under-representation of Black Americans in biomedical and health research.

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RESEARCH SHOWCASE

HEALTH SCIENCES

SCHOOL OF MEDICINE AND HEALTH SCIENCES

A Comparative Study of Viral Transport Media Versus 0.9% Normal Saline with the Hologic Panther Aptima SARS-CoV-2 Assay

The global shortage of testing supplies caused by the COVID-19 pandemic necessitated the use of alternative testing methods not typically used for clinical specimens. In our lab, it was important to compare the limit of SARS-CoV2 detection in different types of collection media and temperatures that were suggested by the Food and Drug Administration (FDA) to prove the reliability and suitability of the testing material. The objective of this study was to statistically compare the qualitative and quantitative results between 0.9% normal saline and Remel M4RT viral transport media (VTM) using the Hologic Panther SARS-CoV2 testing assay. The specimen types used for this study were a series of spiked samples of 0.9% normal saline and VTM with ZeptoMetrix NATtrol™ SARS-Related Coronavirus 2 ranging from a high dilution of 8.3 x 103 cp/mL to a low dilution of 16.28 cp/mL diluted over 10 samples. Each dilution was tested in triplicate at different temperatures simulating clinical specimen transport at room temperature (22.4 degrees C), refrigeration (4.1 degrees C), and frozen (< -70 degrees C). Specimen results were consistently comparable qualitatively at a dilution of ≥1.04 x 10^3

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HEALTH SCIENCES

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Examination of the Brain Health of Former NCAA Division I Football Athletes and Former NFL Athletes

The purpose of this study was to examine the brain health concerns of former NCAA Division I (DI) college football and National Football League (NFL) players. This study aimed to understand (1) How post-concussion symptoms and concerns about brain health compare between former DI and NFL athletes, and (2) How DI and NFL athletes describe the role that playing football had on their brain health.

We utilized a study design incorporating a structured questionnaire of former NFL and DI football athletes (N = 133) and subsequent semi-structured interviews (N = 19). Questionnaire data was analyzed using descriptive and inferential statistics; analysis of the interviews was descriptive.

There was a significant difference in the number of concussions sustained between former NFL and DI football athletes, but no significant difference in the Neurobehavioral Symptom Inventory (NSI) scores or self-reported worry about future brain health, measured on a scale from 1-8.

No significant difference exists in concern about brain health between former NFL and DI football athletes despite former DI football athletes having significantly fewer self-reported concussions and less total playing time. Healthcare professionals should recognize that worry about sequelae from concussions is individual to each patient and cannot be based solely on level of play.

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HEALTH SCIENCES

SCHOOL OF MEDICINE AND HEALTH SCIENCES

Impact of Being Multilingual on Online Science-based Examinations

Individuals categorized as English-language Learners (ELL) include recent immigrants from countries in which English is not the primary language of instruction, international students studying in U.S. institutions of higher education (IHE), and those individuals who arrived in the United States as children or teenagers but whose parents do not primarily speak English in the home. Eighteen percent (18%) of incoming college students are non-native English speakers, with international students making up approximately 40% of IHE populations. Complexity of the language in both teaching and assessments in science-based courses may negatively affect ELL performance on aptitude tests. At the IHE level research is limited regarding the resources needed for ELLs. Academic programs within the SMHS Biomedical Laboratory Science (BLS) department are offered primarily online and asynchronously to a highly diverse student population, including ELLs. BLS faculty noted anecdotal evidence that students who are ELL tend to perform lower than their non-ELL peers in science-intensive courses.

This project’s objective is to explore the relationship between English language proficiency and performance in online, asynchronous science courses, as measured by scores on multiple-choice examinations. We also seek to explore the barriers that ELL students experience in the online learning environment.

We utilized the Language Background Questionnaire (LBQ) to measure relative use of English and the Combined English Language Skills Assessment (CELSA) to assess participants' level of language experience and proficiency. Statistical analyses including correlation was performed between the CELSA, LBQ, and course final examination scores.

To date, among 46 participants (80.4% female; 19.6% male; age range 22-51) 69.6% have a bachelor's degree as their highest level of education. Thirty-five percent had no previous healthcare experience, while 34% were already medical laboratory technicians. Twenty-six percent did not consider English as their native language and therefore will be interviewed regarding their experiences and recommendations. CELSA scores ranged from 53 to 75 (highest possible score) with only 21.7% scoring below 70. Preliminary analyses showed no significant correlations between CELSA scores and final exam scores in the Clinical Biochemistry course.

Recruitment is ongoing to increase statistical power. Relationships between other variables will be conducted, as well as qualitative analysis of interviews with ELL students. Using this data we plan to develop, implement, and examine interventions and strategies that may improve learning and performance in online courses for all students, but particularly ELL.

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RESEARCH SHOWCASE

HEALTH SCIENCES

SCHOOL OF MEDICINE AND HEALTH SCIENCES

Comparative Study of the Biofire FilmArray Torch 2.1 Assay and the Thermo Fisher Quant Studio 12K Flex Amplification Test for SARS-CoV-2 Detection

Corona viruses are zoonotic viruses that have caused disease in both animals and humans. The most important in this group is severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), the virus that causes COVID-19. This virus has emerged as the leading cause of a pandemic that has claimed millions of lives worldwide. This has prompted an immediate need for the testing of SARS-CoV2 by clinical laboratories everywhere.

Patient nasopharyngeal samples were tested on the Biofire TORCH using the respiratory panel 2.1 and then on the Quant 12K Flex for SARS-CoV2 under the emergency use authorization from the U.S. Food & Drug Administration for use in laboratories. Results were collected and compared.

We evaluated the performance characteristics of both platforms using 109 samples, the overall agreement between the two testing platforms was 96.3%, The negative predictive value was 97.9% and the positive predictive value 93.8%. Sensitivity was 88.2% and specificity was 98.9%.

Testing between platforms yielded high correlation and specificity for the rapid testing and detection of SARS-CoV2 which can aid in the diagnosis and treatment of the virus.

Primary Presenter

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RESEARCH SHOWCASE

HEALTH SCIENCES

SCHOOL OF MEDICINE AND HEALTH SCIENCES

Leadless Pacing Post Transcatheter Aortic Valve Replacement

High degree atrioventricular block (HDAVB) post Transcatheter Aortic Valve Replacement (TAVR) remains one of the most common complications post procedure given proximity of the aortic valve to the conduction system. HDAVB post TAVR leading to pacemaker implantation has been reported to be as high as 22% and is associated with higher inpatient hospital mortality. Leadless pacemakers (PPM), first approved for use in the United States in 2016, were created to avoid complications associated with transvenous endocardial pacemakers. Leadless PPMs are most commonly used in elderly patients who require single chamber pacing.

Given limited data within the literature, we reviewed safety and efficacy data in TAVR patients who received leadless PPM post TAVR for treatment of HDAVB.

Eleven of 329 patients undergoing TAVR at our institution between 1/16/18 and 10/19/21 who received a Micra® leadless pacemaker post TAVR were included in this case series. Demographics, complications, along with pacing and implantation data at time of implant and follow-up was examined. Follow-up data ranged from 7 days to 25 months post implantation.

Out of the 11 patients, 6 received an Edwards® Sapien 3 valve and 5 an Edwards® Sapien 3 Ultra valve. Three patients received a MicraVR® and eight a MicraAV®. Three of the eleven patients were lost to followup after receiving MicraAV® PPM. One patient died 5 days after implantation of a MicraAV® due to noncardiac causes. MicraAV® recipients at followup were found to have atrial mechanical sense, ventricular pacing (AM-VP) an average of 23% of the time, ventricular only pacing an average of 35%, atrial mechanical sense, ventricular sense (AM-VS) average of 0.3%, and ventricular sensing (VS) 41.3% of the time. Sensitivity, impedance, and thresholds were stable when compared to implantation data except for 1 patient who had a significant increase in capture threshold.

Based on this case series, leadless pacing is a safe and viable alternative to traditional PPMs for treatment of HDAVB post TAVR. No post procedure complications were seen. For those who received MicraAV®, successful atrial mechanical sensing, ventricular pacing was demonstrated thus proving atrioventricular synchrony is possible in this patient population.

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RESEARCH SHOWCASE

HEALTH SCIENCES

SCHOOL OF MEDICINE AND HEALTH SCIENCES

Determining the Efficacy of Saliva in the Detection of SARS-CoV-2 Using Contrived and Clinical Samples

Since declared a pandemic, 370 million cases of COVID-19 have been confirmed globally, resulting in over 5,500,000 deaths. The unprecedented burden that the COVID-19 pandemic has placed on individuals and healthcare systems highlights the need for rapid, reliable techniques to detect the SARS-CoV-2 virus. While saliva is a promising sample for detecting the SARS-CoV-2 virus using molecular assays, often SARS-CoV-2 tests do not include saliva as an approved sample. Benefits of using saliva to test for SARS-CoV-2 include reduced discomfort to patients during sample procurement, simplified collection methods, and possibly increased sensitivity and specificity of SARS-CoV-2 detection. In this study, we evaluate the efficacy of saliva in detecting SARS-CoV-2 on the Cepheid Xpert® Xpress SARS-CoV-2/Flu/RSV reverse transcription PCR assay. Evaluation of sensitivity and specificity of SARS-CoV-2 detection will be performed in clinical and contrived saliva samples. Cellular debris and mucus will be removed from saliva by centrifugation, and the supernatant will be analyzed. Detection of SARS-CoV-2 between COVID-19 positive saliva and nasopharyngeal samples will be compared. Finally, the sensitivity of unprocessed and centrifuged saliva samples using contrived samples will be compared. Heat-inactivated SARS-CoV-2 will be spiked into a pooled saliva matrix that tests negative for SARS-CoV-2. After, serial dilutions will be prepared and split to create an unprocessed and centrifuged sample which will be tested in replicates on the Xpert® Xpress SARS-CoV-2/Flu/RSV assay. Positive Percent Agreement and Negative Percent Agreement will be calculated for unprocessed and centrifuged saliva samples using the nasopharyngeal test result as the reference standard. Using data from the contrived samples, the limit of detection will be compared between unprocessed and centrifuged samples. In positive samples, cycle threshold values will be compared between nasopharyngeal, unprocessed, and centrifuged saliva samples. The results from this study will provide valuable insight into the validation of saliva as an easy to procure biological sample for detecting SARS-CoV-2 and how processing impacts the sensitivity of SARS-Cov-2 detection in these samples. Based on previous literature, we expect substantial agreement between saliva and nasopharyngeal samples in the detection of the SARS-CoV-2 virus.

The views expressed in this abstract are those of the authors and do not necessarily reflect the official policy or position of the Department of the Air Force, Department of Defense, nor the U.S. Government. No Federal endorsement of Cepheid is intended.

The views of Cepheid are not necessarily the official views of, or endorsed by, the U.S. Government, the Department of Defense, of the Department of the Air Force. No Federal endorsement of Cepheid is intended.

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HEALTH SCIENCES

SCHOOL OF NURSING

Implementation of a Transitional Care Model to Decrease Readmissions for Ischemic Stroke and TIA Patients

Stroke is a significant cause of morbidity and mortality in the United States. Poor continuity of care after hospitalization can increase the risk of adverse health outcomes such as unplanned readmissions for stroke and transient ischemic attack (TIA) patients. Transitional care models (TCMs) can be used to improve the coordination of care post-discharge.

The purpose of this Quality Improvement (QI) project was to develop, implement, and evaluate a TCM for ischemic stroke/TIA patients over a 3-month period. This project had four aims: 1) to decrease the unplanned 30-day readmission rate in the intervention group, 2) for all eligible patients to be enrolled in the TCM after discharge, 3) to have all enrolled participants receive all components of the TCM, and 4) for all participants to express satisfaction with the TCM.

A TCM was designed and piloted for adult patients discharged home from the project site hospital with a diagnosis of ischemic stroke or TIA. The TCM consisted of patient education materials, scheduling of a primary care provider appointment, and two follow-up phone calls with surveys at 7-days and 30-days post-discharge. Unplanned 30-day readmission rates were compared before and after project implementation.

Nine participants were enrolled. Five of these participants (55.6%) completed both the 7-day and 30-day surveys and comprised the intervention group. 100% of all eligible patients were contacted for enrollment. The post-intervention mean 30-day readmission rate of 3.7% (SD = 2.97) was significantly lower ($p < .05$, $t(4) = 2.98$) than the pre-intervention rate of 35.0% (SD = 13.39). All participants gave a score of 3 or higher on Likert-scale questions ("agree" or "strongly agree") with regards to overall satisfaction with the TCM after completing all components.

While this was a small pilot project, results demonstrated that the TCM may have had a positive impact on readmission rates. The TCM was also well-received by participants and provided useful feedback on the hospital's stroke program. Long-term implementation of a TCM may be of benefit in this patient population to improve health outcomes such as unplanned hospital readmissions.

Primary Presenter

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RESEARCH SHOWCASE

HEALTH SCIENCES

SCHOOL OF NURSING

A Community Educational Intervention to Improve Firearm Safety Behaviors in Families

Every day in America, children are injured or killed from the accidental shooting of firearms. Additionally, few households with children report storing all guns unloaded and locked up. Recent evidence supports education on safe firearm storage as an effective intervention in promoting firearm safety in families with children. However, Pediatric healthcare providers often do not have enough time for firearm education during well visits

This Quality Improvement (QI) project aimed to use an educational intervention with statistics on firearms in children and implemented the Asking Saves Kids (ASK) campaign to assess and improve firearm safety behaviors in families with children less than 7 years of age at a preschool in Virginia.

This QI project measured, monitored and evaluated the impact of an educational intervention to improve firearm safety behaviors in families using a pretest/posttest design. Participants completed a demographic survey and the ASK questionnaire to rate their firearm safety behaviors. Baseline data at pretest and 4-6 weeks post intervention were evaluated using McNemar's test to evaluate changes over time within categorical outcome variables related to firearm safety behaviors.

36 participants completed both the pretest and posttest. McNemar's test was not statistically significant for any project aims. However, in evaluating all families throughout the project, 12.7% responded with a self-reported change in firearm safety behaviors from baseline. Qualitative data from families who did not ask were also evaluated and grouped into themes.

This pilot project is cost free, effective, and extends the reach of the ASK questionnaire into the community while instilling a heightened awareness of the dangers that unsafely stored firearms pose to children. Additional studies are recommended.

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HEALTH SCIENCES

SCHOOL OF NURSING

Certified Nurse Program: Mitigating Barriers to Certification

Specialty nursing certification, the formal recognition of a nurse's specialized knowledge, skill, and expertise, is associated with positive impacts on patient, nurse, and organizational outcomes. Recognizing these benefits, improving certification rates was prioritized as a strategic goal for the nursing department. However, rates remained unchanged. A pre-survey identified that perceived barriers, mirroring those cited in the literature persisted, including exam costs, no time to study, a lack of institutional support, a lack of institutional reward and recognition, no access to preparation courses, discomfort with test-taking, and unsure of how to pursue the exam. A structured program to address these barriers was needed.

This project aimed to develop and evaluate a Certified Nurse Program to address the perceived barriers to certification by implementing initiatives to increase the utilization of available resources; prepare nurses to take and pass the CMSRN, PCCN, and CCRN exams; and recognize nurses pursuing and maintaining a specialty certification to improve the perception of organizational support.

This program was implemented at a 200-bed suburban hospital in Maryland. Support, preparation, and recognition initiatives were implemented to mitigate barriers to certification. Support and preparation efforts were aimed at nurses pursuing the Certified Medical-Surgical Registered Nurse (CMSRN), the Adult/Critical Care Nursing (CCRN), and the Progressive Care Certified Nurse (PCCN) exams, including expanding the pre-paid voucher offering, providing review classes, and launching a Certified Nurse Program Website. Visible recognition events were hosted for both new and incumbent certified nurses. All 900 nurses were invited to participate in a pre-and post-implementation survey to determine awareness of available resources, barriers to certification, and the perceived organizational support (POS) score.

Overall certification rates increased from 31% to 37%. Twenty-three nurses participated in the review classes, and 10 (44%) passed their certification exam, 4 (17%) failed, 7 (30%) were still to test, and 2 (9%) left the organization before testing. Sixty-nine nurses completed the pre-survey, and ninety-six completed the post-survey. Classes were the most identified resource. Time to study, cost of the exam, and discomfort with test-takings remained the most identified barriers to certification. An independent samples t-test revealed no difference in POS score.

A structured program to mitigate perceived barriers can improve certification rates. With organizational support, these targeted initiatives can be sustained and serve as a model for other specialties, decreasing overall perceived barriers and enhancing perceptions of organizational support.

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RESEARCH SHOWCASE

HEALTH SCIENCES

SCHOOL OF NURSING

Effect of a Web-based Educational Intervention in Improving Depression Knowledge and Help-seeking Behavior in Women

Based on a need assessment conducted in a faith-based organization, we noticed a gap in depression knowledge, an unwillingness to seek help, and a lack of open dialogue among the women. Studies have shown that low depression literacy impedes early recognition, prevention, and willingness to seek help.

This study evaluates the effects of web-based educational intervention in improving depression knowledge and help-seeking behavior among women in a faith-based organization.

Our research question is “What is the effect of a web-based educational intervention on depression literacy (BluePages) in improving depression knowledge and help-seeking behavior within one month among women in a faith-based setting?”

Using a quantitative pre-post design method, this study utilized a convenience sample of 38 women recruited from a community church. Participants were between 18-65 years of age, English speaking, with or without depressive symptoms, or clinical diagnosis of depression. Participants completed educational modules on the BluePages website and pre-post questionnaires measuring depression knowledge and help-seeking behavior using a Depression Literacy tool (DLit) and the General Help-Seeking Questionnaire (GHSQ).

The study revealed improved depression knowledge using a paired sample t-test, revealing a p-value of 0.01 and a mean difference between the pretest (M=12.63, SD=3.92) and posttest scores (M=11.16, SD= 3.91). There was no significant difference in the help-seeking behavior scores for pretest (M=4.15 (SD =0.95) to posttest scores (M=4.36 SD =1.00).

Findings from this study will add to the existing body of knowledge on depression literacy. However, additional research is necessary to generalize the findings to a larger population.

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RESEARCH SHOWCASE

HEALTH SCIENCES

SCHOOL OF NURSING

Structured Type 2 Diabetes Education to Improve Self-Monitoring Blood Glucose, Self-Care Management, and Diabetes Knowledge in a Multicultural Family Practice Clinic

The family medicine residency clinic (FMRC) providers have neither sufficient time nor continuity of care to provide diabetes education to effectively reduce A1c levels. The FMRC has 500 multicultural type 2 diabetes patients with an A1c >7% that has increased by 23.2% in the previous five months. Multiple studies have demonstrated that structured diabetes education can significantly decrease blood glucose readings, improve self-care management, and diabetes knowledge to attain optimal glycemic control.

The objective of this project was to implement an evidence-based project (EBP) in FMRC to improve participants diabetes knowledge, self-care management, and blood glucose levels.

A four-week, pre-post, same subject project was conducted in the FMRC. The intervention was a 40-minute structured group diabetes education delivered face-to-face. Outcome measures include self-monitored blood glucose, self-care management, and diabetes knowledge. Based on statistical power analysis, a convenience sample of 21 type 2 diabetes patients with an A1c >7% were recruited. Participants' age ranged from 38 to 82 years old with 71% of the participants Hispanic and African American.

The 7-day average Self-Monitored Blood Glucose (SMBG) decreased from 168.76 mg/dl to 155.05 mg/dl, $t=3.97$, $p<0.001$. The modified DKT score improved from 64.55% to 78.84%, $t=5.04$, $p<0.001$. A paired t test determined a statistically significant relationship between structured group diabetes education with SMBG and diabetes knowledge. The DSMQ was not statistically significant (pre=33.95, post=35.52, $p=0.169$); however, power analysis showed a small effect size ($d=0.28$).

Structured group diabetes education is an effective intervention among type 2 diabetes patients in the multicultural setting to improve SMBG and diabetes knowledge.

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RESEARCH SHOWCASE

HEALTH SCIENCES

SCHOOL OF NURSING

Social Determinants of Health and Outcomes in Rural Children in America

This poster presents results from a scoping review of the literature about social determinants of health (SDOH) and health outcomes in rural children. Across the rural-urban continuum, children in America experience SDOH including food insecurity, poverty, and inadequate housing, but SDOH affect rural communities differently than urban ones. There are some unique challenges in rural areas, such as environmental and work exposures, distance from specialty providers and lack of social structures and care coordination, which negatively impact health.

An initial search in CINAHL and PubMed databases generated nine hundred and thirty-seven records using MeSH terms of social determinants of health, health status disparities, healthcare disparities, socioeconomic factors, rural health, rural health services, rural population, child, child health services, and United States. Studies published between 2011 and 2022 that included rural American children, social determinants of health, and health outcomes and/or disparities were considered for abstracting. Studies that focused on specific health conditions, homelessness, immigrants, and school health were excluded. Sixteen articles remained for inclusion. The majority of study designs were retrospective secondary data analyses and reported the use of a variety of tools and analysis methods.

The included samples had a total sample of over 700,000 children. Rural America has fewer pediatricians, community-based services, and care management systems and without these services, fewer children are insured, immunized, screened for developmental delays and more experience potentially preventable conditions. Rural children had lower attendance rates to well-child visits, travel five times as far to get to a children's hospital, lag in educational attainment, disproportionately represent the most deprived, and experience more severe injuries. At the same time, rural communities reported strong cultural capital that may attenuate these gaps. Unemployment and food desserts were determined to be explanatory for poorer outcomes in rural areas.

This review provides a contemporary synthesis of the state of knowledge about SDOH and rural children's health in America. Future work is needed to improve access to housing, education, pediatrician care, and social structure. Future interventions are needed that improve surveillance for SDOH, recruitment of non-traditional and cross-disciplinary providers, and care coordination within and outside the rural practice sites. Finally, as more scientists research rurality, the literature needs a consistent definition of the term to allow for true comparison across studies.

Equipped with accurate, consistent data, improvements can be made to support these children and their families toward healthier outcomes.

Primary Presenter

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RESEARCH SHOWCASE

HEALTH SCIENCES

SCHOOL OF NURSING

Ventilator-Associated Pneumonia Bundle Compliance: A Quality Improvement Project

In many hospitals, patients requiring mechanical ventilation are managed in an intensive care unit (ICU) or a unit that requires a higher level of care compared to a medical-surgical unit. Patients on mechanical ventilation are susceptible to acquiring ventilator-acquired pneumonia (VAP) if precautionary measures are not followed.

The purpose of this quality improvement project was to improve nurse's knowledge on VAP and VAP bundle interventions. Outcomes for evaluation were: (1) RN knowledge enhancement on VAP and VAP bundle interventions, (2) incorporation of knowledge into RN clinical practice, and (3) deduction in VAP incidences. Both the knowledge enhancement and the deduction in VAP incidences were based on pre- and post-intervention comparisons.

A comparative, before and after design for data collection and analysis was utilized. A modified basic knowledge assessment test was given pre- and post-intervention. A self-assessment survey assessed knowledge enhancement and incorporation of knowledge into RN practice.

Thirty registered nurses participated in the intervention and completed the self-assessment survey. The results were significant, t (16.574) =3.268, p=.005. The rate of responses in the post-test (M=27.87, SD=2.53) was significantly higher than that of the pre-test (M=20.87, SD=8.31). Of the thirty nurses who participated in the project, 96.7% completed the self-assessment survey identify that their knowledge was enhanced and that they would incorporate this education into their practice.

We identified an improvement in RN knowledge on VAP and VAP bundle interventions on the nurses who participated in the education project. Self-assessment surveys highlighted that nurse would incorporate the learned education into their current practice and felt as though their knowledge had been enhanced.

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HEALTH SCIENCES

SCHOOL OF NURSING

Impact of the COVID-19 Pandemic on Community Resilience Practice: Lessons Learned from an Academic-Community-Government Partnership to Reduce Liver Diseases

The Coronavirus 2019 (COVID-19) pandemic abruptly disrupted essential health services worldwide, as more pressing community needs including COVID-19 screenings and vaccinations, masks, hand sanitizers, and food rightly took precedent over health screenings such as hepatitis screenings. Chronic hepatitis b virus or hepatitis c virus infection, often asymptomatic, increases the risk of liver cancer. The aims of the present study are to (1) describe the impact of COVID-19 pandemic on a collaborative academic-community-government (ACG) partnership to improve the viral hepatitis screening, and (2) identify approaches to effectively leverage an ACG partnership to reduce liver diseases in the Washington-Baltimore metropolitan region.

The Washington-Baltimore Metropolitan Area Hepatitis B Virus Task Force was convened and consisted of eight local organizations: four community clinics/community-based organizations, three health departments, and one academic institution. We conducted a qualitative study using semi-structured key informant interview guide which focused on the adjustments as well as challenges and barriers of the ACG partnership during COVID-19. We adopted Israel's partnership evaluation within community-based participatory research (CBPR) interview guide which consisted of questions on capacity building of task force members to participate in CBPR partnerships. All interviews were audio-recorded, transcribed, and thematically coded.

Interviews were conducted with 15 of the 20 partnership members: two academic, nine community, and four government members. Three main themes emerged: (1) communication barriers; (2) screening barriers; and (3) adjustments to overcome barriers. ACG partnership members discussed communication barriers with patients as well as partners due to coordination and time, as well as screening barriers due to disruptions in health fairs. Despite these barriers, the impact of the COVID-19 pandemic on community resilience practice included rapid introduction of a hybrid screening model, stronger partnership with community organizations to increase screening efforts, and regular ACG taskforce meetings to overcome barriers with COVID-19.

Lessons learned from the ACG partnership during the COVID-19 pandemic are that strengthening community partnership resiliency is essential to sustain cancer screenings. To continue to sustain cancer screenings, providing guidance regarding the importance of cancer screenings despite the pandemic, and partnering with trusted community-based organizations and government organizations to reach vulnerable communities are important. Lessons learned from the current partnership experiences provide insights on how to make CBPR and cancer screening efforts elsewhere more resilient amid a time of crisis such as the COVID-19 pandemic.

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HEALTH SCIENCES

SCHOOL OF NURSING

The Hidden Workforce: A One-year Comparison of Advanced Practice Provider Stress in COVID-19

The COVID-19 pandemic has killed more than 600,000 people in the United States. In recent decades, the healthcare workforce has employed advanced practice providers (APPs) to alleviate physician workload and improve patient access to care. During the pandemic, APPs were deployed across service lines to treat COVID patients. We aimed to compare levels of stress, burnout, and risk perception one year into the pandemic for APPs.

APPs in multiple specialties who cared for COVID patients were surveyed online at a tertiary academic center during spring 2020 and 2021. Questions evaluated workplace stress, burnout, and risk perception related to COVID; vaccination status and Professional Quality of Life Scale (PROQOL) were added in 2021. Results were compared using chi-squared tests, along with demographic and professional characteristics of participants.

A total of 92 surveys were collected, between spring 2020 (n=49) and 2021 (n=43). Participants were mostly female (80.4%), white (70.3%), and primarily employed in the intensive care unit (35.8%). Other specialties included: emergency department (8.7%), perioperative (6.5%), surgery (17.4%), medicine (15.2%), women's health (1.1%), and other (15.2%). In 2021, 97.67% of respondents were vaccinated. Comparing 2020 to 2021, APPs felt more control in their risk of contracting COVID (56.3% vs 83.7%; p=< 0.01), less afraid of contracting COVID (77.1% vs 41.9%; p=0.001), however, more likely to resign due to COVID (0.0% vs 11.6%; p=0.01). There was also a trend toward feelings of extra stress at work (75.6% vs 90.7%; p= 0.09). This was reflected in the 2021 PROQOL survey where 69.7% of participants met criteria for moderate or high levels of traumatic stress and 88% met criteria for moderate or high levels of burnout, while only 7% of participants experienced high compassion satisfaction.

APPs have become increasingly prevalent across the healthcare workforce, and have been widely utilized in the spectrum of COVID care. Despite decreases in risk perception a year into the pandemic, perhaps attributed to vaccination, stress levels remained high with increased thoughts of resignation. As an integral component of the healthcare team during the pandemic, further research is necessary to increase retention strategies and reduce burnout.

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HEALTH SCIENCES

SCHOOL OF NURSING

Antibiotic Stewardship for Asymptomatic Bacteriuria in Older Adults Residing in Long-Term Care at End-of-Life

Differentiating between asymptomatic bacteriuria (ASB) and urinary tract infections in older adults is challenging due to their atypical presentation. There is a critical gap in practice to adhere to clinical guidelines advising against treating ASB with antibiotics.

The purpose of this Quality Improvement project was to implement an antibiotic stewardship program at a hospice organization to standardize judicious use of antibiotics at the end-of-life. The outcome measures were designed to evaluate clinician knowledge, prescribing policies and practice changes, the completeness of documentation, the appropriate usage of antibiotics, and clinician antibiotic use attitudes and beliefs.

Hospice clinicians were recruited using convivence sampling. A pre-post same subject and mixed-methods design was implemented for data collection and analysis. The key data collection tools were the Agency for Healthcare Research and Quality's Suspected UTI SBAR form, the Antibiotic Use Attitudes and Beliefs Nursing and Provider Survey, and the Centers for Disease Control and Prevention's Checklist for Core Elements of Antibiotic Stewardship in Nursing Homes. The outcomes were designed to be measured using paired t-test, chi-square tests, mean rating, descriptive statistics, and by identifying emerging themes.

The baseline chart review revealed 136 prescriptions lacked the provider's indication. There was no post-intervention data to compare and perform the chi-square tests due to a lack of study participation. Six people completed the knowledge surveys. The post-test mean score (66.67 [SD = 12.91]) was not significantly lower (p = 0.61) than the pre-test mean score (70.83 [SD = 18.82]). Two UTI SBAR forms were submitted with a 100% completeness rate. A freeze on new policy approvals prevented the project recommendations from undergoing the review process.

There was insufficient data to report whether the project improved the projected outcomes. The lack of study participation was attributed to the competing demands and burnout amidst the COVID-19 pandemic. While several antimicrobial stewardship programs in long-term care facilities have been adapted from the acute care setting, there is a paucity of data on economic models of infection prevention and the specific strategies to overcome the unique challenges in long-term care. Future research in this setting is highly encouraged and will require written policies to support sustainability.

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RESEARCH SHOWCASE

HEALTH SCIENCES

SCHOOL OF NURSING

Implicit Bias Training: Improving Racial/Ethnic Disparities in Maternal Care

Racial and ethnic disparities persist in the United States leading to adverse maternal outcomes. Nationally, the maternal mortality rates in black women are two to three times higher than white women. Pennsylvania and New Jersey have seen similar trends with New Jersey having the highest mortality rate among black mothers and the fourth-highest rate nationwide. Pennsylvania's rate although increasing, ranks twenty first with the rates for black mothers more than double that of the state average. Implementing implicit bias training as recommended by the Council on Patient Safety in Women's Health, is a key intervention that may help to reduce these disparities.

The objective of this project was to evaluate the effectiveness of implicit bias training to increase awareness of this phenomenon.

Data was collected from a convenience sample of registered nurses in labor and delivery and postpartum units at two community hospitals in New Jersey and Pennsylvania.

Participants completed the free, online race Implicit Association Test (IAT). The IAT categorized test results as no, mild, moderate or strong automatic preference for white over black people. They were then provided an educational intervention, after which, they retook the IAT. Quantitative data was analyzed with IBM SPSS Statistics software and the Wilcox signed-rank test used to compare pre and post training results. Three demographic survey questions were asked - age, sex and race, which were analyzed with descriptive statistics. Qualitative data regarding what was learned and how it will be used in practice was collected with two open ended questions at the end of the survey. These questions were analyzed for themes.

Completing the study were thirteen white, female participants. Twelve subjects included their age which ranged from 47-61 years, with a mean = 49.83, median =58 and SD = 7.918. scores. An analysis of the results demonstrated that an educational session on implicit bias did not elicit a statistically significant change in participants awareness of bias ($Z = -.137$, $p = 0.891$).

These findings can be attributed to the small sample size which did not generate enough power to detect differences and this may lay the groundwork for a replicative study with a larger sample size. A positive implication for practice is that respondents overwhelmingly indicated they will endeavor to be more consciously aware of their biases while recognizing that we all have biases.

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HEALTH SCIENCES

SCHOOL OF NURSING

The Impact of Mentorship on Nurses' Level of Self-Efficacy and Motivation to Pursue Board Leadership Positions

Nurses comprise the largest component of the healthcare workforce and possess a unique understanding of healthcare operations and patient care. On average, the proportion of nurses serving on hospital boards ranged from 2 to 6%, with the proportion of physicians averaging 20%. Over the last decade, much attention has been placed on emphasizing the importance of a nurse's presence on boards. Despite these initiatives, nurses continue to display an overall hesitancy towards board service.

The aim of this project was to implement an evidence-based mentorship program to address barriers to board leadership and increase overall self-efficacy and motivation to pursue these positions.

Eleven nurse leader mentees and eleven mentors (n=22) participated in a voluntary mentorship program that addressed barriers to board leadership and gave guidance to seeking out board positions. Mentees completed the Sundean Healthcare Index for Preparedness in Board Competency (SHIP-BC) survey pre and post participation to measure changes in self-efficacy. Mentors and mentees also completed additional surveys to measure satisfaction with the program.

There were increases in the mentees average score on the SHIP-BC survey after program completion with a statistically significant difference in personal – interpersonal skills, as exhibited by a two-sided exact p-value of 0.027. Both groups expressed satisfaction in the program, expressing the value of formal mentorship and a in increasing comfort level surrounding pursuing board leadership positions.

Nurses possess a unique understanding of the healthcare sphere that make them valuable resources for board positions. Through these roles, nurses would have increased opportunities to advocate for patients and influence healthcare transformation. Utilization of an evidence-based mentorship model can assist in increasing nurses' understanding of the importance of board leadership and overall feelings of self-efficacy.

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RESEARCH SHOWCASE

HEALTH SCIENCES

SCHOOL OF NURSING

Improving Screening for Sleep Disturbance in Patients with Parkinson's disease

Sleep disturbance (SD) is one of the most common and debilitating non-motor manifestations of Parkinson's disease (PD). SD intensifies the disease-related disabilities of motor and non-motor symptoms. In spite of this, it is often under-recognized and under-addressed by healthcare professionals. The Movement Disorder Society recommends the Parkinson's disease Sleep Scale (PDSS – 2) to screen and measure severity of overall sleep problems in this patient population.

The purpose of this quality improvement project is to increase utilization of a standardized approach to assessment of sleep difficulties. This can facilitate identification of individual sleep disturbances to target treatment appropriately. Outcomes for evaluation consisted: 1) to improve the screening rate of sleep disturbance in at risk patients with PD, 2) increase screening to a benchmark goal of 80%, 3) and assess for association between the PDSS – 2 sleep screening questionnaire and treatment planning.

Forty-one patients were screened using the PDSS – 2 questionnaire over three cycles. The project used the PDCA study design to implement the PDSS -2 sleep screening questionnaire to be distributed to every returning patient.

The result is an improvement of 31.7% in the rate of screening, which is not statistically significant $X^2 = 2.14$, $p = 0.14$. The change in the rate of treatment planning from pretest to posttest is from 52.5% to 31.7 %, which is statistically significant, $X^2 = 5.03$, $p = 0.03$. The use of PDSS – 2 did impact the rate of treatment planning for sleep.

The QI project positively increase the rate of sleep screening in at risk patients with PD. An improvement in the rate of screening and reduced rate of treatment planning were helpful in identifying sleep disturbance to improve targeted treatments.

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RESEARCH SHOWCASE

HEALTH SCIENCES

SCHOOL OF NURSING

Implementation of a Standardized Handoff Tool for the Transition of Care of Adult Liver Transplant Patients

The transfer of care of the adult liver transplant patient from the inpatient to the outpatient setting has increased in complexity and has the potential to lead to errors and adverse events.

This quality improvement project with a pre-post design implemented a structured hand-off communication tool used by transplant advanced practice providers (APPs) when adult liver transplant recipients transitioned from the inpatient to outpatient setting.

APPs (N= 10) were given a pre and post I-PASS survey including the System Usability Score (SUS). An EMR chart review was completed on discharged patients 3 months prior to I-PASS implementation and for the 4 months post I-PASS implementation. Data gathered included 30-day readmission rates, incidence of patient calling with questions prior to first hospital follow-up appointment, medication errors, time needed for APPs to prepare for visit and total time of clinic visit after discharge.

The I-PASS tool achieved a SUS score of 84.7 which is considered excellent. There was also a statistically significant improvement in questions "I would use the current hand off process", and "I felt confident using the current hand off process". APPs also reported significant improvements when surveyed on feeling positive about the I-PASS hand off experience. While there were not statistically significant improvements in the additional measured metrics, positive trends were identified.

Adult liver transplant APPs supported the I-PASS implementation, while there were statistically significant improvements in measures of provider satisfaction and positive trends in improved patient safety metrics were observed in this complex patient population. Our findings support continued implementation of the I-PASS model and expansion to other organ groups within our organization.

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HEALTH SCIENCES

SCHOOL OF NURSING

Effectiveness of Provider Education to Improve Screening, Diagnosis, and Management of Postpartum Depression

Postpartum depression (PPD) effects approximately 15% of new mothers after the birth of their child which results in feelings of anger, fear and being overwhelmed. In the practice setting for this project there were low rates of PPD screening, leading to missed diagnoses and inadequate management of PPD.

The purpose of this project was to develop, implement and evaluate the effectiveness of an education program to improve providers' perceived knowledge, awareness and practices regarding screening, diagnosis and management of PPD at an obstetrics practice.

The project developed and implemented an educational program to instruct providers at an obstetrical practice about the signs and symptoms, diagnosis, screening tools, and management (behavioral health referrals, medication initiation and follow up) of PPD. Screening rates of PPD using the Edinburgh Postnatal Depression Screening (EPDS) as well as provider self-assessment of perceived knowledge and awareness were evaluated before and after the education program.

Independent samples t-test showed that providers who participated in the education significantly increased their post-education knowledge ratings of PPD management ($t(14)=-3.742$, p=.002), referrals to mental health professionals ($t(14)=-8.497$, p=.0001), and prescribing ($t(14)=-5.00$, p=.0001) compared with pre-education ratings. Significant improvement in screening rates using EPDS was demonstrated between pre and post education ($X^2(1,N=249)=8.684$, p=.003).

PPD is a silent disease in U.S. society as there are feelings of shame and social stigma regarding this issue. Providing education for obstetrical providers pertaining to PPD resulted in improvement in provider perceived knowledge and screening rates of PPD in patients in this organization.

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RESEARCH SHOWCASE

HEALTH SCIENCES

SCHOOL OF NURSING

Mental Health First Aid (MHFA): Implementing an Evidence-Based Practice Change Initiative in a School Setting

School-aged children with unidentified mental illnesses experience poor health outcomes and increased medical costs. Successful management of this public health threat requires a collaborative community approach with a focus on enhancing adults' mental health literacy (MHL) to improve outcomes.

The objectives of this project were to implement an evidence-based mental health education (utilizing MHFA) and sustainment program within a school setting for staff and parents supervising children to optimize the adults' MHL over a three month period.

A pretest-posttest design was used. Participants were recruited from a school in the Western United States. Inclusion criteria consisted of: English speaking, male and female school staff and parents of any ethnicity (with supervisory roles), aged 18-65 years, and no previous MHFA training. The intervention included MHFA training by the Nurse Leader. All participants were asked to complete the Mental Health Literacy Scale (MHLS) to measure baseline and post-intervention MHL. Sustainment was achieved by developing a school-centered mental health toolkit (measured for usability) and integrating a school mental health champion.

The sample size consisted of 15 staff and parents. There was a statistically significant MHL score change from pretest to posttest, $p = < 0.001$. The toolkit bolstered sustainability by increasing utilization of community resources/mental health aids.

Mobilizing lay people as MHFA responders serves as a powerful tool to curb mental health crises. Healthy People seeks to extinguish this burdensome threat with early identification and intervention; implementing communal mental health practices affords the opportunity to meet such initiatives. Further implications for practice, policy and quality exist. Implications for practice are the ability to meet the Institute of Healthcare Improvements (IHI) Triple Aim Initiative: Improving the health of the population and experience of care and decreasing healthcare costs (through early identification and treatment). Implications for healthcare policy are support for the American Academy of Pediatrics (AAP's): (a) Call for heightened collaboration of educational settings and healthcare providers to uphold the health of children and (b) policy encouraging the establishment of mental health champions within school settings. Implications for quality are fulfillment of the Institute of Medicine's (IOM) six domains of healthcare quality.

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RESEARCH SHOWCASE

HEALTH SERVICES

MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

Rare Disease Symptoms Characterization in COVID-19 Comorbidity using N3C

Rare disease (RD) is any disease that affects a small percentage of the population. Even though these diseases are rare they consist of a diverse collection of more than 7–10,000 different disorders, most of which affect a small number of people per disease but yet they consist of a large population worldwide. Aside from the difficulties of presenting a reliable diagnosis and administering appropriate treatment, several issues arise as a result of the fact that many diseases go undiagnosed. Machine Learning holds great promise in this field and is already being used successfully in basic research, diagnosis, drug discovery, and clinical trials. COVID-19 along with patient data with a rare disease and clinical information, yet few methods are available to effectively analyze such diverse and unstructured data. Using an integrated machine learning approach, we aim to characterize RD Symptoms distribution and detect rare diseases from symptoms using a robust model that can efficiently predict the disease of a human, based on the symptoms that one possesses. We built five machine learning models for our analysis for supporting the results of the detection of rare diseases. We achieved an impressive accuracy with our machine learning model based on data consisting of simply rare diseases and their various symptoms. These prediction models can greatly assist clinicians and patients in early detection and diagnosis of the prevalence of the possible rare disease. The analyses described in this publication were conducted with data or tools accessed through the NCATS N3C Data Enclave covid.cd2h.org/enclave.

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RESEARCH SHOWCASE

HEALTH SERVICES

SCHOOL OF MEDICINE AND HEALTH SCIENCES

A Comparison of Physician-Researcher Role Duality in the Clinical Trial System as Measured by the Physician Orientation Profile Questionnaire

Within the clinical trial system, the physician-researcher is expected to complete the duties of the healthcare provide and trial recruitment. The Physician Orientation Profile (POP) questionnaire measures five indices of physician-researcher attitudes and behaviors. We compared the responses of a sample of physician-researchers in the US to responses from previously published studies.

Recently, a mixed-methods study was executed in a sample of physician-researchers to explore their occupational identities as an influential factor in patient recruitment for industry-sponsored clinical trials. The quantitative phase included the self-administered 45-item POP. Total-like scores were calculated on a scale of 0-45 and POP orientation was assigned to each case. The frequency proportion and absolute differences of the responses were compared to 4 POP studies published in 1987 to 2011.

Seventeen cases qualify for analysis. No cases are oriented at the extremes of the POP continuum (range: 15-25). The mean overall POP score 19.06 + 3.412 represents clinical orientation of the sample. There is no statistical difference in the proportions of any responses in the recent study versus studies of 87 to 1,485 respondents. There is no evidence a difference exists in responses of cases in this study (range of p-values of chi-square proportions: 0.393 to 1.00). Greater than 20% absolute difference in individual responses was seen for items on institutional pressure to be a clinical trial investigator, importance of publishing and presenting at conferences, and resolving treatment conflicts using clinical experience versus published data. Fewer investigators indicated that they would enroll more patients if they received personal income incentives for participating in clinical trials. Overall, physician-researchers feel that being an investigator is an asset to their reputation and increases their patient population, and they remain optimistic that the treatment will work as the quality of patient care increases when the patient is on trial.

One publication did not report response frequency for all items, so a full comparison could not be made to that study. In this recent study, some respondents skipped survey items they did not agree with, resulting in data missing not at random (MNAR) which can introduce bias and challenge the generalizability of results.

Physician-researchers, including those in industry-sponsored trials, continue to operate from a clinically-oriented mindset. Changes in regulations, medicine, and the research enterprise have occurred over the last 35 years with limited changes to the way role duality is expressed by physician-researchers.

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RESEARCH SHOWCASE

HEALTH SERVICES

SCHOOL OF MEDICINE AND HEALTH SCIENCES

A Preliminary Pharmacogenomic (PGx) Openarray Accuracy Assessment in the Clinical Laboratory

An emerging form of precision medicine, pharmacogenomic (PGx) testing combines the disciplines of molecular biology, pharmacology, and bioinformatics to characterize an individual's drug metabolism profile. The PGx platforms of today have evolved to detect hundreds of clinically significant drug metabolizing genetic mutations in one test, which in turn, determines drug and drug dose recommendations per the Food and Drug Administration's (FDA) guidance for over 300 medications. PGx testing is proving to be clinically significant as it can reduce adverse drug reactions and downstream prescription costs by narrowing down safe medication choices for patients sooner. PGx testing platforms in the clinical laboratory consist of real-time polymerase chain reaction (RT-PCR), openarray (OA), and gene sequencing. While relatively new, adaptation of these technologies has been slow due to their complexity and lack of standardized implementation. As a result, our clinical laboratory validated specifically, an OA platform manufactured by Applied Biosciences which evaluates 120 single nucleotide polymorphisms (SNPs) for 36 drug metabolism genes via buccal swab. The primary aim of this study is to assess the accuracy of our OA by comparing its genotyping calls to those of the National Center for Biotechnology Information's 1000 Genomes Project Database. Our results generated 2300 genotyping calls spanning 115 SNPs for the twenty Coriell control samples; with 3 false positives and 11 false negatives equating to an overall test sensitivity of 98.1%, specificity of 99.8%, and positive predictive value of 99.5%. Eleven of the twenty Coriell samples had at least one or more discordancy, which were most frequently observed in assays for the following genes: CYP2C19, CYP2D6, and DRD2. This study has ultimately contributed to the validation of the PGx OA assay in our clinical laboratory.

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RESEARCH SHOWCASE

HEALTH SERVICES

SCHOOL OF MEDICINE AND HEALTH SCIENCES

Sex trafficking screening and intervention in the emergency department: A scoping review

Introduction: Human sex trafficking is a global public health crisis. Emergency departments (EDs) are important access points for trafficked persons who seek medical care. However, because of victims' inability or hesitancy to disclose their situation coupled with health care practitioners' lack of training and institutional protocols, many trafficked persons go unrecognized in the ED.

Methods: We performed a scoping review of current literature. PubMed, SCOPUS, and reference lists were searched to identify articles for inclusion. Two reviewers independently screened literature search results and abstracted data from included studies. Descriptive analysis was conducted.

Results: We selected and analyzed 23 studies that focused on adult human sex trafficking identification, screening, interventions, or education in the ED. Eight (35%) of the publications used a survey model to quantitatively assess outcomes. Many of the other publications were descriptive or qualitative in nature, with some using a structured interview approach. We observed that no validated or consistent screening tool exists for the identification of possible adult trafficked patients in the ED. However, we found that educational interventions and screening tools can improve health care practitioners' confidence, victim identification, and knowledge of "next steps" for assisting victims.

Conclusions: We found that most ED clinicians and staff have little or no formal training in sex trafficking victim identification, support, institutional protocols, or available local resources. Our review demonstrates a paucity of formal training programs, validated adult screening tools, and standardized institutional protocols to aid in the care of trafficked patients in the ED.

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HEALTH SERVICES

SCHOOL OF MEDICINE AND HEALTH SCIENCES

Use of Shelter Database to Determine Missed Identification of Homelessness at an Urban Academic Hospital

Hospital patients' homeless status aids physicians in development of care plans after discharge. Standardized tools for universal screening exist, however the rate of correct identification of homelessness appears to be low and is not widely studied. We investigated the rate of correctly identified homelessness documented during ED visits and hospital admissions by using the Homeless Management Information System (HMIS) to verify homeless status of patients.

The HMIS is a database of individuals who have used shelters or transitional housing in Washington, DC. Adults in HMIS from 9/1/2019-2/29/2020 were searched in the Electronic Medical Record (EMR) for patient matches. Inclusion criteria was having had at least 1 ED visit or inpatient admission within the 6-month period. Charts were reviewed for documentation of housing status for up to 2 ED visits and 2 inpatient admissions per matched patient. Fischer's exact test was used to compare identification rates in the ED vs admissions.

2,523 (50.2%) HMIS entries had EMR charts, with 702 patients (14%) meeting inclusion criteria. Out of 813 ED visits without admission (586 patients; 227 second visits), homelessness was identified in 37% (303 of 813 ED visits). Out of 220 admissions (188 patients; 32 second admissions), homelessness was identified in 64% (140 of 220 admissions). The difference in rate of identification of homelessness was significant (37% ED visits vs 64% admissions, p<.0001). Among ED visits, homeless documentation was in the physician note (89%), social work note (22%) or nursing note (15%). For admissions, documentation was in the physician note (72%), social work note (56%), discharge summary (54%), discharge note (46%), initial ED physician note (37%) or ICD-10 coded using Z59.0 (19%).

Homelessness was not documented in at least one-third of hospital admissions and two-thirds of ED visits, accounting only for homeless patients who have used shelters or transitional housing. Homelessness may be more often identified in admissions due to the thorough nature of the encounter, additional time available, better documentation, or the need to create more detailed discharge plans that incorporate housing barriers. Some EMRs incorporate screening alerts to aid identification of homelessness, however our EMR lacks these. Further study should investigate the use and impact of these homeless screening tools.

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RESEARCH SHOWCASE

HIV/AIDS

INSTITUTE FOR BIOMEDICAL SCIENCES

Nanoparticle-enhanced Immune Cells for Eradicating the HIV Reservoir

Antiretroviral drugs suppress HIV replication but fail to fully eliminate the virus which persists in latently infected cells. Lasting viral reservoirs promote co-morbidities and threaten disease relapse. Strategies such as "shock and kill" stimulate HIV-infected cells out of latency for subsequent killing by an immune effector cell. However, these approaches rely on patients' endogenous immune cells, which are often dysfunctional. The adoptive transfer of Natural Killer (NK) cells represents an attractive therapy as NK cells may circulate to sites of HIV reservoir, kill virally infected targets, and resist infection by HIV. NK cells also express receptors that engage antibodies bound to HIV-infected cells to activate antibody-dependent cellular cytotoxicity (ADCC). NK cell therapies alone may be ineffective, however, due to insufficient viral reactivation and/or poor availability of HIV-specific antibodies. Here, we use nanoparticle depots to co-localize latency reversing agents (LRAs) and anti-HIV broadly neutralizing antibodies (bNAbs) to enhance NK cell killing of latent HIV-infected cells. These nanoparticles were conjugated onto the surface of NK cells, forming NP-NK "biohybrids".

The hypothesis is that the release of LRAs and anti-HIV bNAbs in the presence of latent HIV-infected cells and NK cells will reactivate virus and prompt enhanced cytotoxic activity via NK-mediated ADCC.

We synthesized biocompatible poly(lactic-co-glycolic) acid nanoparticles (NPs) encapsulating TNF-α (a well-established LRA) and the bNAb 3BNC117 and evaluated their physiochemical properties by dynamic and electrophoretic light scattering. We assessed the capacity of NPs to release their cargo in various solvents by ELISA. Reactivation and bNAb binding were determined by flow cytometry. To generate biohybrids, we conjugated fluorescently labeled NPs onto the surface of NK92 cells by avidin-biotin binding and assessed conjugation and cell phenotype by flow cytometry. To investigate the cytotoxicity of NPs and NK cells on latently HIV-infected cells, ACH-2 cells were co-cultured with combinations of NPs and NK92 cells. ACH-2 viability was assessed by flow cytometry.

TNF-α and 3BNC117 efficiently encapsulate in NPs and retain their function post-release. NPs stably conjugate onto NK92 cells to generate biohybrids without perturbing cell phenotype. Combined TNF-α and 3BNC117 significantly enhances NK-mediated killing of ACH-2 cells over NK alone or either monotherapy.

In vitro, the concerted action of LRAs and bNAbs enhances NK92 cytotoxicity against latent HIV-infected ACH-2 cells. Orchestrating the synergy of these therapeutic mechanisms may potentially serve as a replacement or adjuvant to current antiretroviral therapy, significantly improving quality of life for people living with HIV.

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RESEARCH SHOWCASE

HIV/AIDS

INSTITUTE FOR BIOMEDICAL SCIENCES

Pharmacological Enhancement of IL-15 Signaling to Improve "Shock-and-kill" Strategies Against Latent HIV

Despite effective anti-retroviral therapy (ART), HIV remains a profound global issue, with more than 38 million people infected as of 2020. The largest barrier to HIV cure is the formation of a latent reservoir within 24 hours of initial infection that cannot be cleared by subsequent ART treatment. Several "shock and kill" strategies have been developed to target this latent reservoir but have failed to have a clinical impact due to their limited effect on reservoir size. Finding novel therapeutic strategies that can Shock latent HIV, enhance Translation of viral transcripts, enhance immune Effector functions, and Sensitize reactivated cells to apoptosis could enhance Killing and elimination of latent HIV reservoirs. As such, development of STESK strategies have the potential to enhance the efficacy of "shock and kill" strategies. Among the clinically relevant latency reversing agents (LRA) under investigation, IL-15 or the IL-15 superagonist N-803 have been shown to reactivate latent HIV *ex vivo* and *in vivo*. We previously identified a small molecule, HODHBt, that enhances the biological activity of IL-15 by increasing STAT5 phosphorylation and transcriptional activity leading to viral reactivation *ex vivo* in cells isolated from PLWH. We used the Connectivity Map to identify compounds with similar transcriptional profiles to HODHBt and narrowed to five clinically relevant FDA-approved candidates. We evaluated their ability to promote transcriptional changes similar to HODHBt. From the 5 tested compounds, only one, Isotretinoin, shared a similar transcriptional profile to HODHBt in CD4T cells. Next, we tested the ability of Isotretinoin to reactivate latent HIV in a primary cell model of latency. Isotretinoin increased viral reactivation mediated by IL-15 to a similar extent as HODHBt but unlike HODHBt, specifically promoted cell death of latently infected cells compared to controls when combined with IL-15. In contrast to HODHBt, Isotretinoin did not increase IL-15-induced STAT5 phosphorylation. This indicates that Isotretinoin is able to reactivate latent HIV through a mechanism mediated by IL-15 but not directly dependent on STAT5 phosphorylation while maintaining a similar transcriptional profile. Isotretinoin is a derivative of retinol and has a number of structural analogues, which we are now investigating for their potential LRA activity. In conclusion, Isotretinoin and other retinol derivatives have the potential to function as LRAs in combination with IL-15 for the development of STESK strategies against latent HIV.

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RESEARCH SHOWCASE

HIV/AIDS

INSTITUTE FOR BIOMEDICAL SCIENCES

PERSISTENT DYSREGULATION OF Vδ1 T LYMPHOCYTES IN ART-SUPPRESSED PEOPLE LIVING WITH HIV

Major human gammadelta (γδ) T cell populations, Vδ1 and Vδ2 cells, are critical components of immunity both as potent cytotoxic effectors and modulators of adaptive responses. During early HIV infection, peripheral Vδ1 cells expand and Vδ2 cells are depleted, preceding the inversion of the CD4/CD8 T cell ratio. The changes in overall γδ T cell frequencies is not reversed even after prolonged suppressive antiretroviral therapy (ART). Our group previously demonstrated that Vδ2 cells retain their cytotoxic functions in ART-suppressed people living with HIV (PLWH) despite their persistent depletion. Whether the phenotype and functionality of Vδ1 cells in PLWH remain intact is unknown. We hypothesized that expanded Vδ1 cells in ART-suppressed individuals possess different functional characteristics compared to uninfected controls.

TCR repertoire, phenotype, and cytotoxic function of both subsets was compared in PLWH on suppressive ART (HIV RNA <50 copies/mL for >1 year) and uninfected individuals. Immune repertoire sequencing (Illumina) was used to assess TCR diversity. Surface expression of protein markers associated with cytotoxicity, immune exhaustion, and memory were analyzed by flow cytometry. Direct cytotoxic function of isolated Vδ1 and Vδ2 cells was measured in Daudi cell killing assays.

The Vδ1-TCR, but not Vδ2-TCR repertoire in PLWH showed more diversity than controls. We also found higher expression of multiple key cytotoxic receptors on Vδ1 cells in PLWH compared to uninfected individuals, but this did not translate into increased Daudi cell killing. Expression of PD-1 and TIGIT was comparable in both subsets between donor groups suggesting the reduction in cytotoxic function may not be due to immune exhaustion. Additionally, both subsets from PLWH had a marked reduction in chemotactic receptors associated with inflammation and lymphoid tissue homing.

Lower chemokine receptor expression combined with higher cytotoxic marker expression in the absence of increased killing capacity suggests Vδ1 cell dysfunction in ART-suppressed PLWH. Higher TCR diversity in PLWH suggests that Vδ1 cell expansion is the result of a polyclonal response. Further investigation is required to determine whether there is a connection between higher Vδ1 cell TCR diversity and alteration in their cytotoxic and chemotactic functions. Overall, ART may reverse some, but not all γδ T cell dysregulation. Considering their central role in mediating both innate and adaptive responses, abnormal γδ T cell function might have greater implications towards restoring the complete immune response in PLWH.

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RESEARCH SHOWCASE

HIV/AIDS

INSTITUTE FOR BIOMEDICAL SCIENCES

Evaluating the Effects of Biological Sex, Age, and Sex Hormones in the Immunostimulatory Activity of Latency Reversing Agents

The "shock and kill" approach to eliminate the HIV latent reservoir employs latency reversing agents (LRAs) to "shock" or activate latent cells into transcribing HIV, after which "kill" is prompted through immune system response or cytopathic effects from HIV, thus potentially eradicating the viral reservoir. Previous studies have shown differences in HIV infection by biological sex, including effects from sex hormones on HIV infection and transcription. Sex hormone involvement in the maintenance and reactivation of the latent reservoir and immune activation, and how this would influence cure strategies, is now starting to be evaluated. In this work, we evaluate the interplay that biological sex, age, and sex hormones estradiol, progesterone, and testosterone have on the biological activity of two LRAs under clinical investigation in cure approaches. We focus our studies on the immunostimulatory properties of γc-cytokine IL-15 and TLR-7 agonist GS-9620. We measured immune activation by evaluating the induction of the activation marker CD69 in CD4 T, CD8 T, and NK cell populations upon stimulation with both LRAs. We also evaluate cytokine secretion using a 10-cytokine array panel that includes IFN-γ, IL-1β, IL-4, IL-5, IL-6, IL-8, IL-10, IL-12p70, IL-22, and TNF-α, as well as INF-α using ELISA. Treatments were performed in the presence of three physiological concentrations of estradiol, progesterone, or danazol (a testosterone derivative). Based on our preliminary data, estradiol and progesterone reduced both CD4 and CD8 T cell activation mediated by IL-15. Interestingly, progesterone but not estradiol reduced NK activation mediated by IL-15. On the other hand, progesterone may enhance GS-9620 mediated activation of CD8 and NK cells. Danazol did not influence the immune activation mediated by the LRAs tested. Furthermore, biological sex may influence the activity of IL-15, particularly in CD4 T and NK cell populations. We also observed an influence of age in the immune activation properties of both LRAs. Finally, progesterone may suppress GS-9620 mediated TNF-α secretion. In conclusion, our investigation has found that biological sex, age, and sex hormones could influence the immune activation properties of these two clinically relevant LRAs. This could have implications for cure approaches in diverse populations of people living with HIV.

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RESEARCH SHOWCASE

HIV/AIDS

MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

Content Analysis of Undetectable=Untransmittable and Other HIV Risk-Related Information on State Health Department Websites in the US

State health department websites serve as a resource for the general public to access updated and accurate health information. Currently, there is widespread unawareness and disbelief surrounding Undetectable=Untransmittable (U=U), the scientific finding that indicates that people living with HIV (PLWH) who reach and maintain an undetectable viral load cannot sexually transmit the virus. Dissemination of the U=U message can potentially reduce HIV stigma and incentivize HIV testing and treatment. This study systematically analyzed U=U and other HIV risk-related information provided on state health department websites.

A content analysis of all 50 state and DC health department websites was conducted in 2022. Coders utilized two navigation pathways to access U=U and other HIV risk-related content: an internal website search bar and HIV-related menu options from the homepage. A coding framework was developed through an iterative process, and two coders independently coded all content (95% overlap; inter-rater reliability=0.89). U=U information accuracy was measured by meeting four criteria: indicates zero transmission risk, applies to sexual transmission specifically, refers to a person whose viral load is undetectable/suppressed, and mentions that suppression needs to be sustained across time. The presence of information about other forms of biomedical HIV prevention—pre-exposure prophylaxis (PrEP) and post-exposure prophylaxis (PEP)—was also coded.

Of the 51 health department websites, 64.7% explicitly referred to U=U by name. However, the extent and accuracy of the sites' conceptual description of U=U varied. A minority of sites (33.3%) met all four criteria for U=U information accuracy. Multiple sites (31.4%) used ambiguous language to describe sexual transmission risk (e.g., "effectively no risk") and 7.8% presented contradictory information across different site locations. Among the three sites corresponding to the highest prevalence of HIV (DC, New York, Maryland), DC and New York met all four U=U accuracy criteria, while Maryland met none. Most sites that provided information about U=U restricted such information to external linked sources (82.4%). Most sites mentioned PrEP (90.2%) and PEP (82.4%).

Further efforts are needed to keep state health department websites updated with accurate U=U information. The availability and accuracy of U=U and HIV risk information is necessary on health department websites, as knowledge of U=U may ultimately lower rates of HIV sexual transmission and enhance the health and well-being of PLWH.

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RESEARCH SHOWCASE

HIV/AIDS

MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

Implementation of Pre-exposure Prophylaxis (PrEP) for HIV Prevention in the Caribbean Region: A Systematic and Critical Review

The impact of HIV in the Caribbean remains to be a global concern. The Caribbean region is the second most affected region globally after Sub-Saharan Africa, with an HIV prevalence of 1.1%, and approximately 330,000 individuals were living with HIV. One way to prevent new HIV infections is implementing pre-exposure prophylaxis (PrEP) to reduce transmission. While there are multiple sources that examine the rates of HIV within the Caribbean as well as treatment and intervention strategies, there is very limited scholarship surrounding the implementation of PrEP. We conducted a critical and systematic review of the literature to understand better the work done for the implementation of PrEP in the Caribbean region. The review included a systematic review of the literature, a review of the national plans to implement PrEP, and a critical review of the grey literature. The systematic review was limited to publications between January 2012 to January 2022. Using PubMed, Scielo, among other search engines, 3,257 publications were identified, of which only seven met the criteria for inclusion in the analysis. Of the 30 countries in the region, only nine have implemented or are in the process of implementing PrEP. Finally, the grey literature evidenced the disparities in HIV prevention in the region and highlighted the need to develop local and regional strategies for PrEP implementation. Overall, this review provides evidence of the need for research, implementation, and coordination for PrEP care in the Caribbean.

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RESEARCH SHOWCASE

HIV/AIDS

MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

Resource Limited Settings Develop Higher Drug Resistance Mutation Rates as a Result of Different Treatment and Drug Resistance Mutation Interactions

Resistance mutations are a major cause of the failure of Antiretroviral therapy (ART). In order to have a holistic perspective on why drug resistance occurs in resource limited settings (RLS), multiple factors which influence drug resistance (DR) were studied to showcase how these factors increase DR in RLSs. These variables include time on ART, widespread use of ART, interactions between drug resistance mutations (DRMs), viral load (VL) and CD4 count, and public health approach. By looking at how resistance mutations within a class of ARVs known as Nucleoside Reverse Transcriptase Inhibitors (NRTIs) occur within subtypes, as well as their interactions with each other through compiled data, the data supports the components cited by providing factual evidence as to how RLSs accumulate increased rates of complex DR. Overall, Subtype C was found to have increased DR, while also being the most prevalent subtype in RLSs (1, 10). The associations of NRTI mutations (negative correlation of K65R to TAMs/M184V to TAMs, as well as the positive correlation of K65R to M184V), show how National ART Programs based off WHO guidelines lead to increased resistance to first line ART, and ultimately, VF.

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RESEARCH SHOWCASE

HIV/AIDS

MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

Assessing Anti-Retroviral Therapy (ART) Treatment Failure Rates among HIV infected Clients in Homa Bay County, Kenya

Antiretroviral Therapy (ART) is known to be effective in preventing HIV transmission and to reduce AIDS-related deaths. As more patients are initiated on ART, there is risk of many of them not adhering to their drugs, hence increasing the risk of treatment failure. This study aims to identify the HIV treatment cascade and determine treatment failure rates and factors associated with treatment failure among patients in facilities in Kenya.

Using electronic medical records and standardized paper registers, 280 suspected treatment failure patients from nine sites supported by Elizabeth Glaser Pediatric AIDS Foundation (EGPAF) were included in this analysis. The median repeat viral load, median time to initial elevated viral load and to complete all three EAC sessions were reported by sex and age in both suppressed (viral load less than 1000 copied/ml) and unsuppressed (viral load greater than or equal to 1000 copies/ml) groups. Unadjusted odds ratio of treatment failure and corresponding 95% confidence intervals and p-values were utilized from the binomial regression model. Time to treatment failure and its failure rate were analyzed using Kaplan-Meier survival curve. Differences in mean survival time of some categorical factors (e.g.: regimen type) were reported using Log-rank Test. Subset analyses were performed for those 15 patients who had optimized regimens after first failure.

A total of 247 (88.2%) clients completed the first enhanced adherence counseling (EAC) session, while 193 (78.1%) completed all three EAC sessions. Of these, 175 patients had repeat viral load, 109 (62.3%) were not suppressed and 66 (37.7%) were suppressed with median repeated viral load of 7928copies/ml and 135.5copies/ml, respectively. In unsuppressed group, young adults (20–24 years) had the highest repeat viral load of 39007copies/ml and they took shortest median time to initial elevated viral load and to complete all EAC sessions; the median repeat viral load for males was 1.5 times female group. Patients who had PI-based regimens were 88% (p-value <0.0001) and 80% (p=0.0024) less likely to be not suppressed (failure) compared to those who currently had DTG-based and NRTI/NNRTI regimens, adjusting for all other factors. At the end of the first year of ART, the survival probability was 99.1%, whereas in year 4, the treatment failure rate reached almost 39%. The mean survival times between the regimens were significantly different (p=0.0362).

The failure rate of ART was considerably high. Differences in ART treatment between distinct age groups and levels of facilities were observed in this study. Improving drug adherence targeting different age groups is an important intervention to reduce treatment failure among ART clients.

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RESEARCH SHOWCASE

HIV/AIDS

SCHOOL OF MEDICINE AND HEALTH SCIENCES

Developing an Immunotherapy Vδ2 Effector Cell Product for HIV Cure

Gamma/delta (γδ) T cells are innate-like immune effectors that are a critical components linking innate and adaptive immune responses owing to their unique properties. The most abundant peripheral γδ T cell population (Vδ2 cells) specifically recognize phosphorylated metabolites called phosphoantigens (P-Ag), of the isoprenoid biosynthesis or mevalonate pathway. Aminobisphosphonates (N-BPs) bears structural similarity to pyrophosphates and specifically activate Vδ2 cells. We hypothesized that exploiting Vδ2 T cell plasticity by combination of N-BPs and strategic use of cytokines that may induce cytotoxic function, may allow generation of Vδ2 cells with enhanced capacity to target and kill HIV latent reservoirs. Our initial experiments focused on the optimization of a protocol that will lead to a clinical expansion protocol.

First, we compared the potency of different N-BPs Pamidronte (PAM), Zolendronate (ZOL), Alendronate (ALN) and the P-Ag Isopentenyl-pyrophosphate (IPP) at different concentrations. Since we previously reported that MHC+ cells, but not αβ-TCR+ cells were required to expand Vδ2 cells, we investigated whether starting the expansion from TCR-αβ depleted PBMC induced a greater expansion. In addition, modulation of Vδ2 cell cytotoxic phenotype was assessed by combining N-BPs with different cytokines (IL-2, IL-12 and IL-21).

ALN and ZOL combined with IL-2 induced the greatest Vδ2 cell expansion with a mean of 51.5% and 47.1%, respectively compared to 34.3% after PAM and 30.3% after IPP exposure. In addition, ALN induced the highest expression of both CD16 and CD56 cytotoxic markers, regardless of the cytokine combination used (IL-2+IL-12 or IL-2+IL-21) ALN and ZOL induce the highest Vδ2 cell expansion with either cytokine combination more within TCR-αβ depleted cells (mean of 89.4%) than within total PBMC (mean of 50.8%). Finally, the combination of TCR-αβ depletion and ALN+IL-2+IL-12 lead to greater perforin, Granzyme-B and Interferon-γ production, and increased expression of NKG2D.

Our data suggest that the best protocol for the expansion of Vδ2 is to perform a TCR-αβ depletion prior to expansion, and use a combination of ALN and IL2+IL-12. Our findings provide the critical first step in the development of a novel immunotherapy.

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RESEARCH SHOWCASE

HIV/AIDS

SCHOOL OF MEDICINE AND HEALTH SCIENCES

Assessing Interaction with an Online Educational Module Among Parents of Gay Sons

MHealth interventions are a new means of presenting information to patients. It is critical that we understand how users interact with mHealth platforms, and if those who need these interventions are likely to use them. This study documented how parents engaged in an online mHealth intervention, and whether parent characteristics predict engagement.

Parents and Adolescents Talking About Healthy Sexuality (PATHS) is an online mHealth intervention for parents of gay and bisexual sons ages 14-22. It aims to increase parent communication with sons about sexuality and HIV, as well as other parent behaviors supportive of their sons' sexual risk reduction. Content includes material on the importance of communication, HIV information, using and acquiring condoms, and HIV testing. Optional supplemental modules include content on PrEP, understanding anal intercourse, and what to do if a child tests positive for HIV.

Sixty-one parents of gay/bisexual adolescents were recruited into a randomized controlled trial (RCT) of the intervention, for which 31 parents receive PATHS

Participant engagement was operationalized as the total time spent in the intervention and the time spent in supplemental modules. Parent characteristics were assessed prior to randomization utilizing an online data collection platform. These included parent age, education level, HIV knowledge, perceived stress, self-efficacy for communicating with their son about HIV, previous engagement in behaviors supportive of sexual health (e.g., demonstrating condom use), and acceptance of their son's sexual orientation. Bivariate analyses were conducted in SPSS to determine associations between time spent in the intervention and parent characteristics.

Parents spent an average of 51.9 minutes engaged in the main PATH modules (SD = 15.3; median = 36.6 minutes). The supplemental modules, which were not required for participation, had a lesser degree of interaction, with mean times of each video ranging between 1.25 and 3.28 minutes, and median watch times of each video ranging from 0.8 to 3.0333 minutes. None of the parent characteristics we assessed were related to the amount of time parents spent in either the main or supplemental PATHS modules ((correlation coefficients ranged from -0.203 to 0.220, all ns.).

From this study, it can be determined that mHealth modules are an effective means of communicating information, especially with parents of patients. Further research should include the long-term effects of these modules in relation to incidence of HIV, as well as with participation in the HIV care continuum. This project was IRB registered and approved.

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RESEARCH SHOWCASE

HUMANITIES

COLUMBIAN COLLEGE OF ARTS AND SCIENCES

Protecting Cameroon's Heritage: A Contemporary Approach

The looting and trafficking of antiquities in West Africa threatens fair trade, robs local communities of their cultural heritage, and endangers lives by financing black markets and terrorist organizations. As the illicit antiquities trade grows in West Africa, so too do these threats.

This report, through a case study of Cameroon, reviews the efficacy of traditional solutions to current threats in light of the contemporary challenges facing cultural heritage preservation work. Through original interviews of select archaeologists, market stakeholders, and local representatives, I assess the challenges and possible solutions for combating threats to cultural heritage. Conclusively, the data indicates that the established methods for stopping looting in West Africa, as expressed in the literature, are not accurate to the problem on the ground.

Ultimately, this paper has two major findings. First, the people of Cameroon need opportunities to engage regional stakeholders in a constructive dialogue about heritage threats. This dialogue must be inclusive of local voices to end the exploitative cycle in Africa and create functional solutions for those affected. Once the immediate obstacles are understood, joint efforts to conceive and carry out projects must occur at the local level. Such initiatives will require resources, patience, and courage, but are essential to create sustainable systems to protect Cameroon's heritage in perpetuity.

Though the scope of research here was limited to Cameroon, this is a regional issue. Poor implementation in one state opens a gateway for regional crime. Future research will continue to foreground local voices to delve deeper into the challenges and solutions relevant to protecting West African heritage.

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RESEARCH SHOWCASE

HUMANITIES

COLUMBIAN COLLEGE OF ARTS AND SCIENCES

"Dirty Work" Pay: Environmental Racism and the 1970 Washington, D.C. Sanitation Strike

In May of 1970, the District of Columbia's 1,700 sanitation men made it known that they were fed up with racial discrimination, horrible working conditions, low pay, and unequal pick-up routes, issues that had been festering for years. With the help of the international chapter of the American Federation of State, County, and Municipal Employees (AFSCME), the workers went on strike and stopped collecting trash. Sanitation workers leveraged the "dirty work" aspect of their job as pollution-control agents to let the District sit in its own waste for nearly a week. At a time when there was a growing sense of panic toward what was referred to as the "garbage crisis," trash piling up on corners across the District was a powerful symbol of their mistreatment and the importance of their work.

In my honors history thesis, I seek to center the Washington D.C. sanitation strike of 1970 as a fight for environmental justice, fitting within a broader and more inclusive narrative of the environmental movement. I also explore the early history of the local AFSCME chapter in the District and to what degree of success they had in their campaigns of public employee unionization. This strike is of particular importance to the connection between labor activity and environmental justice because of the workers' achievement of "dirty work" pay, a direct acknowledgment of the environmental burden they bear. Though workers began the strike on the basis of racial discrimination and dangerous working conditions, as a result of this strike, Washington D.C. was the first city in the nation to increase wages based on environmental pay. Pulling sources from a number of local archives, newspapers, and government reports, this strike, which up to this point has never been the subject of published scholarship, presents new avenues for examining the intersection between labor and environmental history in other sanitation disputes.

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HUMANITIES

COLUMBIAN COLLEGE OF ARTS AND SCIENCES

The Monster House and Explorations of Unstable Space in Modern Horror

Houses have been a frequent symbol throughout the history of fiction, yet they remain undiluted in their potency in the human imagination. As ubiquitous as it is, the concepts and ideals a house can stand for are seemingly endless, mundane, and often implicit, but for all the banality of a house, the destabilization of such a symbol can often be more exact and explicit. As a genre, horror gives a particular insight into the anxieties of the time and place that produces it, and just as prevalent as the house that stands for family values and what have you is the haunted house—the instability to the house's stability.

In recent postmodern fiction, there has developed a new breed of haunted house: the monster house, a literalization of the heterotopia Michel Foucault poses as the natural habitat of the modern "epoch of juxtaposition." Itself a creature with agency and self-contradictions, the monster house isn't passively haunted but does the haunting itself by defying the logical blueprints of the house as we know it. Using these assumptions, monster houses present modern anxieties of destabilized identities, a nonexclusive but often particularly American concern for the challenges to the nuclear family: the queer, the shifting, the unpredictable, and the often violently (it is horror, after all) disruptive.

Beginning with the literary precedents of the monster house in works like Shirley Jackson's The Haunting of Hill House, this thesis sketches the architecture of the monster house which haunts more than it is haunted, a blueprint of where and how the house presently stands in horror fiction and might stand for decades more. In particular, the monster house's unreality adapts to its format, utilizing the unique tools of the written novel (It, House of Leaves), film (Black Mirror, Channel Zero), to the soundscapes of podcasts (Welcome to Night Vale, I Am In Eskew) and physics-defying video games (P.T., Control). As such, this thesis builds towards a greater understanding of the subgenre by considering how material presentation has as much impact on the realities inscribed within these stories as the internal logic of their plots, form and function both conveying the disruption of the stable foundation of the house we take for granted.

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RESEARCH SHOWCASE

HUMANITIES

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Lexical Differences in Offensive Language (脏话) Between English and Chinese: An Investigation of Season 1, Episode 1 of *Orange is the New Black*

Curse words, as defined by Jay and Janschewitz (2008), serve an emotive lexical purpose, typically anger and frustration, and thus are integral to TV dramas, such as the Netflix original series *Orange is the New Black*. The show is absolutely overflowing with curse words, which made it the perfect case study to investigate how translators would render them into Chinese subtitles. The purpose of this paper is to analyze the English and Chinese renderings of 5 common curse words, *fuck*, *shit*, *bitch*, *ass* and *damn* within Season 1 Episode 1 of *Orange is the New Black*. Within each instance of these swear words, this study will examine which of four observed translation solutions the subtitlers would use to render these swear words and subsequent sentences into Chinese. The observed translation solutions of this research were literal translations (or pragmatic equivalences) or the sanitized solutions, namely omission, and softening. With regard to the results, 68% were sanitized in their renderings, and 32% were literally translated. These results have been produced or influenced by numerous factors that subtitle translators have to consider, including word class of the curse word, the nature of the curse word including its potential cultural boundedness, subtitle limitations, and the assumed tolerance of the target language audience.

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HUMANITIES

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Ugandan Literature: How Language Informs Culture in "Song of Lawino" and *Kintu*

African thinkers attempt to resolve the post-colonial identity crisis by focusing on how culture is defined through language. Their thoughts vary. Kenyan Ngũgĩ wa Thiong'o believes African writers should write in their local tongues to avoid the colonial mentality whereas Nigerian Chinua Achebe surmises writing in English is more valuable because it can reach diverse audiences. My thesis explores these two perspectives and applies them to the Ugandan literary sphere. Northern Ugandan Okot p'Bitek's 1966 poem "Song of Lawino" maintains the beauty of some traditional Ocholi narration styles and figurative language while adopting English and the European epic poem form. Central Ugandan Jennifer Nansubuga Makumbi's 2010 novel Kintu borrows heavily from the vocabulary and figuration of her native tongue, Luganda in a book that is primarily written in English and has been tweaked stylistically to appeal to a Western audience. These two pieces of Ugandan language jointly demonstrate that there is value in negotiating a space between these two polar views on the language in which African literature should be written in.

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RESEARCH SHOWCASE

HUMANITIES

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A Historical Analysis of the Emergence of Film Censorship during the Stalinist Regime with Exemplification from *Chapaev* (Lenfilm, 1934) and *Bezhin Meadow* (Mosfilm, 1937)

By the end of the New Economic Policy period, which lasted for the majority of the 1920s in the newly created Soviet Union, the Soviet film industry produced over one hundred films annually. However, the rate of production fell drastically during Stalin's control over Russia, with the number of films produced never again reaching triple digits throughout Stalin's regime. The paper will analyze comparatively two films from the 1930s after Stalin took control of the Soviet Union, *Bezhin Meadow* (Mosfilm, 1937) and *Chapayev* (1934). Although both films were released during a similar time period, *Chapayev* was praised and promoted by the Communist Party, while *Bezhin Meadow* (Mosfilm, 1937) was aimed to be destroyed and never released. The paper will explore why certain films were censored during Stalin's regime, while others were praised. The paper will also examine through the two movies discussed how film was being used as a political tool in Stalin's Soviet Union, often bringing down creativity.

Stalin's realization of the importance of film for propaganda built the earlier understanding of the Bolsheviks that film could be a powerful means of communication aimed at the masses, especially appealing to those who were working class, had insufficient access to education, and might have even been illiterate. However, a certain degree of economic and social openness during Lenin's period of the New Economic Plan allowed for the creation of high quality avant-garde film productions, whereas strict economic centralization and social control after Stalin's first Five Year Plan was implemented led to a turn not only to socialist realism but also to a high level of government control of the film industry and the censorship of any film deemed to not be fully representative for communist values.

The films *Chapaev* (Lenfilm, 1934) and *Bezhin Meadow* (Mosfilm, 1937) showcase what Stalin and the propaganda apparatus of his regime deemed to be acceptable and respectively to be censored in Soviet film. While *Chapaev* (Lenfilm, 1934) revolves around the positive relationship between a peasant hero and a Bolshevik commissar, Eisenstein's *Bezhin Meadow* (Mosfilm, 1937) presents the destructive relationship between a Soviet government traitor and his son who wants to give him in. The topic, in addition to the use of the avant-garde techniques, made *Bezhin Meadow* (Mosfilm, 1937) irredeemable for Stalin's regime, which censored and sought to destroy it while also repressing and condemning the film's creators.

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RESEARCH SHOWCASE

HUMANITIES

COLUMBIAN COLLEGE OF ARTS AND SCIENCES

Race, Racial Trauma, and Beauty in the Novels of Toni Morrison

Several of Toni Morrison's novel involve African American women struggling with identity and self-esteem, illustrating the relationship between beauty, race, and racial trauma and the omnipresent cultural forces of American society and history. Morrison's *The Bluest Eye*, *God Help the Child*, and *Beloved* display the reasons behind a broken, fragile, and repairing self-image that can be tied to the Black experience both during and after emancipation. Using critical race theory and trauma theory, the evaluation of these three Morrison novels pulls back the curtain on dominant White society's ignorant belief that the effects of racism are diminished beyond recognition post Jim Crow Era. Action in these three novels—during slavery, in the 1940s, and in contemporary culture—demonstrate the continued effects of slavery. *The Bluest Eye* set in the 1940's, shows the impact of segregation and generational trauma on a young African American girl's self-image; *God Help the Child* demonstrates the modern struggles of African American women with fetishization, colorism, and capitalism; and, finally, *Beloved* takes place before emancipation and outlines the destruction of community, family, and self-love during slavery and how those aspects of life are crucial in developing a stable identity. There is a gap in this country between the reality of racism and the its effects on minority communities. Evaluating crucial and intimate texts like those of Toni Morrison, helps bridge that gap.

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RESEARCH SHOWCASE

HUMANITIES

COLUMBIAN COLLEGE OF ARTS AND SCIENCES

The Evolution of George Washington's National University in a Historical and Contemporary Perspective

George Washington's Last Will and Testament admitted failing to establish a national university in the country's capital as a serious source of regret. In his will, Washington granted fifty shares of the Potomac River Company to Congress to help finance, establish and maintain a national university. Those shares never materialized, and a national university as intended by Washington was never founded.

This paper will chronologize when Washington discovered the national university movement that had become popular after the Revolutionary War and how he became its strongest advocate. Washington's absence of a higher education compared to other founding fathers and fellow Virginian elites was something he was self-conscious of all his life. According to many of Washington's peers, his lack of education and his seeming lack of interest in it was apparent. From a historical perspective, Washington's sudden appeal for the national university was uncharacteristic. Not only will this paper talk of the oddities of Washington's interest in the national university, but the contradictions as to why he wanted one at all. Like other founding fathers, Washington knew perpetuating education and educating the civilian population showed a want in societal growth and trust in citizens. Washington specifically wanted a place for young leaders to congregate and learn from their peers' different experiences and backgrounds. Yet, Washington's reasons for opening this university were also forbidding and exclusionary. He envisioned this national university to be for only white males of higher economic status, believing the rich and poor should be educated separately. Washington also despised that many young students went abroad and receive an international source of schooling since he believed students should only be educated in the Americanized system.

Although America's higher education system is one of the best globally, it is still systematically flawed, especially regarding inclusivity and diversity. Additionally, the national university Washington envisioned never came to be, despite institutions that claim to be a todays national university such as GWU, military academies, and other congressionally charted universities. By surveying Washington's personal background, published writings, and popular involvement in the national university movement, I look to highlight how the current movement for the national university is much different from the one Washington envisioned. However, the movement still stays close to Washington's involvement and legacy quoting his belief in creating a university to elevate the country into a more tolerant nation.

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HUMANITIES

COLUMBIAN COLLEGE OF ARTS AND SCIENCES

An It Girl Never Dies: The Revival of Margaret "Peggy" Shippen

Margaret "Peggy" Shippen was the envy of all in 18th century Philadelphia. She was from a powerful, wealthy family, well- connected to upper-class Philadelphian society, and effortlessly beautiful. She was loved for her grace and wittiness by everyone she met, especially the men, who fawned over her and claimed she was the most beautiful woman they'd ever seen in both America and England. She was the "it girl" of colonial North America through and through. But in 1780, her epic fall from grace took her from admired to pitied in less than a month. Twenty-four years later, Peggy Shippen died in exile and was largely forgotten, wiped from the memories of those who knew her- she was, after all, wife of the traitorous Benedict Arnold.

Peggy's reputation changed drastically while she was alive and continued to change after her death. For many decades, she was villainized or rendered a helpless victim of a cruel, manipulative husband. It is only recently that her name has gained traction, not as an accessory to Benedict Arnold but as a woman with agency, intelligence, and wit- a woman whose image deserves a thorough and critical re-examination. A few questions remain unaddressed, however: why has it taken over 200 years to correct her story? How did the it girl fade from popularity in her lifetime, but re-emerge as a traitorous, pathetic side character, losing every ounce of dignity she once had?

This issue required a three-fold solution. To understand the evolution of Peggy's reputation, literature and other popular media depictions of her from her lifetime to present day were collected and examined. Many sources were used to counter the false narratives, including the letters and diaries of her close family and friends, letters from her own hand, first and secondhand accounts of Peggy, and reliable histories of John Andre, Benedict Arnold, and other individuals central to her story. Lastly, to understand the changes in Peggy's image over time, sources detailing popular trends and attitudes in history and literature are referenced. By combining these three elements together, this thesis aims to show audiences how period-typical sexism allowed Peggy to be immediately acquitted of treason, but after her death fall victim to the fictionalization of her life for the purposes of sentimentalism and romanticism.

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RESEARCH SHOWCASE

HUMANITIES

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Centering Marginalized Voices: Narrative as a Tool of Postcolonial Feminist Activism

Narrative and subjective research methods are often overlooked by fields in which objectivity and truth are valued. This paper challenges this objective approach from the perspective of postcolonial feminist scholarship by analyzing the use of narrative in the fields of literature, public policy, and law. A literature review of postcolonial feminist strains of thought, a biographical and literary analysis of the fantasy novels of R.F. Kuang and Jordan Ifeuko, and a synthesis of the connections between narrative and the fields of literature, public-policy, and law were conducted to yield insight into the power of narrative. The voices of women of color in the space of fantasy literature center postcolonial relations in a predominantly White space. Narrative as a tool of policy deconstructs the power relationships often sustained by neocolonial processes. The stories of immigrants' experiences broaden conceptions of feminist jurisprudence as well as notions of citizenship and belonging. These findings demonstrate that centering diverse voices in these fields can challenge traditional constructions of objectivity as a means of resistance and activism. This reaffirms the importance of challenging objectivity and centering diversity across disciplines, and narrative is a tool that can be used to achieve these goals.

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HUMANITIES

COLUMBIAN COLLEGE OF ARTS AND SCIENCES

Citizen Energy: Examining the Role of Citizens in Promoting the Social Acceptance of Germany's Energy Transition

The aim of this study is to examine the importance and cultural implications of civic participation in the *Energiewende*, Germany's transition from fossil fuels to renewable energy sources. Citizen involvement in this process is vital for three reasons: (1) grass-roots activism has historically acted as a catalyst and foundation for improving environmental policy in Germany, (2) participation opportunities have the potential to enhance the social acceptance of renewable energy technologies and policies, and (3) citizen investment in renewable energy can assist with meeting greenhouse gas neutrality goals on time. A growing body of research examines the theme of social acceptance and its importance in relation to successful renewable energy policy. One prominent form of civic action that has the potential to promote social acceptance exists within the German concept of *Bürgerenergie* or "citizen energy," that is, joint investment in renewable energy in which citizens hold the majority of the shares. One non-traditional business form that fosters citizen investments in renewable energy projects in Germany are *Bürgerenergiegenossenschaften* ("citizen energy cooperatives"). These cooperatives reveal insights regarding the role of citizens and culture in Germany's transition to renewable energy sources. Although some studies focus on citizen energy cooperatives as a form of civic participation in Germany's energy transition, few studies look into the historical origins of citizen energy cooperatives. This paper begins to take on this task through examination of the original cooperative movement in 19th century Germany as well as the environmental movement in 20th century German. Tension in these social movements between grass-roots actors and institutions anticipate the same challenges that citizen energy cooperatives presently face. This research culminates with a case study on one citizen energy cooperative in Germany: Energy Cooperative Starkenburg. Interviews with members of this cooperative provide insights into their attitudes and perceptions regarding citizen energy and the influence such cooperatives have on the nation's energy transition. Although the context of this project is German history, policy and culture, this research may have implications for other countries navigating a renewable energy transition.

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RESEARCH SHOWCASE

HUMANITIES

COLUMBIAN COLLEGE OF ARTS AND SCIENCES

How Do Washington D.C. Renters Perceive Their Own Housing Stability?: How Race, Education, and Socioeconomic Status Impacts Housing Disparities

Housing accessisbility and affordability has remained a major issue in American cities, including Washington D.C. This crisis is especially notable for low income individuals, those with lower levels of educational attainment, and people of color. Literature has informed the public on how significant housing is, showing its impact on health outcomes like self-rated health, mental distress, emergency room visits, and Covid-19 infection rates. However, there are still gaps in housing research that should be addressed. There has not been enough literature focusing specifically on individual cities like Washington D.C. Washington D.C. must be isolated as it is experiencing rapid gentrification and housing price increases. Additionally, the variable of self-rated housing confidence has been largely overlooked in housing literature, and I will seek to expand on the limited existing work because what existing research has told us is that worse housing confidence relates to worse health outcomes. Lastly, due to the recency and ongoing nature of the Covid-19 pandemic, gaps still exist regarding the pandemic's impact on housing confidence and its related outcomes. For all of these reasons, my research questions are, how have self-rated housing confidence rates evolved over the Covid-19 pandemic for renters in Washington D.C.? And how do these rates vary by race, educational status, and work status? I hypothesized that self-rated housing confidence would get worse due to Covid-19 exacerbating an ongoing affordability crisis. I also expected there to be racial, economic, and educational gaps that previous literature revealed about housing. By using data from the Household Pulse Survey, initial results suggest that housing confidence rates remained surprisingly steady from spring 2020 to early 2022 for all respondents. All racial groups saw insignificant changes in housing confidence over the pandemic, with white renters consistently showing the most overall confidence. There are significant racial gaps that persisted over the past two years, with Black D.C. renters experiencing the worst self-rated housing confidence and all other minority groups being significantly less confident in making their rental payments than white renters. Additionally, lower educational outcomes and recent job loss relate to worse housing confidence. These initial findings align with the general understanding of the discrepancies that exist in housing. Race, educational, and socioeconomic status continue to drive disparities in housing, therefore causing negative health outcomes. I hope these findings will help further the public's understanding of the importance of housing.

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RESEARCH SHOWCASE

HUMANITIES

COLUMBIAN COLLEGE OF ARTS AND SCIENCES

Being the Perfect Host: The Reagan Administration and the Boycotts of the 1984 Olympics

The modern Olympic Games were created to bring the world together through sport. However, nations have undertaken efforts to boycott the Olympics over the years, effectively undermining the goal of having an apolitical global sporting competition. One of the most profound Olympic boycott efforts occurred in 1984 when the Soviet Union and many allies withdrew from participating in the Los Angeles Olympics. Many have concluded that this Soviet-led boycott of the 1984 Games was a revenge tactic in response to the United States and its allies boycotted the 1980 Moscow Games.

Using archival materials from the Ronald Reagan Presidential Library and the UCLA Special Collections Library, this project offers an alternative to the conventional revenge hypothesis for the Soviet-led boycott. Instead, this project argues that the Reagan administration's domestic and foreign policy approaches between 1981 and 1984 played a substantial role in pushing the Soviets towards a 1984 Olympic boycott. The White House recognized that hosting the Olympics in the US presented a unique opportunity to promote national unity and thus stepped up its efforts to assist in the Games' planning and execution. Concurrently, the continued intensification of the global Cold War pushed the Reagan administration to encourage maximum international participation in the 1984 Olympics, especially including communist nations. Together, the Soviet boycotts and the US approach to the 1984 Olympic Games demonstrate how increasingly scoring ideological and political victories at the Olympics was just as significant for countries as their athletic triumphs.

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HUMANITIES

COLUMBIAN COLLEGE OF ARTS AND SCIENCES

Invoking Chuqui-Chinchay: Tracing Andean Third-gender Subjectivity

In the 21st century, academics and members of the Andean Lgbtq+ community invoke the name of Chuqui-Chinchay; an Andean deity of the jaguar and protector of the third gender as a symbol of a gendered identity. This calls upon not only the deity itself, but evidence for a new construction of gender and reimagining Pre-colonial Andean views on third-gender subjectivity. However, from the 16th century to today, there is significant lack of scholarship addressing third gender subjects in the historiography of Andean history. Specifically, there is a lack of scholarship that challenges colonized notions of gender imposed on Andean indiegnous communities. This research fills this gap by analyzing material evidence of alternative notions of gender and performance of gender by tracing the historical development of third-gender Andean subjects through re-analyzing and challenging 16th and 17th century colonial archival records to reveal pre-colonial Andean notions of gender and sexuality. This research project also hopes to answer the question of what happened to those who fell under the protection of Chuqui-Chinchay, since the deity of the jaguar first appeared in the colonial records 400 years ago. Evidence of third-gendered subjectivity existing in pre-colonial andean societies was gathered by analyzing Moche pottery, particularly those who predated the Incan empire, and by analyzing the writings of indigenous Peruvian chroniclers, and figures of colonial authority such as jesuit priests and colonial judges. These archival sources were re-analyzed with an understanding of the political and power implications of colonization on indigious subjects in the 16th and 17th century. Ethnographic recordings of oral traditions such as Amazonian myths and agricultural corn planting rituals were used as other ways of viewing indigenous sources and knowledge. The results of these ethnographic sources in addition to the colonial records show how third gender subjectivity has connections to the Incan creation myth of Viracocha, Andean notion of gender through agricultural ritual space and balance. By centering third gender subjectivity in an Andean historical framework, this research allows for new ways of rethinking an Andean past and also invites further research and exploration on how indigenious notions of gender can give agency to indigenious subjects in the post-colonial era.

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HUMANITIES

COLUMBIAN COLLEGE OF ARTS AND SCIENCES

Frustration with the Federal Republic: American Conservatives' Views of West German Politics between 1969-1980

My project examines American conservatives' views of West German politics during the late 1960s and 1970s. These years saw massive changes within West German society and government. In 1968, a wave of student protests occurred in West Germany, which took aim at, among other things, the country's Nazi past and the Vietnam War. In 1969, the first Social Democratic government came into power headed by Willy Brandt, ending the Christian Democratic Union's (CDU) long-held dominance of federal politics. Brandt's chancellorship meant a paradigm shift in German foreign policy, abandoning the Hallstein Doctrine, a policy of non-recognition of East Germany, and adopting *Ostpolitik*. Ostpolitik saw the Brandt government establish relations with East Germany and pursued closer cooperation with the Eastern Bloc. My main research looks at four publications representing different strands of conservative thought: *National Review*, *Commentary*, *Human Events*, and *The Wall Street Journal*'s editorial section. I examine what these publications said about Germany between the years of 1969, the election of Willy Brandt, and 1980, which saw the victory of Ronald Reagan and the defeat of Franz Josef Strauss at the polls. I expand upon a framework laid out by Laurence Jurdem in his book *Paving the Way for Reagan*, where he used the first three publications to analyze conservative opinions towards US foreign policy.

Chancellor Brandt's willingness to make deals with the Soviets as part of *Ostpolitik* disrupted the American conservative narrative that the Federal Republic supported hardline anti-Soviet policies. American conservatives argued that the US needed to invest more in its European allies and defense in order to prevent neutralism. This claim, however, became more challenging to argue in the 1970s as *Ostpolitik* became increasingly popular in Germany itself. In their critiques of détente, American conservatives discussed the SPD government's minimization of human rights violations in East Germany and the continued presence of the Berlin Wall. This transatlantic divergence in opinion became most evident in 1980 when American conservatives hoped that a new group of anti-communist leaders, including Margaret Thatcher, Ronald Reagan, and Franz Josef Strauβ, would be elected and respond to the Soviet Union with increased determination. Strauβ's poor performance in that election year highlighted the limitations of the American conservative worldview and prefaced debates between Reagan and Helmut Kohl over what stance NATO should take towards the USSR.

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RESEARCH SHOWCASE

HUMANITIES

COLUMBIAN COLLEGE OF ARTS AND SCIENCES

"We Are Family": An Examination of the Unique Family Structures Depicted in Mamma Mia!

In this paper I will explore how director Phyllida Lloyd's 2008 film, *Mamma Mia!*, depicts unique parent-child relationships, between a mother and daughter as well as three fathers and their daughter, highlighting a non-nuclear family structure that is different to what romantic comedies of the past, and present, depict. I examine how the close relationship between Sophie (Amanda Seyfriend) and her mother, Donna (Meryl Streep), and I argue that their relationship reverses traditional mother-daughter dynamics seen in society, where oftentimes mothers put their own needs before their daughters. Additionally, I analyze the unique relationship between Sophie and her three "fathers," which reflects how family is built on communication and quality-time, not blood. Finally, I will explain how *Mamma Mia!*'s representation of a unique family structure is important to the furthering acceptance of different types of families in the world at large.

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RESEARCH SHOWCASE

HUMANITIES

CORCORAN SCHOOL OF THE ARTS & DESIGN

Andy Warhol's Photographs

In 2008, The Luther W. Brady Art Gallery received a gift of photographs from the Andy Warhol Foundation for the Visual Arts as part of the Photographic Legacy Project. The gift consisted of 152 photographs, both 4x6 inch Polaroids and black and white photographs from 33mm negatives. The photographs are just a fraction of hundreds of thousands of photographs that Warhol took between 1971 and his death in 1987. The photographs reflect Warhol's daily life including his travels, romantic partners, social outings, inanimate objects and preparations for commissioned portraits. Since its arrival at the Luther R. Brady Art Gallery, the collection of photographs has not been comprehensively analyzed. As part of my research, I will be analyzing the photographs and attempting to place them within a broader narrative of Warhol's biography and career. My research will focus on the concept of the photographs as being mirrors to Warhol's internal struggles with being a famous and profitable artist, struggles with his sexuality and his friendships.

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RESEARCH SHOWCASE

HUMANITIES

ELLIOTT SCHOOL OF INTERNATIONAL AFFAIRS

Contraceptive Sabotage as Intimate Partner Violence: Reintroducing the Theory of Physical Autonomy

Contraceptive sabotage is a somewhat ill-defined issue as its verbiage differs in legislation and scholarship: birth control sabotage, reproductive coercion, reproductive control, stealthing, protection deception. However its consequences are the same; physically it results in the lack of sexual autonomy and disregard for the health and safety of one's partner and emotionally it causes intimidation and coercion of one's reproductive and sexual control. Despite its prevalence, birth control sabotage is only acknowledged in one state in the United States, and only regarded in one singular form: stealthing ("AB-453" 2021). The general confusion and lack of legislation regarding contraceptive sabotage compounds and worsens its longstanding impacts on intimate partner violence, generating a necessity for legislation and jurisprudence on contraceptive sabotage issues.

This paper explores contraceptive sabotage and its connection to physical abuse to illuminate legislative solutions for domestic violence. This paper also explores the existence of physical autonomy currently in judicial precedent and notes the necessity for acknowledgment and expansion of these rights. The connections and precedent will inform the reconceptualization of domestic violence into intimate partner violence, a term that recognizes non-physical abuse such as emotional coercion, sexual violence, and contraceptive deceit and sabotage as inherently abusive towards intimate partners and are violations of physical autonomy. If the United States criminal justice system truly aims to eliminate the harms and damages that intimate partner violence derives, the hierarchy of harm produced by intimate partner violence must recognize contraceptive sabotage and reproductive coercion as deprivation of one's physical autonomy.

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RESEARCH SHOWCASE

HUMANITIES

SCHOOL OF MEDIA & PUBLIC AFFAIRS

Political Party Manifestos in Northern Ireland: How Brexit has Changed Party Responses to the Irish Question

In 2016, nearly 52% of British voters cast their ballots to "leave," a vote that would prove to be incredibly consequential. It was the United Kingdom's referendum on European Union membership, known colloquially as the Brexit referendum, and after 47 years of membership, the U.K. narrowly decided to leave. However, it is unfair to say the entire U.K. wanted to leave the E.U. – England and Wales voted to leave, but Northern Ireland did not. Eurosceptics in England may have wanted more control over their own governance, rejecting the E.U.'s authority, but Northern Ireland's situation is unique. The island of Ireland is home to the longest land border between the U.K. and the E.U., one that saw decades of conflict in the previous century. Peace was established in 1998 through the Good Friday Agreement, but it presupposed the U.K. and the Republic of Ireland would both continue to be E.U. members. Twenty years later, that fact would cease to be true. Therefore, while English Eurosceptics celebrated their departure from the E.U., many in Northern Ireland anticipated a different effect. Brexit was not just about trade relationships and government regulation – for those in Northern Ireland, it threatened the status of their country's existence.

The paper examines the period around the Brexit referendum and its subsequent developments on political party attitudes toward the Irish question in Northern Ireland. Focusing on five Northern Irish parties' positions over approximately ten years, using each party's general election manifestos to track changes in rhetoric over time, this paper whether and how the Brexit referendum and the subsequent negotiation process affected the ways major Northern Irish political parties position themselves with respect to their geopolitical status. I anticipate this analysis will reveal similarities between the parties along sectarian lines, with the two republican parties becoming increasingly concerned with the prospect of Brexit and the necessity to bring about a united Ireland, while the two unionist parties will praise Brexit for reinforcing the importance of Northern Ireland's relationship with Great Britain. The Brexit referendum and subsequent negotiation process give us insight into the Northern Irish political system, the ways parties position themselves and respond to each other, and how they use major political events to pursue their own goals.

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RESEARCH SHOWCASE

IMMUNIOLOGY/INFECTIOUS DISEASES

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Characteristics of SARS-CoV-2 in the New Jersey Area During the Early Stages of the COVID-19 Pandemic

COVID-19 is caused by severe acute respiratory syndrome coronavirus 2. We investigated how the viral genome evolved during the initial phase of the US pandemic in the state of New Jersey. Here, we present a novel approach for the integration of discrete omics features (e.g., viral genomic variants, microbial diversity, and host differential gene expression) and present how these features are associated with different clinical outcomes and other patient metadata. We collected whole viral genome data and metatranscriptomic (RNA-Seq) data from 116 patients from Hackensack Meridian Health network across New Jersey from March - June, 2020. Omics data were coupled with de-identified clinical data to test for associations amongst the data types. We used a novel clustering approach, *omeClust*, based on evolutionary distances between viral genomes, taxonomic compositional and expression differences based on metatranscriptomics data, and clinical variables. Significant associations were identified between viral genome regions and clinical features such as nsp10's association with the duration patients spent on a ventilator. We highlight the key role that bacterial community alpha diversity plays in disease outcome. Finally, we identify host transcriptional pathways that are dysregulated in patients with severe COVID-19. This method allows a holistic look at the pandemic during the early stages that can be used for future omics-based studies of the perpetually evolving COVID-19 situation around the world.

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RESEARCH SHOWCASE

IMMUNIOLOGY/INFECTIOUS DISEASES

SCHOOL OF MEDICINE AND HEALTH SCIENCES

The Effects of COVID-19 Beyond the Known GI-respiratory Symptoms

Severe acute respiratory syndrome coronavirus 2 (SARS-COV-2) is a single-strand enveloped RNA virus. Angiotensin-converting enzyme 2 (ACE2) is the main host cell receptor for SARS-COV-2 and is highly expressed on the epithelial cells of the respiratory tract, tongue, salivary gland and oral mucosa. The spectrum of symptoms ranges from mild to critical. Despite abundance of ACE2 receptors in oral mucosa, limited studies demonstrate the oral manifestations of SARS-COV-2 and only have been reported in around 36% patients. Presentation may vary from macules, nodules, plaques to aphthous ulcers or necrotic ulcerations. We present a case of confirmed SARS-COV-2 infection with associated oral manifestations deemed to be secondary to SARS-COV-2.

A 62-year-old female with a history of kidney transplant secondary to polycystic kidney disease, gout and sarcoidosis presented to the emergency department with a dry cough. Medications included tacrolimus, mycophenolate, prednisone, allopurinol. The SARS-COV-2 nasopharyngeal PCR was positive and a chest x-ray demonstrated bilateral lung opacities consistent with viral pneumonia. She received intravenous monoclonal antibody (Sotrovimab). The patient developed oral pain and odynophagia. Oropharyngeal ulcerations were then noted involving the soft palate (Image-1) lip and groin. The infectious disease team were involved and she was started on empiric antiviral therapy (acyclovir followed by valacyclovir). Swab and cultures obtained from the groin and mouth were negative for HSV. Further workup including HSV antibodies, HSV PCR, HIV, Histoplasma antigen, QuantiFERON-TB, T-Spot and CMV PCR were negative. The ENT team were consulted and a punch biopsy of the lip lesion was performed and sent for pathological evaluation. HSV, CMV, fungal and viral cultures were negative and immunohistochemical markers were unrevealing for an infectious etiology.

SARS-COV-2 infected millions of people worldwide. Symptoms predominate in the respiratory tract. Oral manifestations in the setting of confirmed SARS-COV-2 infection have been described in the literature but less studied and less known to medical practitioners. In our case we demonstrated a case of oral ulcers in the setting of COVID-19 infection, with negative histological markers for fungi and common viruses such as herpes simplex virus and cytomegalovirus. Immunosuppressant medications are known to cause oral ulcers, but this is less likely as the patient was taking these medications for a considerate amount of time and have never presented oral ulcers before. The mucosal lesions that we observed in our study were not specific and it was indistinguishable from other fungal or viral lesions. The diagnosis was made by exclusion in the setting of tissue biopsy and negative immunobiological markers and cultures

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RESEARCH SHOWCASE

IMMUNIOLOGY/INFECTIOUS DISEASES

SCHOOL OF MEDICINE AND HEALTH SCIENCES

Viability of Pooled Granulocytes Recovered from Leukoreduction Filters Using Citrate-Phosphate-Dextrose-Adenine and Citrate-Phosphate-Dextrose at Room Temperature and Refrigeration

The current storage standards limit granulocyte component storage to room temperature (20-24°C) and they must be transfused into patients within 24 hours of collection. The ability to prolong the storage of granulocyte concentrates intended for transfusions would significantly improve their utility and availability for patients in need. Therefore, the goal of this project was to determine if the addition of preservatives, Citrate-Phosphate-Dextrose-Adenine (CPDA-1) and Citrate-Phosphate-Dextrose (CPD), to granulocytes stored at room temperature (20 to 24° C) and refrigeration (4°C) can maintain recovery and viability over time.

Granulocyte viability was determined using pooled granulocytes recovered from leukoreduction filters (PGR LRF) of whole blood donations. We utilized and optimized conditions to elute granulocytes adsorbed to the leukoreduction filters (LRFs) and further processed by ficoll paque density gradient separation. Total white blood cell (WBC) counts and distribution of the major WBC subsets were determined for each of the LRF used. PGR LRF granulocyte count and viability were assessed at seven time points after storage at RT and 4°C.

Granulocyte count averages were consistently higher for all PGR LRF aliquots when stored at 4°C compared to storage at RT throughout the 10 days of testing. Percent viability was consistently maintained >75% after day 1 for all categories and storage conditions. PGR LRF in CPDA-1 samples at 4°C showed significantly ($p<0.05$) higher viabilities than RT and percent viabilities were maintained at >70% until day 6 of storage. PGR LRF in CPDA-1 aliquots maintained higher viabilities for all time points after 24 hours than PGR LRF in CPD in both 4°C and RT storage conditions.

By obtaining granulocyte counts and cell percent viability for each aliquot at each time point, we established that CPDA-1 can be used to effectively store granulocytes at refrigeration temperatures for 48 hours with preservation of viability. CPDA-1 is better able to maintain the granulocyte count and viability compared to CPD at RT and 4°C storage of PGR LRF. In addition, CPDA-1 storage at 4°C demonstrated greater stability than storage at room temperature after 24 hours. These results suggest that the current standards may be extended pending other more sensitive *in vitro* neutrophil function tests such as assessment of chemotaxis, phagocytosis, and oxidative killing.

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RESEARCH SHOWCASE

IMMUNIOLOGY/INFECTIOUS DISEASES

SCHOOL OF MEDICINE AND HEALTH SCIENCES

The Role of Whole Blood DEFA1 mRNA as a Biomarker for COVID Severity

Accurately predicting disease severity in COVID19+ is challenging. Known biomarkers for inflammation have variable utility answering this dilemma. Several publications indicate elevated neutrophil activity relative to T cells may indicate a severe response to COVID19. Using both microarrays and RNA sequencing, Defensin alpha 1 (DEFA1) was identified as a sensitive biomarker of neutrophil activation. DEFA1 is a known microbicidal and cytotoxic peptide associated with neutrophil granules. Droplet digital polymerase chain reaction (ddPCR) for DEFA1 mRNA, relative to the transcript actin B (ACTB), is proposed as a novel way to quantify host inflammatory responses to COVID19 infection. We sought to determine if DEFA1 levels as measured by ddPCR correlate with clinical severity in COVID19+ patients.

Whole blood was collected in RNA stabilizing 'Tempus' tubes from COVID19+ ICU patients, floor patients incidentally COVID19+, and a healthy COVID19 negative control group from 30 Oct 2020 – 14 Apr 2021. Using BioRad ddPCR, both DEFA1 mRNA levels and COVID19 viral burden were quantified from whole blood.

RNA stabilized whole blood samples were collected from 38 COVID19+ patients (52.6% female, mean age 57.8yo, 60.5% Black). DEFA1 levels were stratified into 5 groups (1=0-5%, 2=6-10%, 3=11-20%, 4=21-50%, 5= >51%) and compared to a binary classification of SARS-CoV2. Average DEFA1 levels were: critical 86.2% (n=24); moderate 62.5% (n=7); incidental 19.7% (n=7); control 5.28% (n=6). DEFA1 levels for the critical and moderate were significantly greater than control ($T < 0.01$ for both) and significantly higher in the critical vs incidental ($T< 0.01$). There was a positive correlation (Pearson $R = 0.45$) between Sequential Organ Failure Assessment (SOFA) scores and DEFA1 levels. Clinical indicators, such as neutrophil count, lymphocyte count, neutrophil/lymphocyte ratio, and lactate had no significant trends in relation to COVID-19 severity.

Our data suggests that DEFA1 levels may help predict severity and risk of organ failure in COVID19+ patients. DEFA1 levels measured by ddPCR may provide a quick novel test to discriminate outcomes, severity and need for ICU admission in COVID19+ patients. Future studies are needed to elucidate DEFA1 and ddPCR's ultimate role in clinical decision making.

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RESEARCH SHOWCASE

IMMUNIOLOGY/INFECTIOUS DISEASES

SCHOOL OF MEDICINE AND HEALTH SCIENCES

Risk Factors Associated with the Clinical Outcomes of Acute and Post-acute COVID-19 in Adult Patients

While most attention has been focused on acute COVID-19, lingering symptoms from the post-acute sequelae of COVID-19 (PASC) merit concern. The GWU COVID-19 Recovery Clinic is documenting these presentations and has defined six phenotype categories: pulmonary, cardiac, connective tissue, vascular, central nervous system (CNS), and other. This research seeks to identify factors associated with disease severity and PASC phenotypes at 6-15 months post-infection.

An IRB-approved, retrospective cohort study was performed from charts of adult patients with persistent symptoms after acute COVID-19. Data were abstracted from clinical history prior to diagnosis, during acute COVID-19, and during the post-acute phase, including lab results and mental health assessment responses. PASC phenotypes were determined clinically and hospitalization was used as a proxy for disease severity. Descriptive statistics, unadjusted odds ratios, and significance tests were calculated using RStudio (4.1.1).

Study participants with persistent symptoms at 6-15 months post-infection (n=116) had a mean age of 45.16 (SD 13.23), of which 70% were female, 60% were Caucasian, 12% were African-American, 9% were Asian, and 3% were Hispanic/Latino. When including all patients who had persistent symptoms at 1-15 months post-infection, those with obesity (BMI ≥30) or type 2 diabetes were much more likely to undergo a severe acute phase of COVID-19 (OR 12.75; 95% CI: 1.91-84.95; p=0.02; n=61 and OR 34.67; 95% CI 4.43-271.46; p<0.001; n=61 respectively). At 6-15 months post-infection, those suffering from a pulmonary PASC phenotype were more likely to have smoked (OR 3.27; 95% CI 1.18-9.11; p=0.02; n=91). Those presenting with at least one CNS phenotype had a significantly higher level of C-reactive protein (CRP) than those without (3.70 mg/L, SD 5.19 vs. 1.26 mg/L, SD 2.36; p=0.009; n=53). Additionally, acute phase severity was not significantly associated with the presence of PASC.

Our research further demonstrates the increased risk of severe acute COVID-19 among patients with obesity and type 2 diabetes. Furthermore, those with a smoking history were more likely to continue to have pulmonary symptoms of COVID-19 at 6-15 months post-infection. Additionally, our study suggests that there may be a relationship between CRP and persistent CNS symptoms. A better understanding of these associations can help predict the full burden of COVID-19 and improve clinical guidance.

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RESEARCH SHOWCASE

INTERNATIONAL AFFAIRS

COLUMBIAN COLLEGE OF ARTS AND SCIENCES

Key Recommendations for Higher Education Institutions to Provide Non-Financial Support to Refugee-Background Students

According to a 2019 study by the office of the United Nations High Commissioner for Refugees (UNHCR), only three percent of people with refugee status globally had access to higher education that year – an abysmally low number compared to 37 percent globally. In 2019, the UNHCR and partnering countries committed to a "15by30" goal under which each country would work to increase the number of refugees with access to higher education to 15 percent by the year 2030. However, despite the United States' position as a significant partner to the UN, Higher Education Institutions (HEIs) in the US have made little commitment to providing programming specifically for refugee students since 2019 – either domestically or internationally. While creating scholarship programs for refugee students may be daunting to HEIs, especially coming out of the COVID-19 pandemic with economic impacts felt by HEIs across the world, there are many ways HEIs can make their programs more accessible to refugee students with minimal financial contributions.

This presentation will outline key recommendations for US-based HEIs to improve accessibility to domestic and international refugee students in ways that require little to no financial commitment. The presentation compiles data from literature reviews, as well as interviews with practitioners and recipients of effective support programs for refugee-background students for an in-depth understanding of the programs that already exist, and how they could be improved upon and scaled up. Programs reviewed include mentorship programs led by students, staff, or faculty which are proven to decrease dropout rates of refugee-background students. Additionally, this research touches on small changes that could be made to HEIs' admissions processes that would go a long way in decreasing barriers commonly faced during the application process. As a result of this research, students in No Lost Generation GWU have proposed the Welcoming Campus Initiative, a program at the George Washington University which would create a more inclusive environment for refugee-background students. This proposal has been adapted to four other campuses across the country, and has the potential to kickstart a national effort to revolutionize the way refugee-background students are integrated into campus communities.

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RESEARCH SHOWCASE

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Towards the 'Africa We Want': Nigerian and Rwandan Stakeholder Perceptions on Trade Integration under the AfCFTA

The African Continental Free Trade Agreement (AfCFTA), signed and ratified by African Union (AU) member states, has created the largest free trade area in the world, connecting 1.3 billion people across 55 countries with a predicted GDP valued at US$3.4 trillion. Its agreement marks a rare consensus amongst African countries that the continent's development progress can be transformed by Pan-African trade. Within the Preamble of the AfCFTA's Protocol, African governments proclaimed their determination to "take the necessary measures for reducing the cost of doing business and creating a conducive environment for private sector development and thereby boosting intra-African trade." This pre-fieldwork study aims to draw awareness to the importance of studying regional trade agreements from the perspective of the business community and emphasizes the role of African businesses in partnership with their governments, as the primary beneficiaries and agents within the AfCFTA.

Data is drawn from media content analysis and qualitative interviews in two countries—Nigeria and Rwanda, chosen because they vary significantly in terms of geographic and economic size, industry composition, sea access, and initial participation in the agreement. Drawing from media content analysis and qualitative interviews, this study uses difference-between proportions analysis to compare perspectives on the agreement and to identify the benefits and concerns from business actors, while highlighting the policies that they are advocating for so that they can be well-positioned to take advantage of the opportunities the AfCFTA holds.

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RESEARCH SHOWCASE

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Government Response to Coronavirus and Vaccine Hesitancy in Africa: A Comparative Analysis Between Morocco and Zambia

Even as coronavirus vaccine became more accessible, vaccine hesitancy is simultaneously intensifying. Government handling of the pandemic—which varies wildly by country—may play a major part in this phenomenon. Previous research pertaining to the relationship between public trust in government and willingness to receive a coronavirus vaccine has focused overwhelmingly on a handful of prominent Western leaders and countries. This paper uses data from the Oxford COVID-19 Government Response Tracker (OxCGRT) and Afrobarometer to examine this relationship through a comparative study of Morocco and Zambia, in the form of two multivariable linear regression analyses. The models were found to be good fits, and results showed that perception of government handling of the pandemic did, in fact, affect whether those interviewed were willing to receive a vaccine. In both Morocco and Zambia, stringent pandemic response led to greater willingness to receive in a vaccine. Notably, however, this effect was more pronounced in Morocco—where measures meant to contain the spread of the coronavirus were rigorously and consistently implemented—than in Zambia, where the opposite was true. Evidently, a less effective pandemic response—such as Zambia's—leads to lower public trust and therefore less willingness to receive a vaccine.

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RESEARCH SHOWCASE

INTERNATIONAL AFFAIRS

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The Reintegration of Children Formerly Associated with Armed Groups in Nigeria: A Glimpse into the Contributions and Challenges of NGOs and INGOs

Beginning in 2009, the terrorist organization Boko Haram has wreaked havoc upon the population of Nigeria and used an estimate of 8,000 children as soldiers, human shields, suicide bombers, porters, spies, and more. Throughout this conflict, thousands of children have been robbed of their childhoods, and upon their release or escape, they are in need of healing through reintegration programming. For this study, qualitative data collection was used in the form of website content analysis and interviews with the Commissioner of the Borno State Ministry of Women Affairs and Social Development and staff from UNICEF, Search for Common Ground, Street Child, GOAL Prime Nigeria, and the Neem Foundation. This research aims to understand the contributions of INGOs and NGOs providing reintegration programming for children associated with armed groups and the challenges faced within the context of ongoing conflict in North East Nigeria. Ultimately, the NGOs and INGOs interviewed for this short study provide programming involving social, psychological, educational, and economic reintegration as well as community strengthening intervention. However, these organizations and the reintegration process face challenges, such as insecurity, inaccessibility to children in need, community perception, competing cultural ideals, and insufficient funding, resources, and time to conduct programming.

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RESEARCH SHOWCASE

INTERNATIONAL AFFAIRS

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European Champions in a Zero-Sum World: The Rise of Industrial Policy and Competition with China in Europe

On February 6th, 2019, the European Union (EU) rejected the proposed merger between Europe's two largest rail companies, Siemens and Alstom. This sparked outrage among the German and French governments, who strongly supported the merger that would have created a "European Champion in Mobility." Just thirteen days after the Siemens-Alstom merger was rejected, the two governments released a joint "Franco-German Manifesto for a European Industrial Policy Fit for the 21st Century." In the manifesto, the governments state that EU competition rules "need to be revised to be able to adequately take into account industrial policy considerations in order to enable European companies to successfully compete on the world stage." However, over a year after the Siemens-Alstom merger was rejected, the European Commission approved a merger between the Canadian rail company Bombardier and Alstom, despite Bombardier's similar market share to Siemens in both the global and European markets. This paper examines the differences between the two merger cases and tests two hypotheses: first, is that the disparate decisions reflected structural changes between the two cases, namely the CRRC's entrance into the European market through their acquisition of the German locomotive firm Vossloh in 2020 and the different concessions offered by the merging parties. Second, is that the Siemens-Alstom decision ran counter to the emerging norms of zero-sum thinking and a European industrial policy in the form of support for "European champions," and the Bombardier-Alstom approval represented a "correction" to the EU's "mistake." The paper concludes that evidence suggests the normative factors played a stronger role in the different decisions compared to the structural factors. This could indicate a broader global shift towards realist, zero-sum thinking after three decades of liberal thought dominating the post-Cold War order.

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RESEARCH SHOWCASE

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The Future of Diplomacy: How Ecocentric Deals and Technological Innovation Can Guide United States Policy in Southeast Asia

Home to a rapidly growing population and in the midst of an economic boom, Southeast Asia has become the center of a major geopolitical discussion surrounding the future of sustainable development. The region is uniquely vulnerable to climate change and positioned to be the launchpad for a plethora of potential solutions for partnership building and climate change mitigation. In order to assess the opportunities for the United States in this situation, this research project will focus on Thailand as a case study and examine its energy infrastructure via an extensive literature review, in-depth interviews, and qualitative assessment of critical Thai renewable energy projects.

The literature review will center around relevant published works, scientific studies, and analysis of current policies between the United States and Thailand. Our findings will also be based on interviews with subject matter experts based in academia as well as the private and public sectors. The findings from these interviews will contribute to future energy policy recommendations directed at the United States government in its dealings with Thailand and other ASEAN nations.

A core element of the research will rely on in-person site visits to key energy projects in Thailand. Our team will visit the Sirindhorn Dam, which is the world's largest floating solar plant. The research will also assess rooftop solar power in Bangkok and the feasibility of wind projects across Thailand's Southern regions. Based upon our existing research, the current regional challenges in ASEAN nations include policy inconsistency, lack of storage and transfer technology, and market stagnation due to a lack of competition.

Our team will evaluate renewable energy project viability on three main factors: 1) grid policy design support, such as incorporating lessons learned on how to balance utility interests balanced with customer needs to increase the adoption of distributed solar 2) technology transfer, such as advanced weather forecasting tools, inverters, and battery storage tech, and 3) increase in private and government investment in renewable energy projects.

The purpose of this research is to maximize the potential for partnership between the United States and Thai Governments in order to create sustainable and innovative renewable energy projects. U.S.-ASEAN cooperation is critical to achieving global climate change mitigation goals; through the literature review, in-depth interviews, and site visits, our research aims to support the United States.

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INTERNATIONAL AFFAIRS

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Go Jae-Gi Yourself: Feminism in South Korea and its Effects on Gender Differences in Korean Language

This paper aims to investigate the development in women's language in Korea in the past decade and the possible effects that recent feminism movements have had on these developments. A comparison of elements proposed by Wang (2005) on gender differences in Korean language will be used to test the hypothesis. Wang (2005) discussed seven politeness strategies that are frequently used by Korean women namely tag questions, hedges and ambiguous expressions, conventional indirect forms, avoidance of vulgar expressions, cooperative and facilitative conversational styles, honorifics, and longer utterances. Robertson (2013), in contrast to Wang (2005), found no significant differences between men and women's speech. Although the strategies Wang mentioned were commonly a part of women's language in the past, there is a possibility that women are moving away from them in the wake of feminist movements and a push for gender equality. In order to prove this statement, research on modern women's language in Korea was conducted by watching various YouTube videos by Korean women in different social settings and comparing their language to Korean men in various YouTube videos. The results favored Robertson's research in that there were no major differences between men and women's speech. In fact, in most instances, men used the strategies that were previously dominated by women more frequently. Overall, the study revealed that there is a close correlation between feminism movements and gender differences in the Korean language.

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INTERNATIONAL AFFAIRS

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Lost Time: Evolving Demands in the Western Sahara and the Path to Armed Conflict

In November 2020, the Polisario Front (POLISARIO) ended a 30-year ceasefire over the Moroccan territorial claims over Western Sahara, one of the longest unsolved armed conflicts in the world. Representing the Sahrawi, the people of Western Sahara, POLISARIO has sought liberation from Morocco since the early 1970s. The Sahrawi's frustration stems mainly from unsuccessful efforts to peacefully resolve the conflict since the United Nations (UN) endorsed a peace plan in 1991. Since then, there have been several failed peacemaking agreements and UN envoys who have resigned in frustration. One of the root causes of the stalled independence referendum is the 1974 Spanish census, which decided eligible voters in the proposed referendum. Whereas POLISARIO insists only those included in the census should vote, Morocco claims the census is flawed and needs to be expanded. This study aims to analyze how the demands of POLISARIO and the Moroccan government evolved over the conflict in Western Sahara and their implications on the Sahrawi's prospects for peace today.

Notably, with each failed peacemaking process, the more irreversible the demographic change of Western Sahara and Morocco has become, gradually rendering the census meaningless to either cause. And given shifting political alliances in the African continent, this study argues that opportunities for a peaceful resolution are quickly closing. To this end, this study analyzes the evolving demands of the conflict parties in three stages. First, it looks at the inception of POLISARIO and how its initial demands contrasted with those of the Moroccan government. Then, it examines how the parties changed their demands with the internalization of the conflict, including the deployment of the United Nations Mission for the Referendum in Western Sahara (MINURSO) and the peace agreement proposals that followed. Finally, it considers the contemporary demands of both parties, specifically through the lens of (1) the Western Sahara's shifting demographic dynamics, (2) Morocco's diplomatic campaign against the Sahrawi Arab Democratic Republic in the African Union, and (3) the restlessness of POLISARIO youth who were born and raised during the frozen conflict. Through an analysis of these three stages of the conflict parties' demands, this study concludes that time is running out for peacemaking processes to take place in Western Sahara.

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RESEARCH SHOWCASE

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Navigating Complex Crises: Practitioner Response to Syrian and Lebanese Economic Vulnerability in Lebanon

Lebanon has experienced a series of unprecedented crises, sinking into a severe global emergency; Government instability, resource insufficiency, and the impact of the Syrian refugee crisis has been exacerbated by a global pandemic, a chemical explosion, and an economic crisis. In just two years, economic vulnerability among Syrian refugees and Lebanese natives has skyrocketed, with the international community and NGO network extending its assistance capacity in place of government negligence. Although there is immense scholarship on the conflicts within Lebanon, there is a lack of focus on why past humanitarian efforts have not successfully resolved pre-existing conflicts, nor mitigated unprecedented emergencies. This can recognize the nuanced obstacles practitioners face that prevent sufficient response. This research examines the limitations that inhibit practitioners from effectively responding to the compounding crises within Lebanon, and navigates how these factors could propose shifts from short-term solutions to long-term resolutions. Cash assistance has emerged as a central problem, with limitations and benefits experienced by recipients and practitioners. With this, my paper examines how cash assistance has presented problems both within the practitioner community and on-the-ground, yet poses possibilities for successful response. With 9 NGO and INGO practitioner interviews, in addition to analysis of cornerstone reports, this project indicates how the compounding crises and its humanitarian assistance are entailed with inefficiency, redundancy, and lack of cohesion, revealing limitations that must be holistically addressed to improve aid feasibility. This paper provides recommendations for enhanced monitoring and evaluation, increased collaboration among complementary agencies, greater capacity building with the Lebanese government, and strengthened financial responsibility-sharing. The conclusion arrives at the emerging dialogue of dollarizing cash assistance to combat hyperinflation. In repositioning towards long-term resolutions and beyond short-term solutions, response in Lebanon can become a global example of how to approach contemporary compounding crises.

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Women and Agroecology: Inclusion, Exclusion, and Empowerment in Peru

As agroecology gains prominence in Latin American development, there is a need for closer inspection of how agroecological organizations and actors address gender. While many agroecological organizations and projects have included commitments to gender equality, there is little to no research on the effectiveness of these efforts. In Peru, a country with a small but growing agroecology community, women are heavily involved in farm work, but not necessarily empowered in projects executed by agroecological groups. Therefore, this study examines how agroecological organizations design, implement, and present their work on gender equality. Through content and discourse analysis of two case studies of recent agroecological projects, Frutos de la Tierra (2015-2020), and FORMAGRO (2017-2020), this study identifies factors of exclusion, inclusion, and empowerment present in program documents, videos, and Facebook posts. It explores how rhetorical commitments to gender equality affect women in practice and the limits of inclusion and empowerment. This study argues that these projects fell short of full inclusion and empowerment across the design, implementation, and presentation stages. Despite this, they created valuable experiences for women participants and furthered the conversation about gender in agriculture in the country, a significant point of progress. Additionally, this study identifies areas of progress in the field of Peruvian agroecology and prospects for further research. Lessons learned in Peru will be of particular interest to other Andean agroecological programs, especially those aimed at women and girls. These lessons also relate to a growing interest in gender and other social factors in the field of sustainable agricultural development research more broadly.

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RESEARCH SHOWCASE

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Nonviolence in Deeply Divided Societies: An Exploration Into the Inhibitory Power of Zero-sum Identities

With the shift in attention towards civil resistance and away from violence, nonviolent movements acquired an exclusive level of legitimacy domestically and internationally. Nonviolence is successful because it generates cross-societal legitimacy, which prompts mass mobilization at far higher levels. However an emerging discourse is demonstrating that polarizing ethnic identities can hinder the efficacy of nonviolence. Accordingly, there is a need to study civil resistance campaigns specifically in deeply divided societies (DDS) - the conflicts which are most protracted, contain a higher proclivity towards violence, and revolve around a zero-sum perception of identity. DDS are defined by a lack of cross-cutting identities, and thus represent a unique style of polarized identities which must be evaluated in nonviolence literature. This research employs comparative historical analysis, supplemented by 6 semi-structured interviews, to analyze two civil resistance movements in deeply divided societies: the civil rights movement in Northern Ireland (late 1960's) and the first Intifada in Israel/Palestine (1987-1993). My aim was to understand if unique identity politics in DDS impact civil resistance movements by measuring the presence and attitudes towards cross-communal mass mobilization (CCMM). CCMM represents an indicator of success of nonviolence because it encompasses the two critical elements of a successful nonviolent movement: mass mobilization and cross-cutting representation. The findings suggest that the strict identity politics in these contexts do influence civil resistance. Specifically, polarizing language based on historical group memories coupled with an emphasis on in-group solidarity develop negative attitudes towards CCMM. These findings demonstrate the need for a separate conversation on nonviolence in deeply divided societies, which can address the two themes listed above. They also highly recommend future research on in-group solidarity which measures its capacity to undermine cross-communal mass mobilization in societies with highly polarized identities.

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RESEARCH SHOWCASE

INTERNATIONAL AFFAIRS

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Russian Foreign Policy toward Yugoslavia: Conflict and Cooperation from 1990-1999

Over the course of this paper, I will discuss Russian policy towards Yugoslavia throughout the course of the 1990s. Russian policy towards Serbia shifted from cooperation to conflict, and then back to cooperation over the course of the decade. I will analyze how domestic Russian political history, the shape and nature of the international stage, and key individual figures were all driving factors in forming Russia's foreign policy orientation towards Yugoslavia, with a specific emphasis on Russian foreign policy directed towards the Serbian nation.

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RESEARCH SHOWCASE

INTERNATIONAL AFFAIRS

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Belt and Road in Africa: A Local Perspective on China's Soft Power

China's Belt and Road Initiative (BRI) has been a primary tool in the country's achievement of improved diplomatic relations and economic development. Existing literature on infrastructure development strategies mainly emphasize Western cases, the underperformance of these projects, and neglect of public perception, acceptance, motives, and concerns from governmental institutions and locals themselves. This research aims to emphasize the lived experiences of African beneficiaries of these BRI projects by answering the following questions: To what extent is the BRI perceived as a positive development by local Kenyans affected or potentially affected by the SGR project? Have Kenyans adopted more positive or more negative attitudes toward China more generally as a result of the SGR? This research seeks to explore whether or not large-scale BRI infrastructure development projects are in fact propagating these positive sentiments on the ground, by drawing on semi-structured video interviews conducted with local Kenyans, supplemented by content analysis. This interpretivist approach allows this study to speak to BRI's efficiency as a soft power strategy to bolster favorable narratives of China by highlighting the experiences of Kenyans directly impacted by the initiative and offering a point of comparison for the assessment of soft power in other contexts.

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RESEARCH SHOWCASE

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Understanding the Female Participants of the Capitol Riot

What types of women participated in the January 6th (J-6) Capitol Hill attack in 2021 and why? Despite the prominent role of some women in the attack (e.g. Jessica Watkins in the Oath Keepers), women are often overlooked in existing extremism research. Additionally, existing extremism literature often fails to investigate extremism through a gendered lens, conflating the motives, roles, and radicalization pathways of male and female extremists. This paper addresses these research gaps by developing and testing an original theory about the women charged in the Capitol Riot, how they differ from their male J-6 counterparts, and why they participated.

This paper argues that J-6 women were motivated to participate in the Capitol Riot by a different set of "push" and "pull" factors for radicalization than J-6 men due to their increased exposure to online far-right narratives. It uses a mixed-methods approach – including original data collection and in-depth case study analysis - to investigate the correlates of female J-6 participation. First, this paper collects original data about the demographics and social media activity of J-6 participants using the George Washington University's Program on Extremism compilation of J-6 federal charging documents. It compares the behavior of 50 J-6 men and 50 J-6 women to analyze trends in the riot participants through a gendered lens. Second, this paper process-traces case studies of some of the female Capitol Riot participants to investigate and attempt to explain some of the statistical findings in more detail. Thus, this paper helps fill important gaps in extremism research and offers new opportunities to confront an increasingly complex web of radicalization drivers.

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RESEARCH SHOWCASE

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The Intersection of Gender-based Violence and Gangs in the Northern Triangle

Noting the fact that the Northern Triangle, a geographic region that is composed of the three Central American countries of El Salvador, Honduras, and Guatemala, has some of the highest rates of femicide in the world and continues to deal with the social, political, and economic impacts of gangs, most predominantly MS-13 and Barrio 18, this paper aimed to explore the relationship of these two issues. In other words, the purpose of this paper was to see how gangs contribute to the severity of violence against women in this area, given the fact that there is little scholarship on this problem. However, noting that women's lives are impacted beyond just high death rates, this paper questioned: how have gangs in the Northern Triangle shaped gender-based violence in the region? In order to do conduct the research for this paper, the researcher analyzed two different reports: *Women on the Run: First-hand Accounts of Refugees Fleeing El Salvador, Guatemala, Honduras, and Mexico* and *Violentas y violentadas: relaciones de género en las maras Salvatrucha y Barrio 18 del Triángulo Norte de Centroamérica*. The analysis of these two varied reports provides important insight to the complex, violent situation that women face at the hands of gangs, displaying that women suffer from sexual, physical, economic, and psychological violence from gangs. Significantly, there was an overwhelming number of stories reporting the reality of economic and psychological violence. These women also expressed resorting to joining the gangs as a product of the cycle of violence, that they faced structural violence since the state and security forces could not protect them from gang violence, and that the domestic violence they faced was shaped by gangs. These results showcase how gangs specifically impact the health, safety, and development of women in the Northern Triangle.

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RESEARCH SHOWCASE

INTERNATIONAL AFFAIRS

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Ideas to Impact in International Climate Change Litigation: Leveraging Non-Compulsory Resolutions and Agreements for Climate Justice

The 2015 United Nations Sustainable Development Goals (UN SDGs) and the 2016 Paris Agreement marked monumental progress for collective action towards addressing the climate crisis. However, skeptical scholars and pundits alike have criticized the UN SDGs and the Paris Agreement for their discretionary natures and the lack of enforcement mechanisms to hold parties accountable. In contrast, to unenforceable soft laws such as agreements and resolutions or global cooperative goals such as the SDGs, treaties are international agreements with enforcement mechanisms. To determine whether non-compulsory resolutions and agreements have an impact on mitigating the climate crisis through climate change litigation suits, this research examines over two hundred climate change litigation cases in the Global North and Global South to determine the value of non-compulsory resolutions and soft laws in generating tangible climate action in the judiciary. Based on data collected through the Climate Change Laws of the World database, I estimate a logit regression to argue that the UN SDGs and Paris Climate Accords had a significant impact on increasing environmental success in the judiciary for cases in the Global North excluding the United States, with the success rate disparity between cases in the Global North and Global South decreasing by 22.1 percentage points following 2016, an interaction finding significant at the ten percent level. As a result, this article provides insight into the value of non-compulsory resolutions and agreements in the context of climate action via the judiciary.

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RESEARCH SHOWCASE

INTERNATIONAL AFFAIRS

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U.S. Security Policy Toward Iran, 1975-1981

Why was U.S. security policy toward Iran sometimes more cooperative and sometimes less cooperative, January 1, 1975-December 31, 1981? During this period the U.S. moved from pursuing a close partnership with Iran during the Gerald Ford term and early Jimmy Carter administration, to strong hostility as Carter was seeking re-election and trying to manage the taking of American hostages in Tehran at the same time. My study traces the shifts in U.S. security policy using widely available secondary source material, complemented by primary source documents, and my on-the-record interviews with American policy experts. My findings-to-date suggest that American policy choices reflected key shifts in the global and regional distribution of political, economic, and military power as well as the internal politics of the U.S. under both Republican and Democratic presidents. Looking toward the future, I will build on my research to suggest practical policy moves for U.S. decision-makers today.

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NATURAL SCIENCES AND MATHEMATICS

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DDA and DIA Proteomic Evaluation of Motor Learning Benefits in Rett Syndrome Mouse Model

Rett Syndrome (RTT) is a severe neurodevelopmental disorder with progressive loss of motor skills and speech in young children, particularly in girls around 6-18 months. RTT is currently incurable and caused by mutations in an X-linked gene, Methyl-CpG-binding Protein 2 (MECP2). Mass Spectrometry-based proteomics is a powerful technique to understand disease mechanisms by profiling the proteome changes in disease vs. control samples. Here, we aim to use both data-dependent and independent acquisitions (DDA & DIA) proteomics to evaluate proteome changes related to motor learning benefits in a RTT mouse model with loss of MECP2 in the brain. Changes in the proteome can reveal disease etiology and help identify potential protein biomarkers to design novel therapeutic interventions for RTT.

To evaluate the benefits of motor learning, WT and MECP2 KO mice were subjected to wheel running-based motor learning training. Three different brain regions (sensory cortex, motor cortex, and cerebellum) were obtained from WT and MECP2 KO mice with and without exercise. Bottom-up proteomic experiments were conducted using these brain tissues. All samples were homogenized in 8M Urea lysis buffer and protein concentrations were determined by DCA assay. The same total amount of proteins from each sample was then digested with Trypsin/Lys-C, desalted by Waters HLB reverse-phase plate, and subjected to LC-MS/MS analysis using a Dionex nanoLC coupled with a ThermoQ-Exactive HFX Orbitrap MS. DDA data was analyzed with Proteome Discoverer and DIA with Spectronaut software.

We first conducted proteomic experiments using motor cortex tissues from WT and MECP2 KO mice with and without exercise. After removing contaminants, a total of 7399 proteins and 47,794 peptides were identified and quantified in the DDA dataset. The MECP2 gene was significantly downregulated in the KO and KO trained samples compared to WT groups, validating the knockout mice as RTT representatives. 202 proteins reached statistical significance with p-values lower than 0.05. Go-Term analysis between the KO and WT showed the most significant biological processes are regulation of TORC1 signaling, sphingosine biosynthetic processes, and diol biosynthesis. The most significant pathways include monoamine transport, striated muscle contraction, and endoplasmic reticulum stress response.

Significantly altered proteins, such as BDNF, GAMT, MPP1, may serve as biomarkers that improve detection of RTT, increasing the opportunity for treatment. The identified pathways and biological processes contribute to current understanding and management of Rett Syndrome. Ongoing experiments will analyze and compare protein change in the sensory cortex and cerebellum.

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RESEARCH SHOWCASE

NATURAL SCIENCES AND MATHEMATICS

COLUMBIAN COLLEGE OF ARTS AND SCIENCES

Green Pt hydrotalcite-based Catalysts for the Coupling of Alcohols to Long Chain Hydrocarbons

Developing chemical processes that utilize atom-economical and chemoselective methods for making C-C bonds are necessary for a circular, green economy. As such, the catalytic conversion of biomass-derived alcohols to energy-dense hydrocarbons is highly attractive but still elusive. We investigated the use of platinum-doped hydrotalcite catalysts for the conversion of alcohols to long-chain hydrocarbons. These catalysts potentially facilitate this complex reaction via activity towards three key reactions; dehydrogenation of an alcohol to an aldehyde, aldol condensation, and decarbonylation to yield hydrocarbons. The combination of Pt with accessible acidic and basic active sites on the support potentially facilitates part or all of the three-step transformation. Furthermore, doping the hydrotalcite with select transition metals allows us to control the acid/base sites and Pt speciation, and can be used to optimize activity and selectivity for hydrocarbons. This process offers a promising pathway for valorization of biomass-sourced alcohols to drop-in substitutes for fuels and chemicals.

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NATURAL SCIENCES AND MATHEMATICS

COLUMBIAN COLLEGE OF ARTS AND SCIENCES

Evaluating the Use of Dental Characters in Phylogenetic Reconstructions: An Extant Primate Analysis

Recreating the human fossil record is a difficult task, as methods for phylogenetic reconstruction are scant. Genetically, there are time constraints–at present, we have been able to recover hominin DNA that only goes back less than half a million years ago. Therefore, the majority of the hominin fossil record cannot not rely on genetics, but rather rely on morphology. This presents its own challenges, as very few bones have been recovered per species, let alone multiple complete skeletons. However, due to their hard mineral composition, teeth have come to dominate the human fossil record. Dentition is not only plentiful, but they are one of the few types of specimen shared across species, allowing for interspecific comparisons. However, relying mostly on teeth to reconstruct the fossil record, as is the custom at present, poses the question: how do we differentiate between grades or happenstance groupings and genuine phylogenetic relationships? This paper investigates whether dental characters alone can accurately reconstruct a given phylogenetic tree as well as potential influences that affect the reconstruction. We recreated a phylogeny based solely on a dental character matrix of extant primates, compared it to the most up-to-date reference tree, and cross-referenced both trees with primary and secondary diet data. The preliminary results of this paper suggest frugivorous diets have a particularly strong influence on homoplasy, therefore dentition alone cannot accurately reconstruct the phylogenetic tree.

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RESEARCH SHOWCASE

NATURAL SCIENCES AND MATHEMATICS

COLUMBIAN COLLEGE OF ARTS AND SCIENCES

Characterization of Mechanosensitive Channels in Pancreatic Beta Cells

Pancreatic beta cells secrete hormones, primarily insulin, to work as the primary mediators of glucose homeostasis. Insulin regulates blood glucose levels by increasing glucose uptake by peripheral cells, while simultaneously decreasing liver gluconeogenesis. In patients with Type 2 Diabetes Mellitus (T2DM), both the typical pattern of insulin secretion is disrupted, and peripheral cell insulin sensitivity is decreased. Recent studies from the Jeremic and Zderic labs show that treatment with ultrasound can induce insulin secretion in both human pancreatic islets and rat insulinoma INS 832-13 cells. Understanding the mechanism of ultrasound induced insulin secretion could lead to targeted, noninvasive therapies for T2DM patients. Increased intracellular calcium has been implicated in insulin secretion and can be stimulated by activation of mechanosensitive channels, namely transient receptor potential vanilloid (TRPV) and Piezo channels. Isoforms of these channels have also been implicated in glucose stimulated insulin secretion. However, very little is known about the possible regulatory effect of ultrasound on expression and function of mechanosensitive channels in secretory tissues and glands such as pancreas. In this study, we examined rat pancreatic insulinoma (INS 832-13) cells and human pancreatic islets for the expression of TRPV isoforms 1-6 and Piezo 1 & 2, and possible sonogenetic effect of ultrasound on expression of these mechanosensitive genes. Using RT-qPCR, we found that INS 832-13 cells predominately express TRPV1, TRPV2, and Piezo1 channel isoforms. We then treated the cells with ultrasound for 5 min at 800 kHz and 0.5 W/cm2 intensity. At these ultrasound parameters, we previously showed that ultrasound stimulates insulin release from beta cells. However, ultrasound stimulation had no significant effect on expression (mRNA) levels for any of the three channel proteins. Interestingly, metabolic fuels such as glucose also did not show a modulatory effect on the expression of these channels, despite its stimulatory effect on expression on metabolically responsive genes such as TXNIP. Thus, our preliminary data suggest that ultrasound and glucose stimulated-insulin release do not depend on the expression of these genes, implying involvement of post-transcriptional and/or secretory mechanisms in insulin release. Additional protein expressional and functional studies will be needed to confirm or refute involvement of TRPV1, TRPV2, and Piezo1 channel isoforms in ultrasound-stimulated insulin release from pancreatic islets. Understanding the mechanism and role of mechano-sensitive channels in insulin release may open new therapeutic strategies in treating this metabolic disease.

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RESEARCH SHOWCASE

NATURAL SCIENCES AND MATHEMATICS

COLUMBIAN COLLEGE OF ARTS AND SCIENCES

Synthesis and Activity of New POM Prodrugs as Antibiotics against Tuberculosis

Mycobacterium tuberculosis (Mtb) is the causative agent of tuberculosis (TB), a respiratory infection that is difficult to treat, and can lead to death. Overuse of current therapies for TB has fostered the appearance of treatment resistant variants of Mtb, driving the necessity to synthesize novel drugs to eliminate TB. Modern antibiotics generally target enzymes in metabolic pathways of Mtb, such as the methyl erythritol phosphate (MEP) pathway. This pathway produces metabolites that are essential for growth and survival, and is not present in humans, making it an attractive target for drug discovery. 1-Deoxy-D-xylulose 5-phosphate reducto-isomerase (DXR) is an enzyme found in the MEP pathway of Mtb, and when inhibited, may eliminate Mtb infection. Existing compounds such as fosmidomycin and FR900098 are proven inhibitors of DXR, but are entirely inactive against whole-cell Mtb due to low cell permeability. Thus, our goal is to develop a prodrug of the fosmidomycin scaffold that displays high cell permeability, allowing traversal of the molecule across the cell membrane, prodrug hydrolysis, and subsequent inhibition of DXR. Based on data from previously synthesized inhibitors from our lab, we have synthesized four prodrug-protected fosmidomycin analogs with various N-benzoyl substituents, which will be tested for biological activity against Mtb. If successful, these compounds will drive future research of antibiotics against tuberculosis.

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NATURAL SCIENCES AND MATHEMATICS

COLUMBIAN COLLEGE OF ARTS AND SCIENCES

The Plight of the Honeybee: Detrimental Effects of Urban Litter on Honeybee Behavior & Cognitive Function

Honeybee (*Apis mellifera*) populations have been introduced to urban environments in an attempt to mitigate the damages resulting from Colony Collapse Disorder (CCD) on their populations in rural areas. However, keeping bees in inner-city environments may expose them to the by-products of urbanization (Burdine & McCluney, 2019). For example, discarded soda cans and man-made packaged food offer alternative sugar sources for honey bees, which bees are readily accepting in lieu of their natural diet. This study investigates how honey bee behavior and cognitive ability are altered due to exposure to active ingredients found in soda, such as, high fructose corn syrup (HFCS), caffeine, and hydroxymethylfurfural (HMF). The study consisted of three experiments: an observation study, a preference experiment, and the proboscis extension response (PER) test. We found in an observation study that honey bees exposed to HMF and HFCS in simulated hives with realistic concentrations of chemicals not only behaved in an unnatural manner, but they had a lower survival rate compared to bees with simulated nectar. When honey bees were given the choice of the natural sugar source or treatment group of HFCS and HMF in the preference test y-maze, honey bees showed a slightly higher preference for the feeding treatment given to the honey bees prior to the choice. The honey bees' memory retention was evaluated based on the success of eliciting a PER reflex, where the results showed a significantly lower success rate than the high fructose corn syrup and HMF groups compared to the sugar water control. Overall, this study emphasized the struggle honey bees are facing in their transition to urban communities and now research is driven towards determining solutions to help honey bees adapt to the environmental changes.

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RESEARCH SHOWCASE

NATURAL SCIENCES AND MATHEMATICS

COLUMBIAN COLLEGE OF ARTS AND SCIENCES

X-ray Source Populations in NGC 3532 and Other Intermediate Age Star Clusters

Intermediate-age open clusters offer opportunities to constrain the evolution of massive stars and detect compact objects, including high mass white dwarfs, neutron stars, and black holes in binaries. We performed a multi-wavelength analysis of CXO sources in the 300 Myr open cluster NGC 3532 using the Gaia eDR3, VPHAS+, 2MASS, and WISE catalogs, where we used our random-forest machine-learning pipeline to classify 131 sufficiently bright X-ray sources based on their multi-wavelength features. Most sources were identified as coronally-active low mass stars, but some candidate compact objects were also found. We discuss factors affecting the accuracy and confidence of our classifications, as well as information and assumptions that can improve the classifications. Additionally, we present the results of similar analyses for other nearby star clusters with ages between a few Myr and a few hundred Myr.

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RESEARCH SHOWCASE

NATURAL SCIENCES AND MATHEMATICS

COLUMBIAN COLLEGE OF ARTS AND SCIENCES

Experimental Drought Modifies Termite Wood Decomposition via Effects on Discovery Rate and Decomposition in a Tropical Rainforest

Drought will influence decomposition via both direct environmental effects and indirect effects altering decomposer activity and abundance. Both effects are important for tropical forests where microbes and insects (largely termites) drive wood consumption. While microbial decay is thought to be governed by enzyme kinetics, and therefore constrained directly by moisture and temperature, it is unclear if these factors also determine termite activity. In a tropical rainforest site (annual rainfall ~4500 mm) in Queensland, Australia, we conducted a 3.5 year decomposition experiment under natural and drought conditions using a common substrate of Pinus radiata wood in which we allowed or excluded soil macrofauna access. This study demonstrates that both decay agent and climate change effects need to be considered in predicting carbon release from decaying wood. Model flexibility will be key for representing the decomposition dynamics encountered in the tropics under novel drought conditions.

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RESEARCH SHOWCASE

NATURAL SCIENCES AND MATHEMATICS

COLUMBIAN COLLEGE OF ARTS AND SCIENCES

The Cost of Climate Change to Arctic Communities and Infrastructure

Arctic climate is changing rapidly due to amplified warming that will continue through the 21st century. The effects of this climate change are already observed and further projected to destabilize permafrost, putting human infrastructure at risk and limiting accessibility of remote communities. We analyze the spatial patterns of climatically driven environmental changes using a subset of CMIP6 models under the SSP585 scenario and estimate magnitude and extent of affected infrastructure and communities for Arctic regions of Alaska (USA, Canada, Russia, Iceland, Sweden, Norway, and Finland. Economic and infrastructure databases are used to evaluate costs at the regional scale as well as identify communities that are most vulnerable to permafrost related hazards such as ground subsidence and bearing capacity change. The infrastructure database was developed from publicly available sources to identify various types of infrastructure at risk including transportation infrastructure such as roads, railways and airports as well as residential infrastructure including buildings. The economic database was developed for Arctic states using country-specific construction statistics and to calculate regional costs based on permafrost damage derived from permafrost models forced with CMIP6 climate data. Ultimately, we communicate the impacts of climate change on various types of infrastructure at municipal, state and country levels that can be used by various stakeholders to develop adaptation and mitigation strategies in the Arctic.

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RESEARCH SHOWCASE

NATURAL SCIENCES AND MATHEMATICS

COLUMBIAN COLLEGE OF ARTS AND SCIENCES

Trading Nutrients in Mutualism: Soybean and Soil Bacteria

Soluble nitrogen is a limiting nutrient necessary for all forms of life. At the beginning of the twentieth century, the discovery of the Haber-Bosch process for the production of ammonia from nitrogen gas led to the widespread use of industrial fertilizers. Even today 80% of the nitrogen atoms in the human body comes from the Haber-Bosch process. Biological nitrogen fixation (BNF) is the process of nitrogen making its way from the atmosphere into certain plants that host soil bacteria capable of converting nitrogen gas into water soluble compounds. Not all plants are able to self-fertilize by BNF but one class of plants, legumes, through a mutualistic relationship with some soil bacteria is able to utilize this process. In this project, we study nutrient exchange between soybean root nodules and nitrogen-fixing bacteria (rhizobia) using the single cell metabolomic technologies available in the Vertes lab. In the soybean–rhizobia model system, we explore the metabolic pathways activated in infected plant cells for the production of nitrogen containing compounds, and the energy and carbon storage pathways activated in the bacteroids. In order to target infected single root nodule cells for analysis, we rely on a fluorescence microscope that visualizes them due to the green fluorescent protein (GFP) expressed by the genetically engineered rhizobia. The selected cells are ablated by a mid-IR laser pulse delivered through a sharpened optical fiber. The ablation plume is ionized by an electrospray and the ions are analyzed by ion mobility separation (IMS) followed by mass spectrometry (MS). Abundances of the detected metabolites are compared between the infection zone in the nodule, the connective tissue, and the root vasculature. Nitrogen containing compounds (e.g., adenosine and inosine) are higher in the nodule and lower in the root, whereas energy and carbon source compounds (e.g., disaccharide and hexose) are higher in the root and lower in the nodule. These gradients reflect nutrient exchange. Combining the results with metabolic engineering strategies can lead to the broadening of the use of BNF to other plants (e.g., corn). That, in turn, will reduce our need for synthetic fertilizers, thus decreasing our use of fossil fuels. A greater utilization of BNF can reduce overfertilization, improve soil quality and plant growth, thus leading to a positive impact on the world's nutrition. Using BNF will also decrease costs to farmers that currently must use industrial nitrogen fertilizers.

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NATURAL SCIENCES AND MATHEMATICS

COLUMBIAN COLLEGE OF ARTS AND SCIENCES

Recombinant SpTransformer proteins bound to beads increase phagocytosis by coelomocytes from sea urchins.

The California purple sea urchin, *Strongylocentrotus purpuratus*, relies solely on an innate immune system to combat the many pathogens in the marine environment. One aspect of their molecular defenses that remains to be fully understood is the function of the unique and diverse family of SpTransformer (SpTrf) proteins. This gene family likely includes thousands of different isoforms in the population of sea urchins, and are upregulated in response to immune challenge. Native SpTrf (nSpTrf) proteins act as opsonins that augment phagocytosis of foreign targets and a recombinant version (rSpTrf-E1) binds several different pathogen associated molecular pattern molecules. We propose that different versions of rSpTrf proteins function as opsonins to augment phagocytosis. Six rSpTrf isoforms were expressed in insect cells and isolated by nickel affinity. A characteristic of the nSpTrf proteins is to multimerize, which we tested with the rSpTrf proteins. We found that only a subset of the rSpTrf proteins multimerize with the nSpTrf proteins in the coelomic fluid. When magnetic beads are crosslinked to each of the rSpTrf proteins and incubated with coelomocytes, phagocytosis is significantly increased compared to controls. The specificity of the augmented phagocytosis of beads cross-linked with the rSpTrf proteins was tested by blocking with anti-SpTrf antibodies. Preliminary results indicate that one version, rSpTrf-E1, could be blocked, but a second version, rSpTrf-E2, was not. Although we speculate that the SpTrf proteins function similarly to drive the recognition of foreign targets and label them for phagocytosis by the coelomocytes, the sequence diversity and the blocking results suggest that different proteins may have different functions. The proteins may differ in their binding ability to different targets or in the recognition of these proteins by the coelomocytes. Our findings suggest a robust, flexible, and effective mechanism in sea urchins to neutralize a wide range of foreign pathogens.

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NATURAL SCIENCES AND MATHEMATICS

COLUMBIAN COLLEGE OF ARTS AND SCIENCES

Demonstration of the use of Bayesian Priors in GHG retrievals from Laser Heterodyne Radiometer Measurements

George Washington University and Mesa Photonics are developing and deploying a Laser Heterodyne Radiometer (LHR) that simultaneously measures CO2, CH4, H2O, and O2. Because oxygen concentrations are nearly invariant throughout the troposphere and lower stratosphere its line shape is dependent only on pressure and temperature, and analysis of its line shape can be used to improve greenhouse gas (GHG) retrieval precision and provide dry-air corrections. To constrain these fits, pressure and temperature profiles for our LHR data retrieval algorithm can be obtained from the weather data measured by radiosondes as part of NOAA's Integrated Global Radiosonde Archive (IGRA). In a recent paper, we reported on the statistical analysis of this data and highlighted how it can not only be used to constrain both the temperature and pressure profiles, but also the vertical profiles of water mixing ratios. Not only do mean values of radiosonde temperature, pressure, and humidity provide useful priors in column retrievals, but the narrow distributions above near-surface altitudes create realistic constraints to retrieval results.

For other greenhouse gases (specifically CO2 and CH4), prior data to constrain these vertical profiles is much sparser and a different approach is required. The Bayesian paradigm applies prior knowledge and observations to a model being tested. It is the foundation upon which inverse modeling in the atmospheric sciences is built and involves weighting the error the find the optimal value of a state vector given the observations. In this presentation we demonstrate how continuous LHR data from a stationary sensor can be used to refine an initial prior based on available (and widely distributed spatially and temporally) global GHG vertical profiles to constrain data from site-specific installations. Further, we will demonstrate the robustness of this technique to follow temporal excursions such as surface emission events. Initially, this algorithm is applied to synthetic data with a goal of application to the data stream from a sensor scheduled to go on-line at the Smithsonian Environmental Research Center (Edgewater, Maryland, USA) in the 2nd quarter of 2022.

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RESEARCH SHOWCASE

NATURAL SCIENCES AND MATHEMATICS

COLUMBIAN COLLEGE OF ARTS AND SCIENCES

Optical darkness in short-duration gamma-ray bursts

Gamma-ray bursts (GRBs) are extremely bright, high-energy astrophysical explosions with durations on the order of a few seconds. After this initial flash, GRBs produce an afterglow, which is emission across the electromagnetic spectrum that can last from hours to months post-event. However, emission in the optical region of the spectrum is sometimes dimmer than expected. This phenomenon, known as optical darkness, has been well studied in one class of GRBs that are associated with dying massive stars, while the implications for the other class—associated with merging neutron star systems, and called "short" due to the fact that the duration the initial burst is typically ,â≤2 seconds—are less understood. This work focuses on this second class, and implements a procedure for determining the darkness of GRBs based on spectral information from oribtal X-ray telescope data and ground-based optical/infrared follow-up observations; brings the catalog of optically dark short GRBs up-to-date; and investigates some of the possible physical explanations optical darkness. Our analysis tools and resulting complete sample of dark short GRBs enable an in-depth study of the phenomenon. We show that optical darkness is comparatively rarer in short GRBs than in long ones, and highlight the importance of rapid, deep follow-up observations of transient astrophysical events.

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RESEARCH SHOWCASE

NATURAL SCIENCES AND MATHEMATICS

COLUMBIAN COLLEGE OF ARTS AND SCIENCES

Conformational Changes in Amino Acid Based Heterofunctionalized Concave Scaffolds for Protein Surface Recognition

Traditional approaches in medicinal chemistry have largely deemed 80% of the human proteome "undruggable". Important proteins that participate in disease processes have remained understudied due to their lack of a targetable pocket which small molecules can probe and drug. To address this issue, we have synthesized concave scaffolds to target protein surfaces and thereby expand the druggable proteome. A synthetic amino acid monomer 2,4-dialkoxy-meta-aminomethylbenzoic acid (Mmb) was designed to afford scaffolds a cavity via its bifurcated hydrogen bonds and its sp3 hybridized benzylic carbon. The success of the design was confirmed by the crystal structures of cyclic tetramers of Mmb. Protected amino acids and Mmb scaffolds are coupled in solid phase peptide synthesis to produce a linear chain, and late stage macrocyclization is achieved in solution. Nuclear magnetic resonance (NMR) studies confirm cyclization and is used to compare differences between macrocycle conformations in solution, while X-ray crystallography is used to assess solid phase structure. These concave scaffolds, which contain a synthetic pocket, can be diversified by the introduction of different amino acids of varying chirality and by the functionalization of aromatic carbons on the Mmb structure. We present the synthesis of a series of cyc(Mmb1-Ala-Ala-Mmb1-Ala-Ala) macrocycles with varying Œ±-carbon chirality and side chain functional groups to determine the effect of sequence on solubility and conformation of the macrocycles. We find that the tunability of these structures facilitates the creation of concave scaffold libraries that can target protein surfaces and can accelerate the discovery of novel chemical probes and drugs.

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RESEARCH SHOWCASE

NATURAL SCIENCES AND MATHEMATICS

COLUMBIAN COLLEGE OF ARTS AND SCIENCES

Optimizing the Design of a Cherenkov Detector for a New Two-Photon Exchange Experiment

The proton may be extremely small on our scale, but it is not a point-like particle. It would be more accurate to say that the proton is a cloud-like distribution of energy and charge about 1 fm across, and one can characterize this cloud by density distributions called form factors. The distribution of the proton's electric charge is called the electric form factor, and the corresponding distribution of current is called the magnetic form factor. Understanding the ratio of the two at very large momentum scales can reveal the detailed structure of the interior of the proton. In the early 2000s, the new experimental technique of "polarization transfer" contradicted decades worth of unpolarized electron scattering measurements. This discrepancy may be due in large part to two-photon exchange (TPE), a long-ignored, imprecisely quantified correction term. Recent experiments, including OLYMPUS, extracted the TPE contribution to elastic electron-proton scattering by measuring the cross section ratio between electron and positron scattering on protons, but generally lacked the energy and precision to definitively test if TPE is the source of the discrepancy. The TPEX Experiment, proposed to be run at DESY, aims to measure the same cross section ratio to sub-percent precision at large momentum transfers exceeding 4 GeV${^{2}/c^{2}}$, sufficient for a decisive test. Monitoring the relative electron and positron luminosities will be crucial, and TPEX will employ a pair of quartz Cherenkov counters to monitor the M√∏ller/Bhabha (electron/positron scattering) rates at forward scattering angles. I will present the results of Geant4 simulation studies performed to optimize the design and placement of the counters in order to minimize the eventual systematic uncertainty. These studies show that the proposed monitor design is robust to offsets in beam and collimator alignment, the two primary systematics for the OLYMPUS experiment luminosity monitor.

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NATURAL SCIENCES AND MATHEMATICS

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Preliminary Analysis of Atmospheric Temperature Trends Resulting from the 2022 Hunga Tonga Volcanic Eruption

For the past several decades, temperature trends remain consistent with troposphere temperature increasing and stratosphere temperature decreasing. However, anomalies in these trends occur after volcanic eruptions. Several aerosols including sulfate disperse into the atmosphere after a volcanic eruption. Sulfate reflects solar radiation, preventing the radiation from entering the troposphere. This causes a decrease in temperature in the troposphere and an increase in temperature in the stratosphere. On January 15, the 2022 Hunga Tonga volcanic eruption climaxed becoming one of the greatest volcanic eruptions in the 21st century. The magnitude of the eruption correlates to the magnitude and longevity of these temperature anomalies. Identifying these early trends will give a preliminary understanding of how the 2022 Hunga Tonga volcanic eruption impacts atmospheric temperature.

The planetary boundary layer (PBL), the tropopause, and the stratosphere was analyzed using radiosonde data from two different databases, Integrated Global Radiosonde Archive (IGRA) and SondeHub, to identify daily and weekly temperature trends. The PBL is the bottom-most layer of the troposphere covering the surface to 2 km above. The tropopause is the region between the troposphere and stratosphere and altitude varies depending on season and latitude. The stratosphere is the second layer of the atmosphere containing the ozone layer starting around 20 km. Radiosonde data was used because of the frequency and accuracy of temperature collection. IGRA launches happen at 0 and 12 GMT with decades of data stored allowing for historical comparison of temperature. SondeHub radiosonde launches happen throughout the day including a launch that took place during the climax of the volcanic eruption. The radiosonde data shows a decrease in temperature in the tropopause and an increase in temperature in the stratosphere. The data also shows no clear trend in the PBL. The preliminary analysis of temperature after the 2022 Hunga Tonga volcanic eruption shows that changes in temperature follow the expected trend after volcanic eruptions. The volcanic eruption is then expected to continue this trend for several months to up to multiple years. Understanding this anomaly will help us understand what is currently happening in the atmosphere along with creating accurate climate models of temperature change.

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RESEARCH SHOWCASE

NATURAL SCIENCES AND MATHEMATICS

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Conformational Studies of Chiral Macrocycles Guide Design of Protein-Protein Interaction Inhibitors.

Traditional drug design uses small molecules that target proteins by binding in deep hydrophobic pockets. Many important protein-protein interactions (PPIs) occur along large flat protein surfaces. Small molecule drugs often fail to target PPIs because they lack a deep hydrophobic binding site. However, a small number of "hot spot" amino acid residues at the PPI interface contribute most of the binding energy. Selectively targeting hot spot residues would provide a method for disrupting PPIs and would greatly expand the number of potential therapeutic targets for study. Although some macrocyclic compounds have been successful in modulating PPIs, they primarily bind in shallow pockets. Macrocycles that form their own pockets could encapsulate hot spot amino acid residues and are therefore potential PPI inhibitor candidates. We report the synthesis of pocket-forming macrocycles using a combination of synthetic and natural amino acids. To better understand how structure affects activity, we investigate the influence of amino acid chirality on the three-dimensional conformation of designed macrocycles. Nuclear magnetic resonance studies show that altering the chirality of amino acids in the macrocycle sequence affects the folding and overall conformation of the macrocycle. As molecular conformation is intimately linked with activity, our results will inform the design of chemical probes for modulating challenging protein targets.

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NATURAL SCIENCES AND MATHEMATICS

COLUMBIAN COLLEGE OF ARTS AND SCIENCES

Network resilience in the face of deplatforming: the online anti-vaccination movement and COVID-19

The Covid-19 pandemic has resulted in a deluge of both factual and false information which has undermined confidence in vaccines, and in the wake of this infodemic, social media platforms have scrambled to deploy intervention strategies to reduce the spread of mis- and dis-information. To that end, we have mapped the spread of COVID-related posts in a pool of nearly 100 million Facebook users to investigate the multi-sided ecology of the online vaccination debate network. By tracking this network over time, we can investigate the effects of deplatforming and begin probing several questions: which nodes are removed in efforts to constrain the transmission of false information and how has this changed? Which side of the vaccination debate are the banned nodes on, and did they have large amounts of followers? Do these deplatforming efforts target those actors who may fly under the radar with small follower sizes but are more deeply enmeshed in the system? How does the removal of these nodes affect the connectivity of the vaccination network? Using network connectivity measures and examining the distribution of deleted and privatized Facebook pages, our investigation will reveal the effects of deplatforming and the extent to which it can be used as a tool to constrain the channeling of COVID misinformation.

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RESEARCH SHOWCASE

NATURAL SCIENCES AND MATHEMATICS

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DIVERSE POSTFUNCTIONALIZON OF IODO SUBSTITUTED MAGNETIC COMPLEXES USING PALLADIUM CATALYZED COUPLING REACTIONS

Di(trispyrazolyborato)iron(II) ([Tp2Fe]) (Tp- = trispyrazolylborate) is the archetype of a class of complexes that have a strong spin-crossover where the magnetic properties of the molecules can switch from being diamagnetic (S=0) to paramagnetic (S=2). Spin crossover complexes are attracting attention for their potential applicability to nanodevices, binary technology, and innovative sensors. So far, most studies on this family of molecules have focused on the electronic and steric effects of alkyl substitutions on the pyrazole ring. However, those substituents are not reactive and limit the complexes' applicability. The challenge then becomes integrating these molecular complexes into devices while still retaining their spin-crossover properties.

To address this problem, modifications of the molecule's backbone are needed to tune the molecular properties and adapt the complexes to the desired working environment. I functionalized the molecular complexes to display iodine atoms as the carbon-iodine bond is easy to break and is reactive. I targeted and synthesized the iodine substituted complexes to allow a variety of functionalization for the molecular complexes. By doing so these iodo-derivative complexes can provide an advantage for interrogation into nanodevices because iodo-derivatives are expected to be easily sublimated. Therefore increasing nanodevices functionality and accuracy.

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NATURAL SCIENCES AND MATHEMATICS

COLUMBIAN COLLEGE OF ARTS AND SCIENCES

The Role of the Ancient Gut Microbiome in Metabolism and Energy Harvesting

Homo sapiens remain atypical both within the hominin lineage and within extant primates due to our relatively large brain to body size ratio and our unique life history traits, such as the birth of altricial young and a prolonged period of childhood development. Previous literature has suggested that changing energy budgets and allocations due to an increasingly high quality diet and efficient locomotive behavior are responsible for the evolution of these uniquely human traits and development patterns. However, within the hominin fossil and archaeological record, a high quality diet is seen long before a significant expansion of either brain or body size in Homo erectus. Here, we examine another feature of human physiology that may have contributed to an energy surplus and, thus, may address the indiscrepancies within the ancient record between diet and brain size: the gut microbiome.

Modern studies using omics technologies have implicated the gut microbiome in host digestion and metabolism, among other essential functions. Importantly, these studies suggest that humans may have a core functional gut microbiome that has evolved with us through time and that certain configurations of microbes are more efficient at harvesting energy than others. These characteristics of the microbiome suggest that interactions between diet and microbiome may have played an important role in our evolutionary history to produce the energy surplus needed to support the development of large brains and bodies.

In order to understand what the gut microbiome of humans may have been like before the industrial era and globalization of western diets, we examined previously published data on the ancient fecal microbiome dating to 1-2 KA from the southwest USA and Mexico with the goal of analyzing the structure and function of the microbes present. Knowledge of the functional pathways allows for a deeper exploration of how the microbes interact with the host to metabolize indigestible parts of the diet and extract energy that would otherwise have been inaccessible to the host.

This study is important in order to begin an attempt at predicting the structure and function of the gut microbiome in ancient hominins and how hominins may have evolved with their gut microbes through time. This complex relationship between the microbiome and energy draws upon knowledge from a diversity of fields, such as life history, paleoanthropology, paleoecology, archaeology, bioenergetics, and bioinformatics, and is essential to a richer understanding of a key point in human evolutionary history.

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NATURAL SCIENCES AND MATHEMATICS

COLUMBIAN COLLEGE OF ARTS AND SCIENCES

Investigating the Coevolution of Language and Tools in the Brain: An ALE Meta-Analysis of Neural Activation During Syntactic Processing and Tool Use

Language and complex tool use are often cited as behaviors unique to humans and may be evolutionarily linked owing to the underlying cognitive processes they have in common. We executed a quantitative activation likelihood estimation (ALE) meta-analysis (GingerALE 2.3) on published, whole-brain neuroimaging studies to identify areas associated with syntactic processing and/or tool use. The sample included 342 foci from 33 syntax studies and 233 foci from 20 tool use studies. We performed a cluster-level analysis on each group (cluster-level inference: p = 0.05, permutation threshold = 1000, cluster-forming threshold: uncorr. p = 0.001) and a contrast analysis to identify shared and unique activity (uncorr. p = 0.001, p-value permutations = 10000, min. cluster volume = 250 mm3). Significant clusters related to syntactic processing were identified in areas known to be related to language production and comprehension, including bilateral Broca's area (inferior frontal gyrus). Tool use activation clusters were all in the left hemisphere and included the primary motor cortex and premotor cortex, in addition to other areas involved with sensorimotor transformation. Activation shared by syntactic processing and tool use was only significant at one cluster, located in the left inferior frontal gyrus. This minimal overlap between syntactic processing and tool use activation from our meta-analysis of neuroimaging studies indicates that there is not a widespread common neural network between the two. Instead, Broca's area may serve as an important hub that was initially recruited in early human evolution under the context of simple tool use, but was eventually co-opted for linguistic purposes, including the sequential and hierarchical ordering processes that characterize syntax. In the future, meta-analyses of additional components of language may allow for a more comprehensive examination of the functional networks that underlie the coevolution of human language and complex tool use.

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NATURAL SCIENCES AND MATHEMATICS

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Characterization of Cold Plasma Jet Plume Lengths

Cold atmospheric plasma (CAP) is a near-room temperature ionized gas composed of reactive oxygen and nitrogen species. Over the last 25 years, CAP has been heavily investigated in a wide range of biological applications including wound healing, tissue modification, surface sterilization, and cancer treatment. This explosion in CAP research has proliferated use of CAP discharge devices, most notably the atmospheric pressure plasma jet (APPJ). APPJs are one of two popular "direct" CAP sources because they are designed to have direct contact with treatment targets. They have significant advantages over another common direct CAP device, the dielectric barrier discharge (DBD), as APPJs produce a steady and easily manipulable plasma volume that can penetrate deeper targets. Although APPJ devices are found in many fields, specific device characterization is lacking in these areas. At the same time, there has been a new focus on using real-time device diagnostics to optimize discharge characteristics in situ. Here, we use an image processing approach to determine the length of plume jets in an APPJ device and study the effects of electrical settings, including voltage, current, and plasma frequency, on the plume. This will lead to a better understanding of CAP devices, discharges, and contribute to the development of real-time diagnostic methods, a new area in CAP research. With this, researchers will be able to more rapidly and consistently create plasma devices and better understand the characteristics of the plasma used in their applications.

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NATURAL SCIENCES AND MATHEMATICS

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The serotonin receptor HTR1A is highly conserved across and within primate species (Sapajus apella)

Primates, more than any other mammalian group, exhibit social behaviors that are highly variable and complex. Understanding this behavioral variation can provide insights into the environment and evolution of social dynamics. Behavioral variation is influenced by a complicated mix of biological and environmental factors. Regarding the former, serotonin is a neurotransmitter that regulates mood and influences behavior. There are genetic links to serotonin production and uptake, which are important to study from a molecular perspective to better understand variation in behavioral style. Genes influence behavior by altering brain physiology in conjugation with environmental factors.

Previous studies have focused on the serotonin transporter gene (SLC6A4) but have largely ignored the influence of the serotonin receptors (e.g., HTR1A). Recent research on the serotonin receptor gene HTR1A examined genetic variants within chimpanzees and found evidence of an A/C SNP (single nucleotide polymorphism) associated with variation in prosocial behavior. This study explores genetic variations in the HTR1A gene within a sample of tufted capuchin monkeys (Sapajus apella), for which there are matched behavioral phenotype data. Blood samples were collected from six captive Sapajus apella by researchers at the Georgia State University Language Research Center, and this project was part of an ongoing research project looking at cognition and behavior in this species.

DNA was extracted, a segment of HTR1A was amplified using PCR, and sequenced in both directions using Sanger sequencing. The sequences were aligned using AliView and analyzed against the capuchin monkey reference genome (GSC_monkey_1.0 Assembly). There was no variation detected within this sample of Sapajus apella. Additionally, patterns of protein evolution for the HTR1A gene were analyzed using MEGA phylogenetic tree construction in combination with proxies for protein and DNA similarity among twenty primate reference genomes to provide a broader context for the molecular evolution of HTR1A. My findings indicate this gene is highly conserved both within and across primate species. Understanding genetic variation - or lack thereof- associated with behavioral variation is a crucial first step to understanding differences in primate behavioral style and can provide insights into our own behavioral tendencies.

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RESEARCH SHOWCASE

NATURAL SCIENCES AND MATHEMATICS

COLUMBIAN COLLEGE OF ARTS AND SCIENCES

No Matter How the Dice Fall - Looking into Casino Dice

Many of the household board games people play use bevelled dice, with rounded corners, and are one of the most common examples of chance. However, casinos are not allowed to use them due to their supposed unbalanced and imperfect rolls. They are required to use non-bevelled dice with sharp corners and flush sides. When asked, it is safe to assume that the average person would say that each face of any dice have a ,Öô chance of turning up when rolled. So why is there a difference between bevelled and non-bevelled in casinos? There is a huge gap in the research of probability and fairness of different types of dice. This lack of research was our motivation. Many people have looked into the true randomness of dice and there is no lack of research there; the lack of research comes with comparing the difference between bevelled and non-bevelled dice. Our research will investigate whether bevelled or non-bevelled dice are more random or fair and attempt to create a mathematical model. By rolling a large sample size of both types of dice under the same conditions and recording the final-state - the side that was facing up when the dice settled during each of our many rolls - we will be able to create a model to show the differences between the two types. Additionally, we will use the float test to examine our hypothesis about a dice's fairness and balance - that the non-bevelled dice have a more equal spread of the final-states - by seeing how it behaves when placed in a solution that allows the dice to float. This research will explore our findings and their implications in a practical setting, specifically casinos.

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RESEARCH SHOWCASE

NATURAL SCIENCES AND MATHEMATICS

COLUMBIAN COLLEGE OF ARTS AND SCIENCES

A Review of Polygenic Risk Scores and Subjective Cognitive Complaints in correlation with Cognitive Disease

Cognitive diseases such as mild cognitive impairment (MCI) and dementia are ailments that burden many individuals directly or indirectly. In fact, by 2050, it is predicted that the number of people living with dementia within the United States will exceed 13.8 million (Alzheimer's Association, 2020). Advances in genetic research have led to significant discoveries of genetic risk factors in regards to cognitive impairments such as apolipoprotein E4 (apoE4). Additionally, genome-wide association studies (GWAS) have led to the development of cognitive polygenic risk scores (PRS), which are measures of one's genetic predisposition of a certain trait that can also be utilized in cross analyses to form disease risk associations (Richardson et al., 2019). Additionally, current research within the field of cognitive diseases focuses on subjective cognitive complaints (SCC) or subjective cognitive decline (SCD). Lacking concrete definitions, SCCs or SCD refer to individuals who are considered cognitively normal but have complaints about their cognitive abilities. The purpose of this recent research is to connect SCCs or SCD to pre-clinical indicators of cognitive disease. However, with no formal definition of SCC or SCD, these studies feature a wide array of questionnaires and surveys without unity leading to inconsistent and variable results (Smith et al., 1996; Dik et al., 2001). The objective of this literature review is to analyze the current research in hopes of developing a connection between cognitive disease, cognitive PRS, and SCCs. As the research is still ongoing, there are no results to be displayed. However, we expect to highlight the gaps in the current literature for the advancement of future studies.

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RESEARCH SHOWCASE

NATURAL SCIENCES AND MATHEMATICS

COLUMBIAN COLLEGE OF ARTS AND SCIENCES

The Upcoming BurstCube Gamma-Ray CubeSat

BurstCube is a 30 by 20 by 10 centimeter cubesat designed to detect gamma-ray transients including gamma-ray bursts and gravitational waves. It will be launched to and later deployed from the International Space Station in late 2022 or early 2023 for at least a one-year mission. It will point primarily zenith (away from earth) to get a wide field of view of as many events as possible. It will observe the explosions of dying stars (called gamma-ray bursts) as part of a network of other satellites with Fermi and Swift. I am using these multi-instrument observations to build a large statistical sample of gamma-ray events as part of the planning for this instrument. These samples will be cross matched to tell us what types of events the instrument will detect, so that we can plan the downloads and observations. In this poster, you will note some of the planning that has gone into BurstCube, and what will eventually become of the final project—what powers gamma-ray bursts?

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RESEARCH SHOWCASE

NATURAL SCIENCES AND MATHEMATICS

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Taiga Landscape Fragmentation Analysis, Irkutsk Oblast, Russia

Irkutsk Oblast (administrative region of the Russian Federation) has undergone intensive development by extraction industries (logging and oil and gas exploration and extraction) over the last several decades. The goals of this study are (1) to quantify landscape fragmentation surrounding the town of Ust-Kut and village of Tokma and (2) discuss implications of habitat fragmentation for a number of mammals important to the indigenous Evenk people in this region. ArcGIS Pro and Fragstats 4.2 software were used to calculate Number of Patches (NP), Mean Patch Size (MPS), and Edge Density (ED) based on land cover maps derived from Landsat scenes from 1986, 1997, 2010, and 2019. These indices were chosen to represent both landscape (NP and MPS) and land cover class (NP, MPS and ED) scale measures of habitat patches. Results of these indices plotted over time illustrate more than 30 years of fragmentation caused by informal road development. Edge effects and potential impacts of observed changes are discussed based on reviewed ecology literature for native species. Species were identified in interviews with local and indigenous communities utilizing the expanding informal road networks in the region. Results of this study provide a better understanding of how informal road development causes fragmentation and potential impacts on species related to local subsistence and economic activities.

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RESEARCH SHOWCASE

NATURAL SCIENCES AND MATHEMATICS

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Contextual Effects on Size Perception of Semantic Objects

Objects do not exist in isolation, rather they are part of environments in which objects serve to support scene interpretation. Our knowledge about objects and their perceptual properties, for example their size, modulates attentional allocation. Attention has been shown to be more efficiently oriented in small squares compared to large squares. Similar findings have been observed for attentional orienting in real-world objects, such that attention is more efficiently oriented within small objects (e.g., a domino) vs. large objects (e.g., a door) even when their retinal size is identical. While the findings clearly show that object size, both retinal and inferred, influences attentional orienting, it is unclear to what degree context contributes to size-related attentional modulation. We used the Ebbinghaus Illusion to influence object size perception with context. In a set of several experiments, we first established that perceived size manipulated by the surrounding context, as induced by the Ebbinghaus Illusion, does influence attentional allocation. We then extend this paradigm to real-world objects, manipulating perceived size of a central object by surrounding it with either small or large objects . Given the illusion induced change in perceived size of a central object, we predict that attention will be more efficient for targets within objects that are perceived to be smaller. There are two possible explanations for these results: (i) central objects will seem smaller than their real-world size when surrounded by semantically larger real-world objects, following the original illusion; and (ii) objects will scale in relation to one another, using depth as a cue, making the central object seem closer when surrounded by semantically larger objects. Our results point to an influence of context on perceived size of objects, and characterize its influence on attentional guidance.

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RESEARCH SHOWCASE

NATURAL SCIENCES AND MATHEMATICS

COLUMBIAN COLLEGE OF ARTS AND SCIENCES

A Physical Model of Nerve Habituation in Nematodes

C. elegans, a species of microscopic worms, are known to have distinct evasive maneuvers in response to acute heat stimuli. These evasive maneuvers are referred to as escape responses. When a worm's head is stimulated with a laser, it elicits an escape response, but based of what we know about nerve habituation, a type of non-associative learning that refers to a decrease in response after being stimulated multiple times, we expect the worm to stop responding after an unknown number of simulations. How the different developmental stages and species habituate have an implication on the differences of the species and ages nervous systems. In this poster, we use video microscopy and Logger Pro, a software that allows the user to track movement in a video, to track the movement of many worms being repeatedly stimulated with a laser. From this data we built a physical model of the escape response that includes the metrics distance, velocity, and acceleration. In analysis, we use the quantified escape response of many trials to see the pattern of nerve habituation at different stages of development and for different species. The physical model of the escape response is a novel development of this research. Furthermore, this research adds to the body of knowledge of nerve habituation after stimulation from an acute heat source in C. elegans and other nematodes.

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RESEARCH SHOWCASE

NATURAL SCIENCES AND MATHEMATICS

COLUMBIAN COLLEGE OF ARTS AND SCIENCES

Synthesis of Prodrugs of Fosmidomycin as DXR inhibitors against Malaria

Malaria, primarily caused by the parasite Plasmodium falciparum (Pf), is one of the most common diseases in the world; it was responsible for 241 million cases in 2020 alone. Challengingly, Pf has a complex life cycle in humans and has developed resistance to a multitude of drugs that are approved for treatment. As a result, novel mechanisms must be explored that can potentially clear infections. Our focus involves developing inhibitors of 1-Deoxy-D-xylulose 5-phosphate reducto-isomerase (Dxr), an enzyme found in the 2-C-methyl-D-erythritol 4-phosphate (MEP) pathway. The MEP pathway, which is responsible for isoprene biosynthesis, is not found in humans but is necessary for survival of Pf, making it an exciting and tractable target. While natural products fosmidomycin and its acetyl analog FR900098 are known inhibitors of Dxr, prior work in our group has shown that N-benzoyl analogues of these compounds were exceptionally active against Pf parasites. Further, utilizing a prodrug approach, whereby a protecting group replaces the acidic moiety, has shown to enhance cell wall penetration due to neutralization of the negative charge. In my synthetic route, these changes were made to create fosmidomycin analogues that include a fluorinated N-benzoyl moiety and a lipophilic prodrug portion. When biological evaluation is conducted at a later date, we hypothesize that these changes will increase the ability to penetrate the cell wall, and improve bioavailability and other physicochemical properties.

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NATURAL SCIENCES AND MATHEMATICS

COLUMBIAN COLLEGE OF ARTS AND SCIENCES

Bald sea urchin disease progression and recovery in the sea urchin, Strongylocentrotus purpuratus, and a characterization of the pathogenic microbiome.

Bald sea urchin disease (BSUD) is a bacterial infection of sea urchins that occurs in a variety of species in many ecosystems. It is an infection characterized by the loss of some or all surface appendages and can show surface discoloration. Many bacterial pathogens may underlie the disease suggesting that it is an opportunistic infection after a host injury or an environmental stress. However, many studies evaluated sea urchins from the ocean, which likely complicated pathogen identification. Here, an outbreak of BSUD occurred in a closed marine aquarium after a shipment of sea urchins from arrived from California. The closed system likely reduced the number of bacteria to those associated with the microbiome of the sea urchins in the aquarium. This provided an opportunity to identify the bacteria associated with the pathogenic microbiome of BSUD with greater specificity and to identify the possible causative agent(s). Bacteria were collected from the surfaces of sea urchins with BSUD, after their recovery, and from healthy animals in a separate aquarium, plus sea water from both aquaria. The V3-V4 region of the 16S rRNA gene was amplified and sequenced from the bacterial DNA. Across all samples, 1,982 amplicon sequence variants were identified. Although alpha diversity indicated that there were no significant differences in bacterial distribution among the three groups, beta diversity showed distinct clustering among the groups, indicating that the bacterial composition of each group was significantly different. Linear discriminant analysis effect size identified many species and genera that were significantly differentially abundant for each group. Many taxa were associated with the diseased microbiome that have been reported for other marine diseases, including Erwinia rhapontici, Lutibacter agarilyticus, and the genera Arcobacter and Colwellia. Many of the species and genera have pathogenic potential, indicating that there is no single causative agent, but instead BSUD is likely the result of microbiome dysbiosis. We speculate that the dysbiotic change in the normal microbial flora that were initially present on the sea urchin surfaces occurred after the stressful event of shipping. Stresses are known to compromise the immune functions of many organisms including sea urchins. Our results align with previous studies, suggesting that BSUD is a category of diseases that may be caused by a variety of bacteria and/or a significant and pathogenic change in the composition of the microbiome.

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NATURAL SCIENCES AND MATHEMATICS

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60 Years of Permafrost Monitoring in Utqiagvik, Alaska

Permafrost – ground that remains below 0 ℃ for at least two consecutive years – underlays approximately 22% of the Earth's surface in the Northern Hemisphere. Accelerated permafrost thaw can exacerbate climate change and destabilize ecosystems. The Circumpolar Active Layer Monitoring (CALM) program, funded by the US National Science Foundation and administered by the GW Geography Department, consists of more than 200 permafrost monitoring sites spanning both hemispheres. The program examines the response of active-layer thickness (seasonally thawed, uppermost soil horizon of the permafrost system) to climate change. One of the oldest CALM sites is a roughly 1.5 km transect of 10 m2 plots established in 1962 by the US Army Corps of Engineers' Cold Regions Research and Engineering Lab (CRREL) near the village of Utqiaġvik (formerly known as Barrow) – the northern-most community in Alaska. Periodic monitoring of the thaw depth (active-layer thickness), moisture (ice) content, and auxiliary geocryological and ecological parameters were conducted by CRREL over the 1962-1968 period. The annual thaw depth observations were resumed in 1991 under the auspices of the CALM program. This presentation examines the temporal variability and trend of the active-layer thickness over the 1962 - 2021 period in response to climate forcing. Over the past 60 years, air temperatures in Utqiaġvik have significantly increased 0.79 ℃ per decade, though annual precipitation does not exhibit any significant trends. The period of consistent days with mean temperatures above 0 ℃ is also increasing by 8 days per decade. Increasing air temperature promotes permafrost warming. Mean annual temperature at 20 m depth based on a borehole near the CALM/CRREL sites indicated a 0.7 ℃ temperature increase (-8.9 to -8.2 ℃) from 2007 to 2019. However, active-layer thickness has not shown any significant thickening or thinning trend since 1962. Distinct positive correlations between active-layer thickness and warming climate at the CRREL transect are only evident over discrete (roughly decadal) time intervals, suggesting a complex relation between the atmospheric climate and the ground thermal regime of the upper permafrost. Next steps in this project will analyze available data to examine subsidence and other physical processes possibly responsible for stochastic, Markovian behavior of the active layer under persistently increasing air temperature. Permafrost and climate data presented are all publicly available and serve as an important resource for validating climate and other ecological models that incorporate permafrost regions of northern and western Alaska.

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NATURAL SCIENCES AND MATHEMATICS

COLUMBIAN COLLEGE OF ARTS AND SCIENCES

Cohesive Powers of Directed Graphs

While typical ultrapower constructions in mathematical logic produce uncountable models, cohesive power constructions allow us to algorithmically build countable non-standard models with interesting properties. I will explain how cohesive powers work, and outline recent research I've done on cohesive powers for structures from various important classes of directed graphs. I will state a universal embeddability result for graphs in cohesive powers of strongly locally finite graphs. In general, by Dimitrov's theorem, only first-order properties expressed by sentences at lower levels of arithmetical hierarchy are preserved by cohesive powers. I will outline a classification of certain structures from concrete classes when the cohesive power is isomorphic to the original structure.

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RESEARCH SHOWCASE

NATURAL SCIENCES AND MATHEMATICS

COLUMBIAN COLLEGE OF ARTS AND SCIENCES

Investigating Dipolar Repulsions as a Design Principle to Direct Folding in Chemical Scaffolds for Protein Recognition

The human genome encodes approximately 20,000 proteins, yet only ~30% of proteins contain a deep pocket needed for binding small molecule drugs. The remaining 70% of proteins are considered "undruggable" because of their lack of binding pockets. Chemicals that recognize the surface of pocketless proteins can be used as tools to understand protein function and may lead to breakthroughs in treatments for cancer and other diseases. Here, we investigate novel synthetic methodology used to prepare small molecules with unique three-dimensional conformations for use in protein surface binding. These molecules are dimers, trimers, and longer chains of a common scaffold. We report the synthesis of model dimers to study scaffold structure and to optimize coupling reaction protocols for making longer chains of greater complexity. A model dimer was prepared from the condensation of 2,6-dimethoxybenzoic acid and 2,4-dimethoxybenzylamine, which revealed a unique structural fold resulting from repulsive dipolar interactions between the 2,6-dimethoxy groups and the amide oxygen atom. This compound was characterized by nuclear magnetic resonance spectrometry, mass spectrometry, and X-ray crystallography. This study has generated new design principles for the preparation of chemical scaffolds with greater structural complexity. This knowledge will allow us to better understand how new compounds will fold in solution and to probe the relationship between scaffold conformation and protein surface recognition.

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NATURAL SCIENCES AND MATHEMATICS

COLUMBIAN COLLEGE OF ARTS AND SCIENCES

Shrubification of maritime forest understories: A response to sea level rise and climate change

With increasing effects of climate change and sea level rise, plant communities in coastal forests are undergoing rapid change. Several studies have reported on the shrubification of ecosystems such as Arctic tundra, mesic and xeric grasslands, and barrier islands in response to changes in climate. In our study system, a maritime forest on the Virginia Eastern Shore, we observed that an evergreen shrub species, Morella cerifera, has recently become a more dominant component of the forest understory. Over a consecutive three-year period, a series of plant surveys were conducted in 24 plots that spanned the forest-to-marsh coastal transition zone. Plots were stratified by position on the ecotone: high forest plots exhibited forest characteristics, mid forests plots exhibited stress trees and dieback, and low forest plots exhibited ghost forest composition characteristic of the transition to marsh due to sea level rise. I collected data on shrub density, height, canopy area, and stem diameter of all shrubs within a 2-meter-radius circular plot. Additionally, I conducted a presence-absence survey of larger 20 x 20 m plots to monitor how shrubs have expanded across the landscape. Abiotic data - soil salinity and canopy cover - were also recorded for the three years of the study. Plot-means were compared across forest levels through time using repeated measure ANOVA tests. All shrub metrics increased between 2019 and 2021 showing an overall growth of shrubs in the Brownsville Forest, especially at mid and high forest levels. Shrub occupancy was found to be consistently the highest in the mid forest. Although the low and high forest had the same occupancy in 2019, through time, occupancy increased in the high forest but decreased in the low forest. Finally, individual variables were related to soil salinity and canopy cover using regression analysis, which suggested that the change in tree canopy cover had a significant effect on shrub canopy area. Shrubification is an important indicator of transition zone and links the transition dynamics of the maritime forest with climate change effects in other ecosystems. Furthermore, an increase in shrubs has direct implications for the transitioning coastal forest; effects of M. cerifera on light availability, nutrient cycling, competing plant species, and wildlife habitat may have ecosystem-wide consequences during coastal transition.

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RESEARCH SHOWCASE

NATURAL SCIENCES AND MATHEMATICS

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Functional impacts of CRISPR-Cas9 induced variants on a WntA Cis-Regulatory Element in Vanessa cardui butterflies.

While the central dogma of biology clearly states the accepted path of DNA to RNA to protein, there is less known about the non-coding areas of the genome. These sections of non-coding sequences include Cis-Regulatory Elements (CREs), which function as "switches" turning on or off the expression of neighboring genes. Genetic population studies in plants and animals point to CREs as key sequences underlying adaptive traits, the evolution of novel phenotypes, and even human diseases. Here, we aimed to gain insight into the role of non-coding variants in a CRE regulating the function of WntA, a butterfly wing patterning gene. We used CRISPR-Cas9 technology to generate multiple knockout variants of a WntA CRE in the painted lady butterfly, Vanessa cardui. We then analyzed and compared DNA sequences of F2 individuals with variation on wing patterns. Our approach produced three pattern alterations of a particular section of the wing. Next, we conducted PCRs to amplify the sequences of the CRE variants for each group. Finally, sanger sequences were generated to link distinct alleles to the mutated phenotypes.

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RESEARCH SHOWCASE

NATURAL SCIENCES AND MATHEMATICS

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Classifying Galactic Variable X-ray Sources from Chandra Source Catalog v2 using Machine Learning

The X-ray sky is rich with transient and variable sources many of which are serendipitously discovered with Chandra, XMM-Newton, and eROSITA. Machine Learning (ML) algorithms allow one to quickly explore the astrophysical nature of thousands of transient and/or variable sources. The multi-wavelength ML classification pipeline (MUWCLASS), developed by our group, uses the supervised ML random forest algorithm. It takes into account the measurement uncertainties and provides probabilities for each classified source to belong for each of the classes in the training dataset. The latter includes reliably classified, published sources with X-ray counterparts from Chandra Source Catalog version 2.0 (CSCv2) and multi-wavelength properties from multiple all-sky surveys. We demonstrate the pipeline capabilities by classifying Galactic variable sources from CSCv2 and discuss possible astrophysical implications. We envision a wide range of potential applications of the MUWCLASS pipeline by the high energy astrophysics community, including the classifications of large numbers of serendipitously detected X-ray sources for population studies and searches for rare exotic sources.

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NATURAL SCIENCES AND MATHEMATICS

COLUMBIAN COLLEGE OF ARTS AND SCIENCES

Distinct Xenopus laevis Tadpole Immune Response to Frog Virus 3 in the Kidney

Ranavirus infections, such as those of Frog Virus 3 (FV3), are contributing to the ongoing global decline of amphibian species. Tadpoles and adult frogs of the species Xenopus laevis mount distinct immune responses to FV3, but the exact differences between the two are not yet fully understood. The kidney, the primary site of infection of FV3, has a particularly poorly characterized immune response. Lower vertebrates rely heavily on innate immune defenses over adaptive immunity. Amphibians like X. laevis uniquely possess four types of interferons, occupying an evolutionary middle-ground between lower and higher vertebrate immunity. Describing the exact capabilities of amphibian innate and adaptive immune arms can shed light on what determines susceptibility to FV3 and other pathogens, contextualize the evolution of innate immune capabilities in lower vertebrates, and differentiate stages of X. laevis immune system development.

We investigated cohorts of pre-metamorphic tadpoles and adult frogs after infection by injection at 12 hours, 3 days, 6 days, and 9 days, as well as completely uninfected cohorts. Viral loads were determined from infected cohorts using a standard curve. We then compared relative levels of gene expression, selected specifically from the four different classes of interferons, as well as other innate immune genes regarding cell recruitment and inflammation, and a few key adaptive immunity genes. Lastly, we examined populations of cells infiltrating infected kidney tissue using non-specific staining.

We found that tadpole immune capabilities are stronger than previously expected, but they rely heavily on innate immune defenses as we had hypothesized. The already high expression of certain innate immune defenses is amplified further after infection, which could explain why tadpoles are more susceptible to FV3. An over-activation of immune functions may be what causes tadpole mortality, rather than the inability to fight off the infection. However, tadpoles express key immune genes before infection, suggesting certain immune functions play a role in metamorphosis, although this role is not yet entirely clear. The ongoing development of the immune system in tadpoles likely also contributes to their susceptibility. Future research will elucidate the exact effect and mechanisms of metamorphosis on immune system development, and how the developmental changes in immune organs affect susceptibility and response to pathogens like FV3.

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RESEARCH SHOWCASE

NATURAL SCIENCES AND MATHEMATICS

CORCORAN SCHOOL OF THE ARTS & DESIGN

A comparison of thermal escape responses across different species of nematodes

Escape responses are important for survival, as they help organisms avoid harmful stimuli. In this project, we analyzed how escape responses to thermal stimuli differ across four different species of nematodes: Ancylostoma caninum, Ancylostoma ceylanicum, Heterorhabditis bacteriophora, and Caenorhabditis elegans. Our experimental apparatus consists of an open-frame microscope with a 1480nm infrared laser adapted to provide thermal stimulation. This wavelength optimized the amount of heat that was absorbed by the worm, which increased the efficiency and rate of heating or ramp rate. Previous studies have shown that the strength and speed of C. elegans' escape response increases with ramp rate, making this wavelength of light important. We have conducted trials at three laser pulses: 2ms, 9ms, and 12ms, providing a comparison of how each nematode species responds to different temperatures. Videos of the worms were captured and digitized on a laptop computer.

Worms were stimulated while a video was captured. The stimulation was repeated until the worm did not respond. The worm's velocity and acceleration following each stimulation was computed. Additionally, habituation to the stimuli was compared across species by comparing the number of stimuli required until each nematode stopped responding to the heat.

Results show differences between each of the species of nematode, which are likely due to differences in their life cycles. C. elegans, a free-living nematode, shows an escape response at all three temperatures that were tested, and require fewer stimuli to habituate at higher temperatures. However, A. caninum and A. ceylanicum, two types of parasitic hookworm, only begin showing an escape response at the 9ms laser pulse, with A. caninum moving towards the heat at the lower temperature. In H. bacteriophora, velocity, acceleration, and number of stimuli required to habituate increase with each increase in heat delivered. Taken together these data reveal how unique species of nematodes are tuned to specific thermal preferences that may reflect lifestyle adaptations.

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NATURAL SCIENCES AND MATHEMATICS

SCHOOL OF ENGINEERING AND APPLIED SCIENCE

The Synergistic Effects of Insecticides with a Fungicide on Apis Mellifera in Almond Farms in California

Colony Collapse Disorder (CCD) is the driving cause behind the worldwide decline of Apis mellifera (honey bee) populations that have become indispensable for modern, plantation-like agricultural operations. However, the very same type of large-scale farming seems to rely on multiple applications of a host of pesticides. Many agrochemicals are considered safe for pollinators by the Environmental Protection Agency (EPA) despite the fact that their combined effects have not yet been evaluated. Here, the synergistic effects of insecticides (methoxyfenozide, pyrethrin, and permethrin), and fungicides (iprodione) as they pertain to almond plantations in California are examined as a possible cause of CCD. Previous studies attempt to exhibit the link between CCD and other potential causes such as varroa mites, new and emerging diseases, inadequate nutrients, etc. However many flaws in this research emerge that disprove the overall significance of each considered effect. For example, researchers who study the link between varroa mites and CCD cease to mention why CCD has been shown to happen regardless of the presence of a mite. Agrochemicals, however, find their way to a wide majority of honeybee food sources. Although the EPA has done research on individual chemicals, data in the chemicals combined is lacking. The missing research on likely synergistic effects on the cognitive function of honey bees is the link for a better understanding of the effects of modern agricultural practices. For example, such synergistic effects of pesticides may prevent honey bees from remembering key survival mechanisms such as their various roles in the hive, where and how to find food sources, and most importantly, remembering the location of their hive. To measure the cognitive function of honeybees, we utilized the proboscis extension reflex (PER) protocol. This in conjunction with classical conditioning techniques allowed us to document a clear, statistically significant decline in the cognitive memory of honey bees, when fed both an insecticide and a fungicide. Thus, so-called non-lethal agrochemicals, when given together, are not so non-lethal after all. Our findings strongly question the simplistic approach to test one pesticide at a time for registration purposes. Instead, whenever possible, pesticides need to be tested for their synergistic effects on vulnerable, non-target organisms like the honeybee.

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NATURAL SCIENCES AND MATHEMATICS

SCHOOL OF ENGINEERING AND APPLIED SCIENCE

A Novel Intrinsic Measure of Data Separability

Data and models are the two main foundations of machine learning and deep learning. Models learn knowledge (patterns) from datasets. An example is that the convolutional neural network (CNN) classifier learns how to recognize images from different classes. There are two aspects in which we examine the learning process: the complexity of the learning model and the separability of the dataset. The learning outcomes are highly dependent on the two aspects. For a specific model, the learning capability is fixed so that the training process depends on the training data. Separability is an intrinsic characteristic of a dataset to describe how data points belonging to different classes mix with each other.

To quantitatively measure the separability of datasets, in this study, we propose an intrinsic measure -- the Distance-based Separability Index (DSI), which is independent of the classifier model. We then formally show that the DSI can indicate whether the distributions of datasets are identical for any dimensionality. DSI can measure the separability of datasets because we consider the situation in which different classes of data are mixed in the same distribution to be the most difficult for classifiers to separate. And DSI is verified to be an effective separability measure by comparing it to state-of-the-art separability/complexity measures using synthetic datasets and real datasets (CIFAR-10/100). Having demonstrated the DSI's ability to compare distributions of samples, our other studies show that it can be used in other separability-based applications, such as measuring the performance of generative adversarial networks (GANs) and evaluating the results of clustering methods.

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RESEARCH SHOWCASE

NEUROSCIENCE

INSTITUTE FOR BIOMEDICAL SCIENCES

Sexual Dimorphism in Brain Cellular Senescence during Angiotensin II-Induced Hypertension

Sex differences in hypertension development across the lifespan are well established. Women are at lower risk of hypertension compared to age-matched men until menopause when the female hypertension risk sharply rises. The hormone angiotensin II (Ang II) is a well-recognized contributor to hypertension, particularly through its actions in the brain. However, Ang II is too large to enter the brain and influences blood pressure by acting at specialized nuclei located outside of the blood-brain-barrier, particularly the subfornical organ (SFO). In males, Ang II drives pro-hypertensive cellular stressors in the SFO while females are resistant to Ang II-induced hypertension. However, underlying CNS mechanisms that contribute to hypertension in a sexually dimorphic manner remain unclear. Intriguingly, Ang II-induced stressors lead to cellular senescence, a phenotype characterized by marked changes in cell metabolism, macromolecular damage, and a pro-inflammatory environment termed the senescence associated secretory phenotype (SASP). The role of CNS senescence in hypertension development remains unclear. We hypothesized that brain cellular senescence, particularly in the SFO, may be a novel sexually dimorphic mechanism for Ang II-induced hypertension. To test this, male and female C57Bl/6J mice (n=7-10/group) were implanted with subcutaneous osmotic pumps for infusion of Ang II (600 ng/kg/min). SFO micropunches were collected at baseline and following 14 days of Ang II infusion for quantitative real-time PCR analysis. In males, Ang II infusion resulted in a robust increase in key senescent genes p16 (1.9±0.3 fold baseline, $p<0.05$) and p21 (2.5±0.5 fold baseline, $p<0.05$) in the SFO. In parallel, inflammatory SASP indicators were also upregulated in the SFO of males following 14 days of Ang II infusion, including interleukin-6 (IL-6: 2.4±0.4 fold baseline, $p<0.05$) and interleukin-10 (IL-10: 2.8±0.7 fold baseline, $p<0.05$). However, when examining females, clear sexual dimorphism in Ang II-induced SFO cellular senescence was apparent. Specifically, no changes in p16 (1.1±0.4 fold baseline, $p=0.9$) or p21 (1.2±0.2 fold baseline, $p=0.2$) were noted in the SFO following Ang II administration. Similarly, SASP markers remained unchanged in the SFO (e.g. IL-6: 1.3±0.5 fold baseline, $p=0.8$ and IL-10: 0.98±0.2 fold baseline, $p=0.6$). Together, these findings indicate that: 1) SFO cellular senescence is associated with Ang II-induced hypertension in males; and 2) Females are protected against Ang II-driven cellular senescence in the SFO. Given that cellular senescence increases with age, our data suggests that senescence may underlie the sex differences in hypertension at younger ages as well as the increased hypertensive risk in women as they age.

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RESEARCH SHOWCASE

NEUROSCIENCE

INSTITUTE FOR BIOMEDICAL SCIENCES

Sex-Dependent Impact of Losartan on Anxiety and Hyperreactivity

PTSD is a debilitating disorder associated with symptoms such as hyperactivity and increased anxiety. Though PTSD is 2-3x more likely to affect females, they are severely understudied in fear-related research, though preclinical studies show that female rodents may have deficits in fear extinction. Recent studies have linked PTSD with changes in the renin-angiotensin system, and evidence points to the utility of angiotensin receptor blockers (ARBs) in treating PTSD. Our lab has shown that treatment with the ARB losartan decreases the fear response in males, making it a promising potential therapeutic for PTSD. We therefore hypothesized that losartan would reduce fear-potentiated startle (FPS) and anxiety in both males and females, potentially via changes in the prefrontal cortex (PFC), a key region for fear processing. Pavlovian fear conditioning (FC) and extinction as well as fear-potentiated startle (FPS) were used to evaluate the effects of a single injection of losartan (10mg/kg, IP) on extinction of startle and anxiety in male and female C57Bl/6 mice. Following extinction, RT-qPCR was used to analyze activation and plasticity in the PFC. Females had higher freezing during early extinction testing ($p=0.0571$, $n=9$) than males, and had significantly higher anxiety during FPS both 24hrs ($p=0.0043$, $n=17$) and 48hrs ($p=0.0273$, $n=17$) after FC. Following extinction testing, males had increased expression of activity-dependent immediate early gene fos ($p=0.0146$, $n=9$) as well as learning-associated neuromodulator BDNF ($p<0.0001$, $n=9$) and its receptor NTRK2 ($p=0.1530$, $n=9$) in the PFC. Losartan-treated males had increased FPS 48hrs after FC ($p=0.4795$, $n=25$). FPS in females was not impacted by losartan 24hrs ($p>0.9999$, $n=17$) or 48hrs ($p=0.9842$, $n=17$) after FC. Overall, females had significantly higher anxiety during FPS than males ($p=0.0043$, $n=17$), decreased by losartan both 24hrs ($p=0.4064$, $n=17$) and 48hrs ($p=0.3054$, $n=17$) after FC. Losartan did not impact anxiety during FPS in males (24hrs $p=0.9653$, $n=21$; 48hrs $p=0.9453$, $n=21$). These findings indicate that female mice have deficient extinction and higher anxiety than males, possibly related to a male-specific increase in neuronal activation and plasticity in the PFC following extinction. Losartan decreased anxiety in females during FPS to the same level as saline-treated males, indicating its potential efficacy in treating sex-based differences in fear processing. Unexpectedly, we found that losartan may increase FPS in males. Future studies will address the sexually dimorphic neurobiological mechanisms of ARBs on FPS and extinction as well as the potential effects of losartan on the neural circuits of sensorimotor gating and anxiety.

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RESEARCH SHOWCASE

NEUROSCIENCE

SCHOOL OF MEDICINE AND HEALTH SCIENCES

FOUR LEVEL ACDF – SURGICAL TECHNIQUE AND LITERATURE REVIEW

Background: Anterior cervical discectomy and fusion (ACDF) is a common and efficacious surgical treatment for single or multi-level degenerative disc disease (DDD) refractory to conservative management. Anterior plates improve spine lordosis by providing points of fixation for spine form correction. 1-3 level ACDF outcomes are well studied, but 4-level ACDF outcomes are less documented.

Objectives: To review available PUBMED literature for surgical technique, efficacy, outcomes, and depth of reporting for four-level ACDF procedures during a 29-year period.

Methods: In a PubMed literature review adhering to Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines using the keywords "multilevel ACDF" and "4 level ACDF", we identified studies that investigated outcome parameters in 4-level ACDF.

Results: 166 studies (2991 patients) investigating 4-level ACDF between 1973 and 2020 (mean age: 54, range: 7-90) were identified.The C4–5 and C5–6 levels were instrumented in almost 100% of patients. Mean operative time was 159.3 minutes. Mean intraoperative blood loss was 166.3 mL. Mean hospital stay was 4.86 days. Mean follow-up was 30.24 months. PEEK (polyetheretherketone) interbody cages were used in 26 studies, metal cages in 24 studies, autografts in 32 studies, allografts in 32 studies, and both autografts and allografts in 28 studies. Zero-profile devices were used with or without plating systems.

Clinical outcomes included the visual analogue scale (VAS) for neck (mean: 4.31) and arm (mean: 4.74), Neck Disability Index (NDI) (mean: 16.31), and modified Japanese Orthopedic Association (JOA) score (mean: 14.08) for pain or myelopathic symptoms.

Postoperative complications include: wound infection in 1.27%, hematoma in 1.75%, respiratory difficulty in 2.63%, pseudarthrosis in 15.26%, C5 nerve root palsy in 3.72%, dysphagia in 13.39%, hoarseness in 5.42%, neck pain in 13.17%, cerebrospinal fluid leakage in 1.39%, and adjacent-level degeneration in 15.91%.

Fusion was commonly defined by radiographs and the mean overall fusion rate was 86.8%.

Conclusions: ACDF for DDD has been well-documented in 1-3 levels; however, literature synthesis for 4-level ACDF has not been established and is commonly treated by the posterior approach. The anterior approach provides decompression of the spinal cord, cervical nerve roots, and correction of cervical lordosis and disc height in 4-level DDD. It provides good clinical and radiographic outcomes evidenced by the high fusion rate (86.8%) and low risk of complications, with the highest risk being adjacent-level degeneration (15.91%).

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RESEARCH SHOWCASE

NEUROSCIENCE

SCHOOL OF MEDICINE AND HEALTH SCIENCES

Dipsogenic role of Angiotensin II during Fear Memory Retrieval

Brain angiotensin II (AngII) is a potent thirst producing peptide that can also modulate threat learning and memory by impacting the physiological internal state. We hypothesized that acute water deprivation (WD), with subsequent increases in endogenous AngII, contributes to fear memory retrieval plasticity.

Using auditory fear conditioning, C57BL/6J mice underwent a reconsolidation memory protocol while water restricted (24hrs) or ad-libitum in the presence/ absence of the angiotensin type1 receptor antagonist losartan (10mg/kg i.p.) given post fear memory retrieval.

Mice, which underwent WD during memory retrieval, showed a significant reduction in freezing behavior in comparison to the non-WD controls during long term memory (LTM) tests at 24hrs ($p= 0.0019$, $n=12$) and 1week ($p = 0.0024$, $n=12$). No difference in freezing response was observed in losartan-WD mice. Following water deprivation, mass spectrometry revealed an elevated level of AngII peptide in the Subfornical region (SFO), an area essential for fluid regulation. The mRNA expression of RAS and synaptic plasticity genes - Agtr1, Agt and Bdnf ($p<0.01$, $n=6$) - were also significantly up-regulated only in WD saline mice. WD mice also had increased circulating aldosterone and angiotensin II ($p<0.05$, $n=7$) levels.

Our findings indicate that, elevated angiotensinII as a result of WD, reduced LTM while altering the expression of specific RAS genes in SFO. Peripheral administration of losartan however blocked this effect. Thus, we speculate that endogenous AngII acts as neuromodulator under different physiological states driven by thirst and influences the fear memory.

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RESEARCH SHOWCASE

NEUROSCIENCE

SCHOOL OF MEDICINE AND HEALTH SCIENCES

Forebrain Microglia Activation Mediate Non-alcoholic Fatty Liver Disease During Obesity

Non-alcoholic fatty liver disease (NAFLD), characterized by increased hepatic triglycerides (i.e. steatosis), leads to an increased risk for obesity-related mortality. Accumulating data points to central nervous system (CNS) alterations as a NAFLD contributor. In this context, we have recently shown that pharmacological inhibition of microglia, the resident immune cells in the brain, ameliorates NAFLD during obesity. However, the brain regions involved in this microglial driven steatosis remains unknown. The forebrain subfornical organ (SFO), a circumventricular nucleus located outside of the blood-brain-barrier, has recently been suggested to be critical in NAFLD. Thus, we hypothesized that SFO microglia activation mediates hepatic steatosis during obesity. To investigate this, we used a diet-induced model of NAFLD where male C57Bl/6J mice were fed a high fat diet (HFD) or normal chow for 11 weeks, starting at 6 weeks of age. Immunohistochemistry for ionized calcium-binding adapter molecule 1 (Iba1) revealed microglia activation in the SFO following HFD feeding (1.0±0.01 vs 1.4±0.15, relative Iba1 intensity, normal chow vs HFD, $p<0.05$, n=7). 3-dimensional analysis further indicated that HFD feeding was associated with a shift to an activated SFO microglia morphology, including reduced branching complexity (e.g. branch point #/dendrite: 5.1±0.4 vs 3.2±0.1, normal chow vs HFD, $p<0.05$, n=5/group, 203-364 microglia/animal). Building upon this, we employed a chemogenetic strategy to selectively inhibit SFO microglia. HFD or normal chow male mice underwent SFO stereotaxic delivery of a designer receptors exclusively activated by designer drugs inhibitory construct targeted to microglia via the CD68 promoter (pAAV-CD68-hM4Gi-mCherry, n=7–11/group). Inhibition of SFO microglia for 3 days by administration of the synthetic ligand clozapine-N-oxide (CNO; 3 mg/kg i.p. once daily) did not affect body weight (46±2 vs 42±1 g, HFD saline vs CNO, $p>0.05$), food intake, or regional adiposity in normal chow or HFD fed mice. Similarly, indirect calorimetry evaluations revealed no change in oxygen consumption, respiratory exchange ratio (RER), or energy expenditure in either diet group (e.g. RER: 0.73±0.003 vs 0.72±0.002, HFD saline vs CNO, $p>0.05$). However, histological examination (Oil Red O staining) revealed that short-term inhibition of SFO microglia HFD fed obese mice drastically reduced hepatic steatosis (38.3±5.7 vs 18.4±5.4%stained area, HFD saline vs CNO, $p<0.05$). This decline in hepatic steatosis in response to SFO microglia inhibition was further confirmed with liver triglyceride measurements (1.9±0.2 vs 1.4±0.1 mM, HFD saline vs CNO, $p<0.05$). Collectively, these results indicate that SFO microglia activation is a critical contributor to hepatic steatosis during obesity.

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RESEARCH SHOWCASE

NEUROSCIENCE

SCHOOL OF MEDICINE AND HEALTH SCIENCES

Use of Augmented Reality Modeling to Guide Revision Spine Surgery: A Case Report of Hardware Failure and Overriding Spondyloptosis

Introduction: Augmented reality (AR) is a relatively novel technology with broadening applications to different surgical fields. Its applications to deformity spine surgery have been primarily directed to facilitating the efficient, safe, and precise placement of pedicle screws. However, AR may also be used to generate high-fidelity three-dimensional (3D) spine models for cases of advanced deformity with existing instrumentation. Here, the authors present an illustrative case in which an AR-generated 3D model meaningfully enhanced preoperative planning, expedited the removal of embedded instrumentation, and guided the reduction of an overriding spondyloptotic deformity.

Case presentation: A young adult female with a remote history of a motor vehicle accident resulting in a mid-thoracic traumatic spine fracture and complete spinal cord injury treated with long segment posterior spinal stabilization presented with increasing back pain and difficulty sitting upright in her wheelchair. Her index surgery was 20 years prior to presentation, and she had undergone multiple revisions at outside facilities. Imaging revealed pseudoarthrosis, multiple rod fractures, and overriding spondyloptosis of T6 on T9. An AR-generated 3D model was used both preoperatively and intraoperatively to localize rod breaks and the extensively embedded and multifarious instrumentation. Real-time model thresholding allowed for the safe explantation of the defunct fixation system and reduction of her spondyloptosis with quad-rod reconstruction in turn. There were no operative or post-operative complications. Her posture is improved, and she remains at her neurological baseline two months after surgery.

Conclusion: AR is an evolving technology with great potential in neurosurgery. We present a previously unreported and practical application of an AR-generated 3D model aiding in the revision of hardware failure leading to high-grade spinal deformity. This emblematic case endorses further integration of this promising technology and its facets into complex spine surgeries.

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RESEARCH SHOWCASE

NEUROSCIENCE

SCHOOL OF MEDICINE AND HEALTH SCIENCES

Role of locus coeruleus expressing angiotensin type 1 receptors (AT1R) neurons in fear learning and stress-induced anxiety

Background: The locus coeruleus (LC), which plays critical roles in modulating anxiety-like behaviors, has been shown to express the renin-angiotensin system (RAS) component angiotensinogen (AGT) and AT1R, but the role of RAS in LC is unknown. Here, we examined the role of LC expressing AT1R neurons in fear- and anxiety-related behaviors.

Methods: RNAscope® technology was used to analyze cellular mRNA expression of AGT while chemogenetics combined with behavioral testing in AT1R-Cre mice mouse was used to examine the role of LC-AT1R cells in fear memory and stress-induced anxiety. Immunohistochemistry plus retrograde tracing was used to characterize LC AT1R-eGFP+ cells and limbic circuit connections.

Results: AGT mRNA and AT1R-eGFP+ immunoactivity weere found in LC. Retrograde labeling revealed some of AT1R-eGFP+ neurons send projections to the basolateral amygdala, an important brain structure for modulating stress and fear related anxiety responses. Silencing the LC AT1R-expressing neurons with the DREADD-CNO system prior to fear extinction training impaired the extinction of learned fear as shown by increased percent freezing during the training (time×drug interaction, $F(7, 70)=3.219$, $p<0.01$). Furthermore, restraint stress-induced anxiety behavior was attenuated by LC AT1R + neuron inhibition, as shown by increased % time in center (2.97±1.14 Saline v.s. 8.6±1.4 CNO, $p<0.05$) in the open field test and increased open arm entries (5±1.3 Saline v.s. 12±1.1 CNO, $p<0.05$) in the elevated plus maze test.

Conclusion: These findings provide new evidence for an angiotensinergic LC cell type and position the LC AT1R as a potential mediator of noradrenergic regulation in learned fear and stress-induced anxiety.

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RESEARCH SHOWCASE

OBESITY

MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

The COVID-19, Obesity, and Food Insecurity Syndemic

To introduce and provide evidence for the new Syndemic, or simultaneously occurring and interacting pandemics, of COVID-19, Obesity, and Food Insecurity and propose strategies for mitigating its impact, particularly among vulnerable populations including the essential workforce responsible for driving the US food system. To present triple-duty solutions that collectively combat this new Syndemic coupled with the Global Syndemic of Obesity, Undernutrition, and Climate Change.

The COVID-19 pandemic has exacerbated obesity and food insecurity in the US with a disproportionate burden on marginalized populations. Food insecurity and associated shifts to ultra-processed food consumption drive unsustainable dietary patterns and are associated with higher rates of obesity, which increase the risk of COVID-19 infection, hospitalization, and death. The COVID-19 pandemic has also highlighted the existing vulnerabilities and politicization of the industrialized US food system and the inequitable impact on the health and safety of the essential workforce along the food supply chain. Strengthening the social safety net and expanding worker protections will increase food security and secure livelihoods for this workforce among other vulnerable populations within and beyond the scope of the COVID-19 pandemic. These measures can also attenuate the longstanding disparate interactions between race/ethnicity, obesity, and food insecurity, as well as COVID-19 infections, that are a result of structural racism and other social drivers of health. Strengthening local and regional food systems can alleviate the burden of the new Syndemic of COVID-19, Obesity, and Food Insecurity by stabilizing the food supply chain, promoting plant-based diets, lowering greenhouse gas emissions, providing employment opportunities, and incentivizing sustainable agricultural practices. Two proposed strategies to accomplish this shift toward food system sustainability and resiliency are systems-oriented initiatives, such as the creation of a Central Food Processing Facility, and equity-focused legislation at the city and state level.

The novel Syndemic of COVID-19, Obesity, and Food Insecurity is a consequence of a fragile US food system that propagates unsustainable dietary patterns and prioritizes profit over human and environmental health. Strengthening local and regional food systems provides a common solution to both the new Syndemic and the Global Syndemic of Obesity, Undernutrition, and Climate Change by increasing the sustainability of food production and consumption. These strategies can also work to oppose and dismantle structural racism by promoting economic opportunity and stability for historically marginalized producers and consumers.

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RESEARCH SHOWCASE

OBESITY

MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

Current Attitudes and Counseling Behaviors Related to Obesity by Health Care Providers

Background: Obesity affects over 42% of the U.S. adult population, yet it remains undertreated. Many healthcare providers are biased in their perceptions and attitudes regarding obesity management or lack proper knowledge of the disease.

Methods: We analyzed the results of the 2021 DocStyles survey to examine primary care providers' perceptions of obesity as a disease and how these perceptions affected treatment patterns. The survey sample consisted of primary care physicians (PCPs) and nurse practitioners/physician assistants (NP/PAs). Survey questions were designed to garner insight into healthcare providers' attitudes and counseling behaviors related to obesity, including referrals, use of medical therapy, barriers to care, the effects of the COVID-19 pandemic on treatment, and risk factors related to social determinants of health.

Results: 1,253 primary care providers participated in the survey; 1,002 participants were PCPs and 251 were NP/PAs. Only about half of the total primary care providers said that they referred patients for obesity treatment. Almost two-thirds of primary care providers indicated that they had prescribed medication for obesity in the last 12 months. Those who did not prescribe medications reported lack of familiarity with weight loss medications or concerns about drug safety. Over three-quarters of the primary care providers surveyed indicated at least one barrier to treating obesity. Twenty percent of providers reported lack of adequate compensation and time for treating obesity, and 50% stated that their patients had higher priority issues than obesity. Providers reported that barriers to treatment encountered by their patients included inadequate insurance coverage and the lack of affordable weight loss programs. The majority of providers reported that the care they provided was roughly comparable to the care they provided before the COVID-19 pandemic. More than half of providers reported that poverty and food insecurity contributed significantly to the high prevalence of obesity in communities of color. Providers who believed that obesity is caused by patients themselves were less likely to think that obesity was a disease and reported that their patients with obesity had higher priority issues other than obesity.

Significance: Improved familiarity with anti-obesity medications may have a major impact on treatment. Whether the low priority accorded to obesity care by patients reflects the failure of health plans to pay for obesity care, avoidance of care by providers, prior experience with mistreatment by providers, lack of shared decision making by providers and patients remains the focus of future research.

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RESEARCH SHOWCASE

OBESITY

SCHOOL OF MEDICINE AND HEALTH SCIENCES

Obesity and the Severity of Post-Acute Sequelae of COVID-19 (PASC)

Background: A proportion of COVID-19 patients may experience symptoms after recovery from the acute phase of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). Collectively, this presentation is known as Post-Acute Sequelae of COVID-19 (PASC). The connection between the acute phase of COVID-19 and the development of PASC is continuing to be explored, and the identification of risk factors can assist in predicting long-term outcomes. Obesity (BMI > 30) has been previously identified as a risk factor for both contracting severe acute COVID-19 infection and dying from the disease. However, the severity of PASC in obese patients has not been explored.

Methods: Patients in the COVID-19 Recovery Clinic experience symptoms months after initial acute COVID-19 infection. At each visit, patients were interviewed, completed questionnaires, and submitted lab work including serum antibody levels, complete blood count and metabolic panel, and inflammatory markers. Additionally, manifestations of PASC are further subcategorized into specific phenotypes based on organ system and severity. The severity of PASC symptoms is assessed by these phenotypes, questionnaire responses, the number of symptoms reported, the number of participants reporting fatigue as a symptom, and the number of specialists seen between acute infection and COVID-19 Recovery Clinic visit. Using RStudio with calculations of descriptive data, odds ratios, and p-values using Fisher's exact test, we assessed COVID-19 severity at diagnosis, as well as quality of life ≥ 6 months after acute infection.

Results: During acute COVID-19 infection, 7/32 (21.9%) obese patients and 9/112 (8.0%) non-obese patients were hospitalized (Odds ratio = 3.79, 95% CI=1.23 – 11.68, p = 0.03). At 6-12 months after initial COVID-19 infection, 117 participants report continuing symptoms. Of these, 22/117 have a BMI > 30 (Odds ratio = 0.39, 95% CI=0.16 – 0.97, p = 0.04), with an average BMI of 29.6 ± 9.0. The number of reported symptoms, number of participants reporting fatigue as a symptom, and number of specialists seen were comparable between obese (BMI > 30) and non-obese patients.

Conclusion: This research further supports current data that obese participants are more likely than non-obese participants to be hospitalized during acute COVID-19 infection. The severity of PASC in obese patients is comparable to that of non-obese patients. However, future studies should look to incorporate greater sample sizes in order to better understand the relationship between PASC and obesity.

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RESEARCH SHOWCASE

PREVENTION AND COMMUNITY HEALTH

MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

Exploratory Analysis of The Role of Police Disclosure and Self-Protective Actions on Distress Among Victims of Sexual and Other Violent Crime

Background: Sexual crime victimization is associated with low police disclosure rates and poor health outcomes compared to other violent crimes. Further, police disclosure is associated with exacerbated levels of victim distress for victims of sexual crimes. Limited research exists on the relationship between police disclosure and level of victim distress, both across types of violent crime and types of sexual crime, particularly when considering a victim's self-protective actions.

Methods: This study used data from the National Crime Victimization Survey between 2015-2019, with a focus on all types of violent crime (n=10,128) and only sexual crime (n=856). Respondents reported the type of crime experienced, whether the crime was disclosed to police, level of distress experienced, and whether any self-protective actions were taken. Two unweighted multiple group path analyses assessed the mediating role of police disclosure on the relationship between type of crime experienced and victim distress. Difference testing was completed between groups of no action and self-protective action taken for both the (model 1) all violent crime and (model 2) only sexual crime models.

Results: Experiencing sexual crime compared to any other violent crime both decreased the likelihood of police disclosure and increased levels of victim distress; police disclosure was also associated with higher levels of distress and significantly mediated the relationship between experiencing sexual crime and distress. Self-protective actions moderated the direct effect of sexual crime on police disclosure. Experiencing sexual assault, compared to rape or attempted rape, decreased the likelihood of police disclosure, and was associated with decreased distress; police disclosure was again associated with higher distress. Sexual assault had a total effect of decreased distress, and police disclosure significantly mediated that relationship.

Conclusion: The results contribute to growing evidence that police disclosure increases victim distress levels across types of violent crime suggesting a potential area for intervention. Additional research is needed into what contributes to a victim's decision to disclose crime and what about police disclosure contributes to distress.

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RESEARCH SHOWCASE

PREVENTION AND COMMUNITY HEALTH

MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

Understanding and Overcoming Barriers to Prostate Cancer Screening of African American Men in the Arkansas Delta

Background: The Delta region of Arkansas has a large underserved African American population. Cancer morbidity and mortality is affected by race/ethnicity, lack of insurance coverage, geographic area of residence and other social determinants of health. African American men in the United States are 1.7 times more likely to develop prostate cancer and 2-3 times more likely to die from the disease. When prostate cancer is diagnosed early, the five-year survival rate for all races is nearly 100%. The five-year survival rate for men diagnosed with advanced prostate cancer is 31%. Increasing screening and treatment of African American men in the Arkansas Delta region can increase survival rates in this population. By identifying these patients and treating them early, we can also reduce the burden on the healthcare system as we know that late diagnosis and treatment is more costly than early diagnosis and treatment.

Objective: To better understand the barriers to prostate cancer screening and treatment among Africa American men in the Arkansas Delta region and develop a treatment plan.

Methods: A literature review will be completed which will include reviewing SEER data for the region and interviews of residents in this region will be conducted to identify barriers to prostate cancer screening.

Results: There are underserved African American men in the Delta region of Arkansas who are not being screened for prostate cancer. A variety of factors in the region are preventing healthcare screenings and treatment. These factors include social, cultural, and financial barriers to healthcare and there is an opportunity to reach and treat this population.

Conclusion: There is an opportunity to partner with the community in the Delta region to reach out, educate, screen, and treat this vulnerable population who are at increased risk for developing prostate cancer and being diagnosed at a late stage. Statistics demonstrate that 1 in 7 African American men will develop prostate cancer in his lifetime. When prostate cancer is diagnosed early, the five-year survival rate for all races is nearly 100%. The five-year survival rate for men diagnosed with advanced prostate cancer is 31%

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RESEARCH SHOWCASE

PREVENTION AND COMMUNITY HEALTH

MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

Effectiveness of Digital Delivery of Type 2 Diabetes-Related Lifestyle Interventions in Decreasing A1c: A Systematic Review

Background: Digital delivery of lifestyle interventions offers a potentially effective, affordable, and convenient option for patients to prevent and monitor type 2 diabetes (T2D). Such interventions include, for example, mobile applications with wearable technology that target behavior change in areas such as exercise, diet, and care navigation in order to improve glycemic control. Hemoglobin A1c (A1c) is a measure of an individual's average blood glucose level over the preceding three months and is a consistent outcome used to monitor T2D progression. Standard of care and monitoring only based approaches to encourage lifestyle modification have been shown to decrease A1c, yet high healthcare costs and travel-related barriers limit the accessibility of these strategies. Rising T2D rates globally underscore the immediate need to identify the most comparably effective options that decrease A1c and address disease prevention and management. Thus far, researchers have not yet systematically reviewed the literature on the effectiveness of digitally based diabetes lifestyle interventions in decreasing A1c overall and compared to standard of care and monitoring only based approaches.

Objectives: This systematic review examines the effectiveness of digital delivery of lifestyle interventions in decreasing A1c among adults globally both overall and compared to standard of care and monitoring only based approaches.

Methods: Based on application of the Navigation Guide systematic review methodology, 10 studies conducted in eight countries met the inclusion criteria and were evaluated for bias, quality, and strength of evidence. Conclusions were drawn from evaluating quantitative results.

Results: A systematic review of the literature demonstrated sufficient evidence of an association between digital delivery of lifestyle interventions and decreased A1c trends. Research did not show significant differences in A1c changes among the intervention groups when compared to the standard of care and monitoring only based control groups.

Conclusions: These results indicate that while the digital delivery of lifestyle interventions is effective in lowering A1c levels in T2D patients, these interventions do not outperform standard of care and monitoring only based approaches to prevent and manage T2D. These digital interventions do demonstrate a comparable level of effectiveness to standard of care and monitoring only strategies, however, and offer an accessible, convenient, and affordable option for individuals globally who may face barriers to standard of care appointments for diabetic treatment. Future research comparing the effectiveness of this intervention as a long-term alternative to standard of care would further assess the most effective approach to T2D care.

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RESEARCH SHOWCASE

PREVENTION AND COMMUNITY HEALTH

MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

Focus Groups to Understand Barriers and Improve the Awareness, Diagnosis, and Treatment of Sleep Disorders in Black American Communities

Although racial-ethnic minorities are at a higher risk of insufficient sleep and sleep disorders, there is almost no research on targeting sleep disorders diagnosis and treatments for these populations. The long term effects of sleep disorders and sleep loss are associated with many health consequences, including an increased risk of cardiovascular diseases, cognitive disorders, and other co-morbidities. Previous literature indicates that Black Americans have a higher prevalence of sleep-disorder breathing, exhibit more risk factors for poor sleep, and have a large disparity in receiving a sleep disorder diagnosis (Petrov et. al 2015; Johnson et. al, 2018). In order to reduce the health burden of sleep disorders within the Black American population, it is important to understand best how to inform and encourage this population about screening and treatment options. Six focus groups will be conducted, each with a different subpopulation: Black American adults diagnosed with sleep disorders, Black American adults who are family members or spouses of individuals diagnosed with sleep disorders, Black American adults who identify as not having any sleep issues, Black American adults with sleep issues that have not been addressed/diagnosed, healthcare providers at local community clinics, and leaders from Black American community and faith-based organizations. Although this data collection is still in progress, the discussion generated from these focus groups will be coded with particular attention to themes related to awareness of and attitudes towards sleep issues, beliefs regarding barriers to accessing sleep-related healthcare, attitudes related to messaging and communications around sleep, and attitudes and beliefs related to cultural and racial perceptions of sleep. These findings will provide insight on different barriers to treatment and diagnosis that Black Americans may or may not face, and how to better create more effective educational and promotional material regarding sleep disorders for this population. Since sleep disorders and sleep issues have a large impact on one's entire wellbeing, it is essential to understand best how to reach, diagnose, and treat the Black American population.

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RESEARCH SHOWCASE

PREVENTION AND COMMUNITY HEALTH

MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

Addressing FGM/C in the DMV: Creating an Integrated Community of Care

Female Genital Mutilation or Cutting (FGM/C) is any partial or total removal of the external female genitalia or any other injury of the female genital organs for any cultural, religious, or nontherapeutic purpose reasons. FGM/C has been found to be practiced on nearly every continent and is a pressing human and gender rights issue that needs to be studied, addressed, and prevented in the United States (U.S). The CDC and Population Reference Bureau (PRB) reported that an estimated 513,000 girls and women in the U.S. have undergone or are at risk of being subjected to FGM/C and noting that the risk for FGM/C for girls under age 18 was four times that of previous estimates. In addition, according to the PRB's data, the number of women and girls at risk of FGM/C varies widely, with the majority concentrated in cities such as the Washington, D.C., metropolitan area, estimated at approximately 51, 411. This data thus conveys the significance of the DMV area as a location for prevention and intervention efforts.

Our previous efforts have found that there are short and long-term adverse physical and mental health effects of FGM/C. Due to these devastating psychological and physical effects on girls that undergo FGM/C, is it important to create an integrated community of care (ICC) network on FGM/C to ensure there is a well-informed workforce to address FGM/C in the DMV. Previous efforts have noted fragmented and siloed responses to FGM/C. The creation of an ICC will begin the process of educating key interested parties to be in a well-informed position to identify girls and families at risk in the DMV area and to ensure trauma-informed care is provided to those who have undergone FGM/C. Therefore, this thesis project has two aims: to individually assess members of a representative group of key interested parties from health care, law enforcement, education, and advocacy to ascertain their level of readiness to engage in FGM/C and to assemble the ICC to create opportunities for collective engagement for prevention and intervention efforts. This presentation will present the findings from the initial qualitative and quantitative assessment of the inaugural ICC panel and present the training program developed from these findings to ensure a workforce that is ready to engage in addressing FGM/C in the DMV.

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RESEARCH SHOWCASE

PREVENTION AND COMMUNITY HEALTH

SCHOOL OF MEDICINE AND HEALTH SCIENCES

Bystander CPR in the Nation's Capital: How Does it Measure Up?

Introduction: Bystander CPR is a significant predictor of outcomes in cardiac arrest. According to the 2018 report by the Cardiac Arrest Registry to Enhance Survival (CARES) database, the average rate of bystander CPR in cases of witnessed cardiac arrest in the United States (US) is 47%. Previous studies across the US and abroad have demonstrated the rate of bystander CPR is affected by specific geographic areas, urban versus rural settings, socioeconomic status, and demographics. Washington, D.C. is a highly diverse area with significant disparity in socioeconomic status and demographics by zip code. To date, there is no data regarding the rate of bystander CPR in such a diverse population. We hypothesized that bystander CPR would be lower in lower income neighborhoods with predominantly African American residents in the District of Columbia.

Methods: We performed a retrospective analysis of the CARES database to assess the rate of bystander CPR in Washington, D.C. and geographically mapped the incidence of bystander CPR in the city by zip code between March 2014 and September of 2019. We analyzed differences in witnessed bystander CPR between ethnicities. Rates of bystander CPR by zip code were also analyzed

Results: A total of 3,466 cardiac arrests were captured in the database. 30% of witnessed cardiac arrests had bystander CPR. 13% of witnessed arrests were White. White patients were significantly more likely to receive bystander CPR than African Americans (44.83% vs 27.81% $p < 0.001$) and Hispanics (44.83% vs 22.22% $p < 0.001$). There were significantly higher rates of bystander CPR in zip codes where >45% of residents were White (35%) compared to zip codes where 15-45% of residents were White (26.7%) and zip codes where <15% of residents were White (27.5%) ($p=0.004$).

Conclusion: The overall rate of bystander CPR in Washington, D.C. is below the national average. White patients were significantly more likely to receive bystander CPR than African Americans and Hispanics. Additionally, zip codes with higher proportions of White residents had higher rates of bystander CPR. Further research and outreach efforts are needed to improve bystander CPR in Washington, D.C. with an emphasis on African American and Hispanic communities.

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RESEARCH SHOWCASE

PREVENTION AND COMMUNITY HEALTH

SCHOOL OF MEDICINE AND HEALTH SCIENCES

Food Insecurity: an ambulatory quality improvement project

Background: Food Insecurity (FI): lack of access to sufficient quantity of affordable and nutritious food, is a social and economic condition with widespread consequences on the health of many individuals. FI correlates with an increased risk for chronic disease (obesity, diabetes hypertension, heart disease, and cancer and mental health conditions). During the COVID-19 pandemic, in Washington DC, approximately 21.1% were food insecure in May 2020, which is an increase from 10.6% prior to the pandemic. We sought to develop a sustainable method for identifying patients with food insecurity and to establish an effective system in which to provide those who screen positive with local food resources around the community.

Methods: The initial PDSA cycle was used to determine an effective manner in which to screen for food insecurity. Subsequent PDSA cycles focused on the most efficient and effective method of providing community resources to patients who screened positive for FI. Variations included providing only physical resources versus a combination of physical and electronic resources. Participant follow-up occurred one to four weeks later to determine the efficacy rate of each.

Results: During a current state analysis, 15 out of 94 individuals (16%) screened positive for FI. Six patients were provided with resources. Two of the six received a physical brochure containing FI resources, while the other four patients received both a brochure as well as an electronic copy sent to their electronic medical record (EMR) for reference. Five out of six patients were able to be contacted for follow-up. One patient had successfully signed up to receive resources, while the other four had selected a program and were in the application process.

Discussion: Approximately 16% of patients screened at the GW MFA Resident Continuity clinic reported to be food insecure. Health care institutions around the country are integrating FI screening and resources into their assessments, and it was our aim to bring these services to GW MFA clinic. We utilized an established screening tool, which was readily available on the Epic EMR. Our study shows that providing patients who are food insecure with community resources, both paper and electronic, is effective in helping them apply to local programs. GW MFA providers are empowered with the ability to facilitate food security for patients in need; in doing so, we can reduce the burden of chronic diseases associated with FI.

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RESEARCH SHOWCASE

PREVENTION AND COMMUNITY HEALTH

SCHOOL OF MEDICINE AND HEALTH SCIENCES

COVID-19 vaccination hesitancy and confidence in Washington, D.C.

Background: Hesitancy to receive the COVID-19 vaccine is prevalent one year after its availability. Public health experts continue efforts to understand and address hesitancy amongst patients. This study analyzes and compares vaccine hesitancy factors between the District of Columbia (DC) and national data.

Methods: Our study reviewed Center for Disease Control (CDC) survey data up to October 2021 on participants' confidence or hesitancy to be vaccinated as well as behavioral trends leading to vaccinations. The CDC surveyed participants for their definite willingness or definite unwillingness to receive the vaccine. Descriptive analyses compared and contrasted participants responses between gender, race, ethnicity, age, insurance and socio-economic status.

Results: Overall, vaccination rates were higher in DC than national rates (90.3% vs. 79.5%, P = 0.048). Demographically, vaccination rates were higher amongst DC females (93.7% vs. 83.2%, P= 0.015), non-Hispanic whites (98.9% vs. 81.7%, P<0.001), multi-race (92.5% vs. 73%, P < 0.001), income levels <75K but above poverty level (90.2% vs. 77.4%, P = 0.02), and ages 18-49 (87.4% vs. 71.2%, P = 0.005). No statistical difference, between DC residents and national participants, was found among insured participants, non-Hispanic blacks, ages 49+, males, those in urban areas, or incomes below poverty level. When evaluating behavior patterns in vaccinated individuals, DC participants whose "work or school requires vaccination" showed significantly higher vaccination rates compared with national rates (47.6% vs. 24.8%, P <0.001). In contrast, DC residents who stated "many or almost all friends and family were vaccinated" and who were "concerned about COVID-19" had higher rates of definite unwillingness to be vaccinated (31.1% vs. 19.3%, P =0.05; 31.5% vs. 12%, P < 0.001).

Conclusion: In DC, the rates of vaccination were higher than national rates, particularly amongst participants required to be vaccinated for work. In contrast, willingness to receive vaccines remains low in participants "concerned about COVID-19" or those with vaccinated friends and families. Our data suggests that further studies to understand and ameliorate patients' vaccine hesitancy amongst certain subgroups are needed.

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RESEARCH SHOWCASE

PREVENTION AND COMMUNITY HEALTH

SCHOOL OF MEDICINE AND HEALTH SCIENCES

Contribution of perceived patient self-efficacy and hospital readmissions: a case-control study

Background and Objective: Hospital readmissions are a significant burden to patients, their families, and the healthcare system. The average cost of a patient hospital readmission in the United States in 2016 was $14,400, with an estimated cost to the U.S. economy of $41.3 billion. The cost to patients and their support system goes beyond financial ramifications. The AHRQ additionally reported that more than half of discharged patients had at least one medication discrepancy which resulted in a 39% chance of a moderate or severe harmful outcome to the patient. Known contributing factors for hospital readmission include chronic medical conditions such as cardiac issues and depression. Limited research has been performed on the significance of patient's perception of their healthcare self-efficacy and its contribution towards an unplanned hospital readmission.

A patient centered care approach values the role of social determinates of health, including an individual's perceived self-efficacy and baseline level of education. The development and availability of the NIH All of Us research program presents a new resource in clinical research to ask questions regarding the care of patients that may be underrepresented in traditional studies, and it includes information on social determinates of health captured as part of a survey. The sources of data from the NIH All of Us database include Electronic Health Records (EHRs), voluntary submitted data, and genetic biosamples. Previous research indicates that these social determinates play a role in 30%-55% of health outcomes. The focus of this study is to identify patterns between hospital readmissions and All of Us survey data.

Our primary objective was to evaluate the connection between perceived patient self-efficacy and hospital readmissions using survey data from the NIH All of Us database.

Methods: Performed a nested case control study using unique patient visits from the NIH All of Database with a surgical encounter. These visits were then calculated to have a readmission into an inpatient facility within 8-days, 30-days, and 90-days following initial discharge.

Results: Several factors such as patient's medical form understanding, requirement for assistance while completing medical forms, and medical form completion confidence influence the readmission in different time periods. The results were counter-intuitive and showed a lower odds of a readmission if patient health literacy was lower.

Conclusions: Patients with limited understanding of medical forms (30-day readmission OR 0.4) and required assistance when completing medical forms (30-day readmission OR 0.6) showed a lower chance of a hospital readmission.

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RESEARCH SHOWCASE

PREVENTION AND COMMUNITY HEALTH

SCHOOL OF MEDICINE AND HEALTH SCIENCES

Adherence to Gestational Weight Gain Recommendations based on Ward of Residence in Washington, D.C.

Gestational weight gain is a measure of maternal weight increase during pregnancy. In 2009, the Institute of Medicine (IOM) published recommendations for appropriate weight gain during pregnancy for women who were underweight, normal weight, overweight or obese based on their calculated pre-pregnancy body mass index (BMI). Gestational weight gain below IOM recommendations has been associated with an increase in preterm birth and small for gestational age neonates. On the other hand, gestational weight gain above the IOM recommended amount has been associated with large for gestational age neonates as well as increased risk of cesarean section and macrosomia.

Washington D.C. is separated geographically into 8 wards and there are obvious racial, socioeconomic and health disparities between the different wards, with Ward 7 and Ward 8 having disproportionate rates of poor health outcomes. These patterns of segregation and differences in health outcomes very closely mirror the patterns of education attainment, food environment, outdoor environment, community safety, medical care, income and health insurance coverage.

The object of this study is to evaluate whether residence in Wards 7 and 8 contributes to gestational weight gain discordance from recommendations set by IOM guidelines. Potential variables evaluated in this review include prepregnancy BMI, insurance status, race and location of patient's home residence, delineated by ward of D.C. Data was gathered through retrospective chart review of women who received prenatal care at GW Medical Faculty Associates and delivered at GW Hospital between September and December 2019.

Results indicated that there was a statistically significant discordance in gestational weight gain based on prepregnancy BMI. There was no difference in weight discordance when adjusted for race, insurance status or age among residents of Ward 7 and 8 compared to other wards of D.C.

Drivers for health opportunities likely contribute to adherence to IOM recommendations for gestational weight gain, however residence in Wards 7 and 8 alone did not demonstrate these differences. Further evaluation of the data will be used to focus counseling and resources to improve patient adherence to IOM guidelines with the goal of improving birth outcomes.

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RESEARCH SHOWCASE

PSYCHIATRY/MENTAL HEALTH

MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

Risk of Eviction and Mental Health During the COVID-19 Pandemic

The COVID-19 pandemic has exacerbated rates of unemployment and evictions across the United States. Early estimates indicate that one in five renter households were at risk for eviction in the first year of the pandemic. Although existing literature suggests that eviction is associated with poor physical and mental health outcomes, limited research has assessed the impact risk of eviction had on mental health during the COVID-19 pandemic. This project examines poor mental health outcomes among people who experienced risk of eviction and looks into particular disproportionately impacted sociodemographic groups.

Data from the US Census Bureau's Household Pulse Survey for the months of August through October of 2020 was compiled and analyzed. Intrinsic and constructed variables were used to identify poor mental health outcomes (anxiety, worry, little interest in things, depression) among households who reported experiencing risk of eviction. Bivariate and multivariate statistical analyses were conducted to examine the prevalence of poor mental health outcomes and sociodemographic disparities among households at risk for eviction during the COVID-19 pandemic.

Preliminary results reveal that a statistically significant relationship between risk of eviction and experiencing poor mental health outcomes exists. The relationship is statistically significant by certain sociodemographic characteristics such as having less than a high school degree, being female, and being single. Findings from this project suggest that during the COVID-19 pandemic households that experienced risk of eviction also experienced poor mental health outcomes, specifically anxiety, worry, little interest in things, and depression. These results emphasize the need to further investigate the experience of households who experienced risk of eviction during the pandemic. Understanding the challenges these households face is crucial to develop policies that support families and individuals during periods of economic crisis.

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RESEARCH SHOWCASE

PSYCHIATRY/MENTAL HEALTH

SCHOOL OF MEDICINE AND HEALTH SCIENCES

Alexithymia and Disordered Eating: A Case Series

Feeding and eating disorders (FED) in the pediatric population are associated with significant impairments in physical health and cognitive and social development.(1) Many patients with FED and mood disorders struggle to recognize and put into words their specific thoughts and feelings, a psychological concept known as alexithymia.(3) It has been proposed that alexithymia could play a role in the development of eating disorders. Some theorize that feeding and eating disorders are these patient's adopted methods of managing emotions. (4)

Early diagnosis and intervention is extremely important. FED such as anorexia nervosa and bulimia nervosa, are highly comorbid with other psychiatric disorders.(2) Given this, it is important to evaluate pediatric patients for eating disorders, especially those known to have a mood disorder. It is important to assess specific questions such relating to and exploring body image, weight, diet, restrictive eating, purging and exercise. (2)

In terms of treatment options, outpatient therapy has been found to be as equally effective as inpatient treatment as long as the patient is medically stable.(1) There are many options ranging from outpatient intensive programs with meal support, day programs and inpatient programs. Family based therapy, adolescent focused therapy and enhanced cognitive behavioral therapy have shown good outcomes.

We compared the presentation of two adolescents who had coexisting FED and alexithymia: A 17 year old female with a psychiatric history of major depressive disorder with psychotic features and non-suicidal self injurious behavior on 60mg of Prozac and 10mg of Abilify presented with suicidal ideation with a plan and intent to follow through. This is her 4th inpatient hospitalization for SI/SA with previous plans including overdose and hanging. During admission, symptoms concerning an eating disorder were brought to light.

A 15 year old female patient with no psychiatric history who presented to the unit after she was found by train tracks with the intent to jump in front of a train. Over the past 3 months, she had lost roughly 30 pounds due to restrictive and purging behaviors.

As demonstrated in these clinical vignettes, people with eating disorders can have difficulties describing emotions which may contribute to the development of their conditions. Due to this relationship, it is important for providers to screen patients and provide the necessary support that these patients require. Early intervention is the best way to minimize physical and psychological health repercussions.

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RESEARCH SHOWCASE

PSYCHIATRY/MENTAL HEALTH

SCHOOL OF MEDICINE AND HEALTH SCIENCES

Evaluation of a Screening Protocol for Implantable Cardioverter-Defibrillator (ICD) related anxiety and the impact of COVID19.

Background: Two to five years following implantable cardioverter-defibrillators (ICD) implantation, clinical studies suggest that up to 20% of ICD recipients are at high risk for the development of severe anxiety-related disorders such as posttraumatic stress disorder (PTSD) or generalized anxiety disorder (GAD), while in the era of COVID-19, this number may be greater.1 Therefore, the main objective of our study was to implement a web-based self-report questionnaire to evaluate the impact of COVID-19 on the psychosocial distress of ICD patients within the GWU ICD clinic community.

Methods: All ICD patients reporting to the George Washington University Cardiology ICD clinic for routine follow-up care from March 2020 to September 2021 were asked if they would like to volunteer to complete an electronic tablet-based (Survey MonkeyÔÉ§) self-report questionnaire. An informed consent letter was offered and read to the participants. To assess ICD-induced anxiety, depression and exacerbated psychosocial distress from COVID-19, we adapted the Florida Shock Anxiety Scale (FSAS), Patient Health Questionnaire-2 (PHQ2), GAD-2, Diagnostic and Statistical Manual of Mental Disorders(DSM-5) panic attack scale, and the Coronavirus Anxiety Scale (CAS).2-4 This protocol was adapted from a similar study from the cardiac screening program at the University of California, Los Angeles.5 Survey completers were included in the analysis for positive screens across the total cohort. Statistical analysis for comparisons included a two-sample t-test for continuous variables and Fisher's exact test.

Results: A total of 104 (58 male and 46 female) ICD recipients within the last 5 years completed the questionnaire. Within this population, 21% screened positive for generalized anxiety (GAD-2) while 16% for PTSD / panic symptoms (DSM-5 Panic). Of these subjects, 28% reported receiving a shock from their device. No statistically significant differences in positive screens were determined for male and female subject comparisons. Positive screens for males vs. females respectively were (3.5% vs. 8.7% FSAS), (15.5% vs. 8.7% PHQ2), (20.7 % vs. 13% GAD-2), and (8.6% vs.19.6% PTSD). Contrary to our hypothesis regarding COVID19, no subjects satisfied the cutoff score for the CAS.

Conclusions: These findings support previous research in identifying anxiety and PTSD-like symptoms in 16%-21% of ICD recipients, while psychosocial distress from COVID19 was not evident. Given the impact of anxiety related disorders on adverse cardiovascular outcomes, this at-risk population may benefit from a mental health service screen and referral program.

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RESEARCH SHOWCASE

PUBLIC HEALTH

COLUMBIAN COLLEGE OF ARTS AND SCIENCES

Female genital cutting in the Bohra community: the impact of stigma and silencing

The World Health Organization has named Female Genital Cutting (FGC) a violation of human rights. The Dawoodi Bohra community of the South Asian diaspora practices a form of FGC. Information about FGC among this tight-knit community is not accessible. The goal of this research project is to gain a deeper understanding of adult Bohra community members' knowledge of and attitudes toward the practice of FGC. Between and within community stigma around FGC exists as within the community, absence of the practice can be stigmatized, and silence has been the norm since outside of the community, completion of the practice is stigmatized. This exploratory qualitative study was undertaken to understand the role of stigma on the Bohra community adult members. Ten women residing in the United States and Canada aged 29-77 years have served as key informants in this study. Findings suggest that FGC carries a high level of stigma for women. Multiple participants readily recall seldom speaking about their own experience with FGC within their own families or with close friends. The role of stigma, shame, and protecting the Bohra community were dominant themes in the responses. The responses indicate a relationship between strength of an opinion on FGC and closeness to the Bohra community. Several key informants expressed that FGC should be stopped and actions are being taken to protect younger generations residing in the United States and Canada from the practice. However, awareness of the practice is limited within the community. Key informants indicated that they did not know of any specific teachings or texts that advocated for FGC, and several of the key informants questioned the reasoning behind the practice. Information gained from this study will add vital information towards the development of strategies and approaches for the prevention of FGC in the Bohra community.

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RESEARCH SHOWCASE

PUBLIC HEALTH

COLUMBIAN COLLEGE OF ARTS AND SCIENCES

Vitamin D Deficiency: The Silent Killer of the Black Population

Often referred to as the "Sunshine Vitamin," research shows that vitamin D is necessary for our bodies to maintain its overall health (Nair and Maseeh, 2012). There is a lack of research that focuses on the effect of vitamin D deficiency on the physical body, but associated links are clear. Though Blount's disease, bow legs, was previously considered to be eradicated in the United States, researchers note a reemergence of the disease among the Black population in the United States (Abrams, 2002). Vitamin D deficiency (VDD) is an important public health issue because research supports the link between VDD and "cancer, heart disease, fractures and falls, autoimmune diseases, influenza, type-2 diabetes, and depression" (Nair and Maseeh, 2012). Little research has been done to determine the function of Vitamin D in the central nervous system. However, VDD has been linked to an increased prevalence of major depressive disorders, dementia, and alzheimers (Nair and Maseeh, 2012). The Black population in the United States who live in regions with less exposure to sunlight and people who are incarcerated face greater risk for developing vitamin D insufficiency. The purpose of this study is to examine the relationship between lack of sunlight exposure and the development of cognitive disorders. This meta-analysis reviews twenty studies pertaining to the effect of vitamin D deficiency in human and animal populations and analyzes the results. There is no shortage of advertisements or public service announcements warning families about the dangers of the sun. The results have important implications for prognosis of cognitive impairment in the U.S. black population and the establishment of health standards specific to ethnic minorities in the U.S. During the summertime, sunscreen is constantly promoted as a means to protect ourselves from skin cancer, but the importance of sunlight exposure is not advertised. The results of the study may also be used to support criminal justice reform given the link between inhumane conditions (i.e., inexposure to sunlight) and the development of severe neurological disorders.

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RESEARCH SHOWCASE

PUBLIC HEALTH

COLUMBIAN COLLEGE OF ARTS AND SCIENCES

E-cigarette industry tactics targeting youth: a scoping review

Objective: This study aimed to examine the e-cigarette industry tactics targeting youth (ages 15-24 years) in the United States.

Introduction: Non-communicable diseases (NCDs) impose a significant burden on public health. Electronic cigarettes (e-cigarettes) are battery-powered devices that heat liquid into a vapor that can be inhaled. They particularly appeal to youth and young adults. E-cigarette producers have been using a myriad of tactics to influence the use of e-cigarettes by exploiting consumers' vulnerability. Exposure to nicotine and harmful chemicals in e-cigarettes present detrimental harm to adolescent brain development and cognition. Studies have indicated ADHD, PTSD, and impulsivity symptoms due to nicotine exposure during adolescence.

Methods: We conducted a systematic scoping review of literature following the Joanna Brings Institute manual for evidence synthesis. We conducted a search in PubMed, Scopus, and Business Source Ultimate to identify the sources that focused on e-cigarette industry tactics, including political, legal, and financial tactics, product and services tactics, and public relations and advertising tactics. We screened and assessed identified peer-reviewed publications for eligibility. We extracted data from included sources and summarized it in a narrative form.

Results: Of the 5,886 sources identified, 35 studies were included in the final analysis. Of the 35 articles, a great majority (31, 88.6%) discussed public relations, 9 (25.4%) discussed product modification, only 2 (5.7%) examined political tactics and 2 (5.7%) talked about legal tactics and financial tactics used by the e-cigarette industry. The most frequently described sub-tactics under the category of PR were marketing/advertising (30, 8%). Under the product modification category, 11 articles described targeting vulnerable populations (6, 17.1%), product modification and design (3, 8.6%), and manipulation of scientific research and information (2, 5.7%).

Conclusions: E-cigarette producers often used public relations tactics targeting adolescents especially through social media venues. Further research is needed to carefully document and studies these tactics. Given the increasing trends of e-cigarette use among youths, effective public health countertactics are needed to respond to the industry strategies.

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RESEARCH SHOWCASE

PUBLIC HEALTH

COLUMBIAN COLLEGE OF ARTS AND SCIENCES

Socio-Demographic Determinants and Fibroid Characteristics Among Women Undergoing Hysterectomies

Background: Uterine fibroids are the most common, non-cancerous tumors that impact female-bodied people during their reproductive years. Fibroid symptoms include heavy bleeding, pelvic pain, and abdominal discomfort. Fibroids disproportionately burden Black women, as more than 80% of Black women will have fibroids and are more likely to experience severe symptoms than non-Black women. The objective of the study is to examine socio-demographic determinants of fibroid characteristics, including uterine volume, largest diameter of largest fibroid, and the presence of submucosal fibroids alongside race, education, income, and insurance status.

Methods: Data from 78 participants was collected from the longitudinal cohort study: Fibroids Observational Research on Genes and the Environment. The participants attended the Medical Faculty Associates gynecology clinic at GWU and were undergoing a hysterectomy for surgical management of uterine fibroids. The data on race, education, insurance status, and income were collected from participant interviews and patient charts. Participants' fibroid characteristics were extracted from pre-surgery transvaginal ultrasound reports and included uterus volume (volume of an ellipsoid), the largest diameter of the largest fibroid, and presence of submucosal fibroids. Linear and logistic regressions were run to examine whether there were differences in the three fibroid characteristics by race and socioeconomic determinants.

Findings: Preliminary findings indicated no statistically significant differences in fibroid characteristics by race, age, insurance status, and income. However, education level was significantly associated with the diameter size of the largest fibroid. This indicates, initially, that women with no college experience had a shorter fibroid diameter than women with a college degree on average (odds ratio: 0.08, 95% confidence interval: 0.01, 0.50). This finding remained statistically significant after adjusting for race, age, insurance status, and income.

Discussion: One possible explanation for these paradoxical findings is that women with a higher level of education may be more likely to consider other options before undergoing a hysterectomy. This can lead to an increased size of uterine fibroids and higher fibroid burden. Those with a lower level of education may seek out a hysterectomy sooner, as it is the only definite solution to fibroids. The preliminary findings encourage further research on how race, education, income, and insurance status influence the type and timing of fibroid treatment that people seek out.

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RESEARCH SHOWCASE

QUALITY IMPROVEMENT

SCHOOL OF MEDICINE AND HEALTH SCIENCES

Improving Twice Daily Diuretic Timing for Heart Failure Patients

Rationale: The mainstay of treatment in acute decompensated heart failure is prompt administration of loop diuretics. Early administration of diuretics has been shown to both reduce the length of hospital length and mortality in the inpatient setting. The twice-daily (BID) diuretic dosing is widely used for acute decompensated heart failure. While BID dosing is effective, there is some concern that this dosing schedule may lead to increased sleep disturbances in the hospital which can cause frequent nighttime awakenings.

Currently, the Heart Team (cardiology service) at GWUH uses a standardized BID dosing schedule for loop diuretic in patients with acute decompensated heart failure, with default times set to 10 AM and 10 PM. However, the 10 PM dose has significant drawbacks in that it leads to frequent urination at night-time which can disrupt sleep for patients, and it also prevents the medical team from making timely assessment of diuretic response and dose adjustments.

Aim: Increase patients on timed BID diuretics by 25% from baseline over a three-month period

Intervention: Among patients hospitalized for acute heart failure exacerbation, we assessed the timing of twice-daily diuretic dosing. The standard twice-daily dosing EMR order sentence defaults to 10 AM and 10 PM. Our first PDSA cycle included educating Cardiology team members on the importance of earlier second dosing to assess diuretic response. Residents were instructed on how to dose medications at 8 AM and 5 PM. In the second PDSA cycle, we engaged the attached Cardiology team pharmacist to review admission orders for appropriate dose timing. During our second cycle, resident team members were re-educated on the importance of earlier dosing.

Outcome: We collected one week of baseline patient-days which showed 47 patient-days on BID diuretics with no patients on timed diuretics. After our first PDSA cycle, 25% of patients on BID diuretics were on timed diuretics, which increased to 48% after our second PDSA cycle.

Conclusions: Our two PDSA cycles proved effective at increasing the percentage of patients on timed BID diuretics, which allowed for better diuretic response assessment. Future PDSA cycles will be focused on making our intervention long-lasting.

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RESEARCH SHOWCASE

QUALITY IMPROVEMENT

SCHOOL OF MEDICINE AND HEALTH SCIENCES

Blood Product Usage versus Wastage During Level I Traumas with Massive Transfusion Protocol Activated

Hemorrhagic shock is the leading cause of survivable death in the adult trauma population. The massive transfusion protocol (MTP) guides transfusion in situations requiring replacement of greater than one total blood volume in less than 24 hours or infusion of greater than 4 units of red blood cells in an hour. This study endeavors to put a number on the level of transfusion to wastage in the setting of MTP at our facility as it remains unknown. The goal of this retrospective study was to review the transfusion and wastage rates for Level I trauma patients on MTP activation requiring emergency issue of blood components between 2015 and 2020 in an effort to ascertain our blood product transfusion to wastage ratio. In determining our blood product wastage during this scenario, we can then determine what an acceptable rate of wastage is for our facility. There was a total of 6,228 units of blood products issued to 948 Level I traumas. Twenty seven percent of those traumas resulted in a median wastage in units of blood products per case as 2. Our wastage total for all blood products was 11.32%. It is unclear in review of literature currently available whether our total wastage rate during MTP activation is high or low as no other published total wastage rate could be found. Further research is needed to determine whether process improvements may be able to lower our wastage rate.

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RESEARCH SHOWCASE

QUALITY IMPROVEMENT

SCHOOL OF MEDICINE AND HEALTH SCIENCES

Exploring Communication Effectiveness Among Internal Teams and External Stakeholders Conducting Clinical Research

Teams are increasingly vital in the practice of science; this is especially true in the conduct of clinical trials. In the pharmaceutical industry, the Food and Drug Administration (FDA) determines approval and marketability based on clinical trials designed to test drug safety and efficacy. To achieve this standard, diverse stakeholders including research teams, medical centers, Sponsors, and Food and Drug Administration officials must coalesce and engage in effective teaming. At the crux of this coalescence is proper communication. Effective communication is dynamic and looks different depending upon the context of the situation. However certain tenets remain consistent across situations including clarity, consistency, timeliness, and the use of proper communication modalities. Despite these characteristics, communication among internal team members as compared to communication with external stakeholders may differ. Therefore, a survey was designed to explore differences in communication with internal team members and external stakeholders both qualitatively and quantitatively. The survey will be distributed to members of a contract research organization (CRO) who regularly communicate with internal team members and external stakeholders to facilitate clinical trial activation and maintenance. The data will be analyzed to understand the extent to which communication differs among and between teams of stakeholders conducting clinical research in the pharmaceutical industry.

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RESEARCH SHOWCASE

QUALITY IMPROVEMENT

SCHOOL OF MEDICINE AND HEALTH SCIENCES

Food Insecurity: an ambulatory quality improvement project

Background: Food Insecurity (FI): lack of access to sufficient quantity of affordable and nutritious food, is a social and economic condition with widespread consequences on the health of many individuals. FI correlates with an increased risk for chronic disease (obesity, diabetes hypertension, heart disease, and cancer and mental health conditions). During the COVID-19 pandemic, in Washington DC, approximately 21.1% were food insecure in May 2020, which is an increase from 10.6% prior to the pandemic. We sought to develop a sustainable method for identifying patients with food insecurity and to establish an effective system in which to provide those who screen positive with local food resources around the community.

Methods: The initial PDSA cycle was used to determine an effective manner in which to screen for food insecurity. Subsequent PDSA cycles focused on the most efficient and effective method of providing community resources to patients who screened positive for FI. Variations included providing only physical resources versus a combination of physical and electronic resources. Participant follow-up occurred one to four weeks later to determine the efficacy rate of each.

Results: During a current state analysis, 15 out of 94 individuals (16%) screened positive for FI. Six patients were provided with resources. Two of the six received a physical brochure containing FI resources, while the other four patients received both a brochure as well as an electronic copy sent to their electronic medical record (EMR) for reference. Five out of six patients were able to be contacted for follow-up. One patient had successfully signed up to receive resources, while the other four had selected a program and were in the application process.

Discussion: Approximately 16% of patients screened at the GW MFA Resident Continuity clinic reported to be food insecure. Health care institutions around the country are integrating FI screening and resources into their assessments, and it was our aim to bring these services to GW MFA clinic. We utilized an established screening tool, which was readily available on the Epic EMR. Our study shows that providing patients who are food insecure with community resources, both paper and electronic, is effective in helping them apply to local programs. GW MFA providers are empowered with the ability to facilitate food security for patients in need; in doing so, we can reduce the burden of chronic diseases associated with FI.

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RESEARCH SHOWCASE

QUALITY IMPROVEMENT

SCHOOL OF MEDICINE AND HEALTH SCIENCES

Improving the Breast Cancer Screening Rate in Resident Primary Care Clinic

Preventative care is a fundamental goal in primary care fields, and cancer screening is an important part of adult primary care. Breast cancer is diagnosed in 13% of US women and is the most diagnosed cancer in US women but deaths from breast cancer are decreasing, largely due to improved screening methods and improved therapies. The mammogram is the primary method of breast cancer screening and allows for early diagnosis and improved patient outcomes. Screening is typically addressed in the annual physical appointment, but patients can be lost to follow up for various reasons and ensuring up to date screening can be accomplished outside this specific interaction with the primary care provider.

A cohort of internal medicine residents performed a quality improvement project with the goal of increasing the breast cancer screening rate in the resident primary care clinic from 55% to the Center of Medicare and Medicaid Services (CMS) national average of 65%. This study involved 3 successive plan-do-study-act (PDSA) cycles to study whether three separate interventions would increase the breast cancer screening rate: updating the electronic medical record (EMR) patient list to accurately reflect patient population, sending electronic or paper letters to patients, and communicating directly with patients to remind them about breast cancer screening.

The 3 intervention cycles showed no change in the rate of breast cancer screening. Prior to the start of the study, the breast cancer screening percentage was 55%. The first PDSA cycle resulted in an increase to 57% which remained unchanged by the end of PDSA cycle 2 and decreased to 54% by the end of cycle 3.

There are several limitations and confounding factors to this study. First, there was no way to assess compliance with the planned interventions. The transition to a new EMR may have affected reporting and data collection. Finally, it required additional work on the part of medical staff that may be accomplished more efficiently by utilizing the EMR or some other form of automation. Engaging additional stakeholders and designing some alert for patients or providers when a patient is eligible for breast cancer screening would improve screening rates as well as reduce the work burden on healthcare providers.

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RESEARCH SHOWCASE

QUALITY IMPROVEMENT

SCHOOL OF MEDICINE AND HEALTH SCIENCES

Transversus Abdominis Plane (TAP) nerve blocks lead to shorter hospital and ICU lengths of stay after breast reconstruction with DIEP flap compared to epidural nerve blocks

Purpose: Ensuring multimodal pain control after breast reconstruction is an essential clinical consideration that can improve patient outcomes and satisfaction. In recent years, pain management with transversus abdominis plane (TAP) and epidural nerve blocks have largely replaced the use of narcotics in the setting of postoperative pain maintenance to improve pain relief without the side effects of narcotics. In this study, we aim to examine the hospital and ICU lengths of stay between patients with TAP and epidural nerve blocks.

Methods: We performed a retrospective analysis of patients who underwent unilateral and bilateral breast reconstruction with DIEP flap at our center from 2019 to 2021. Our review included 70 patients who received immediate, delayed, or delayed-immediate breast reconstruction with DIEP flaps between January 2019 and December 2021 at the George Washington University Hospital in Washington, DC. The patients were evaluated for demographics including age, race/ethnicity and BMI. Hospital details were collected including type of operation, hospital length of stay, and ICU length of stay (LOS) and 30 day readmission. Statistical analysis included t-test of means for normative data. All data were summarized and displayed as mean ± SD for continuous variables.

Results: A total of 70 patients (Epidural group, n = 30; TAP group, n = 36) underwent breast reconstruction with DIEP flaps with either a TAP or epidural nerve block. 4 patients were excluded from the data based on multiple failed attempts to establish a block or patient specifications requiring alternate means of analgesia. Of the remaining 66 patients, 30 patients (45%) underwent an epidural block and 36 patients (55%) via TAP block. The mean age in the epidural group was 51.6 ± 11.0 years and 48.3 ± 8.8 years in the TAP group. The average hospital LOS for patients with epidural blocks was 5.53 ± 1.20 days compared to 4.02 ± 1.42 days (P< 0.0001) for TAP blocks. The average ICU LOS for patients with epidural blocks was 4.07 ± 1.28 days compared to 2.44 ± 0.81 days (P< 0.0001) for TAP blocks. 10% of patients that received epidural had a 30 day readmission rate vs. 5.56% that received TAP blocks.

Conclusions: TAP blocks reduce hospital LOS in post-surgical DIEP flap patients. TAP block patients had a lower 30 day admission rate compared to epidural patients. An estimated $200,000 was saved by using TAP blocks and reducing the time in the hospital.

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RESEARCH SHOWCASE

QUALITY IMPROVEMENT

SCHOOL OF MEDICINE AND HEALTH SCIENCES

Point of Care Ultrasound for Internal Medicine Residents: A Pilot Program

Point of Care Ultrasound (POCUS) has been recognized by professional organizations such as the American College of Physicians as being an important part of Internal Medicine (IM); however, there is not currently a curriculum at an institutional level. At George Washington, there is not yet a department led program to provide POCUS education specifically to IM residents or faculty. Some of the reasons that POCUS is not being taught include lack of ultrasound trained faculty, lack of resources, and lack of funds. This quality improvement project set out to demonstrate that with minimal resources, training, and funds, that a low cost but effective program can be implemented that improves resident familiarity with ultrasound.

The curriculum involved several plan-do-study-act (PDSA) cycles wherein an instructor provided IM residents with an intervention then a pre and post intervention assessment. The intervention included hands on educational sessions that improved familiarity with assessing basic cardiac, pulmonary, and abdominal pathology. 18 participants completed the pre-test, and 12 participants completed the post-test. The percent of respondents with correct responses increased in the post-test in all knowledge assessment questions.

This quality improvement project was limited in its generalizability and scope. There was not standardized assessment of technical skill. There was limited participation in the pre and posttest assessments. It is fair to conclude that there is a trend towards improved resident comprehension of imaging; however, a larger sample size should be obtained to improve the data set. The role of POCUS in IM is clearly established and this QI project created a foundation for POCUS education within the medicine department that does not require significant resources or expertise.

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RESEARCH SHOWCASE

QUALITY IMPROVEMENT

SCHOOL OF MEDICINE AND HEALTH SCIENCES

A Resident Driven Initiative for Improving Ambulatory Hypertension Management

Background: Hypertension affects 108 million adults in the United States. As a risk factor for developing many comorbidities including coronary artery disease, heart failure, and kidney disease, uncontrolled hypertension leads to billions in annual healthcare expenditure. Therefore, it is crucial to effectively manage hypertension in the outpatient setting in order to prevent these downstream complications.

Aim: Of the patients who have been diagnosed with hypertension, we aim to improve the percentage of patients who are controlled (defined as less than 140/90 mmHg) by 10% in a cohort of resident physician-managed patients.

PDSA 1: Baseline measure- 50.39% met our criteria for adequate blood pressure goal.

Intervention- Each individual resident was tasked to communicate with their corresponding appointment team to schedule follow up for all patients not meeting our blood pressure goal.

Outcome- The percentage remained the same over the course of three months

PDSA 2: Baseline measure- No change from prior PDSA cycle

Intervention- Each resident was tasked to schedule appointments for not only those patients with elevated blood pressure but also those with no documented blood pressure in our electronic health record. Additionally, patients that had not been seen at our institution within the last 12 months, or those that could not be contacted despite repeated attempts, were removed from the corresponding resident panel.

Outcome- There was improvement to 53.72% of our patient panel meeting criteria for controlled blood pressure.

PDSA 3 (current cycle): Residents were asked to remove patients from their panel not seen in the GW MFA Internal Medicine clinic for the past 18 months.

Conclusion: Resident driven initiatives showed modest improvement in overall blood pressure management. Limitations for our study included losing patients to follow-up, lack of availability in appointments, and patients presenting outside of primary care clinic with uncontrolled blood pressure. A multidisciplinary approach involving clinical and administrative staff may have an impactful change in ambulatory blood pressure management. Such initiatives include incorporating nurse visits for blood pressure monitoring or implementing a community health program to assist patients with obtaining blood pressure cuffs and attaining/adhering to antihypertensive medications.

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RESEARCH SHOWCASE

QUALITY IMPROVEMENT

SCHOOL OF MEDICINE AND HEALTH SCIENCES

Increasing inpatient COVID-19 vaccination rates amongst adult hospitalized patients at a tertiary academic medical center: a housestaff driven quality improvement project

Background: Inpatient vaccination initiatives are well-described in the literature, particularly in the administration of influenza and pneumococcal vaccinations to eligible hospitalized patients. The Joint Commission also promotes inpatient influenza vaccination as a quality measure, screening for influenza immunization status and vaccinating prior to discharge if indicated. In the COVID-19 pandemic, hospitals began administering vaccinations after the FDA issued an Emergency Use Authorization for the Pfizer-BioNTech, Moderna, and Janssen COVID-19 vaccines. While vaccination rates were increasing, there were still patients who were unvaccinated despite community efforts. We conducted a quality improvement initiative with the aim to increase the COVID-19 vaccination rates of hospitalized patients on the medicine service at the George Washington University Hospital by 20% over a six month period.

Methods: From November 2021 through March 2022, we conducted several Plan-Do-Study-Act (PDSA) cycles. Initial cycles included gathering baseline data and consulting stakeholders such as the IT department and hospital leadership. Next, we educated housestaff on the availability of the COVID vaccine and the process of ordering and administering the vaccine. We sent reminders to order vaccinations via text to residents on inpatient services and included the information in weekly emails from leadership and placed flyers in all the team rooms. Our last cycle consisted of creating user-friendly pamphlets for patients in their admission packets. Data was collected through the electronic medical record.

Results:The baseline mean vaccination rate of patients on general medicine teams who were eligible to receive a COVID vaccination was 7.99% from August - October 2021. After implementing the PDSA cycles, the mean vaccination rate for the months of November 2021 - January 2022 was 17.44%. A comparison of the two means using one-tailed T-test was statistically significant (p-value 0.044).

Conclusion: The COVID-19 pandemic poses a substantial risk to society. Achieving herd immunity would significantly help limit the spread of the virus. Our group implemented measures to increase the administration of the Pfizer vaccine to eligible patients admitted to the medicine service at GW hospital. We helped increase the mean vaccination rate from 7.99% to 17.44% (p-value 0.044), a 9.45% increase. Other measures to consider in the future include increasing the availability of other approved COVID-19 vaccines at our hospital and implementing the vaccine into the admission order set to help facilitate the vaccination process early in the hospital course.

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RESEARCH SHOWCASE

QUALITY IMPROVEMENT

SCHOOL OF MEDICINE AND HEALTH SCIENCES

Improving the Utilization of Patient Safety Checklists

Patient safety checklists are used in clinical settings to promote adherence to quality standards and reduce the risk of adverse events. Previous studies evaluating checklists in surgical and ICU settings have correlated checklist implementation to improved patient safety outcomes. In inpatient medicine wards, safety checklists appear in progress notes, but checklist composition and utilization vary widely. The objective of this study is to analyze the current use of safety checklists in daily progress notes at an academic medical center and to improve checklist standardization and accuracy in documentation. Attending and resident physicians were surveyed to identify components of safety checklists, followed by a retrospective review of 345 progress notes to identify baseline inclusion rates of 8 components: code status, venous thromboembolism prophylaxis, diet orders, presence of urinary catheter, venous access, Clostridium difficile risk factors, next of kin contact information, and anticipated discharge disposition. Baseline inclusion of these individual components in progress notes ranged from 15% to 80% (M=47.7%, SD=28.15%). A "dot-phrase" automated token of these components was created and provided to physicians which imported patient-specific data and interactive prompts to improve accuracy and inclusion of the components. 310 progress notes were reviewed after the token was introduced and educational sessions occurred. 85 progress notes were reviewed for accuracy and component inclusion, with 54 using the token. Inclusion and accuracy of components in the token user group averaged 95% and 92%, respectively, compared to 45% and 68% respectively in a control group. 175 control documents were monitored for changes in baseline trends after the token and educational postings were made available and demonstrated stability of baseline rates. Education on token use and documentation accuracy was repeated and reference materials were made available in physician workrooms. Six weeks after the intervention, utilization of the token and the presence and accuracy of checklist components were reassessed with the token used in 22% of reviewed notes. Component inclusion and accuracy rates were 94% and 92%, respectively, compared to 43.6% and 90% in documents that did not use the token. This study illustrates that the integration of automated tokens in electronic medical records (EMR) can improve the accuracy of patient safety checklist documentation when used appropriately. Token function was limited by EMR customizability at the user level, and future studies could investigate how expanded use and improved accuracy in documentation can impact efficiency, length of hospitalization, and rates of adverse events.

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RESEARCH SHOWCASE

QUALITY IMPROVEMENT

SCHOOL OF MEDICINE AND HEALTH SCIENCES

Early palliative intervention in septic patients reduces healthcare utilization

Introduction: While the role of palliative care in the emergency department is recognized, barriers against the effective integration of palliative interventions and emergency care remain. We examined the association between goals-of-care and palliative care consultations and healthcare utilization outcomes in older adult patients who presented to the emergency department (ED) with sepsis.

Methods: We performed a retrospective review of 197 patients aged 65 years and older who presented to the ED with sepsis or septic shock. Healthcare utilization outcomes were compared between patients divided into 3 groups: no palliative care consultation, palliative care consultation within 4 days of admission (i.e., early consultation), and palliative care consultation after 4 days of admission (i.e., late consultation).

Results: 51% of patients did not receive any palliative consultation, 39% of patients underwent an early palliative care consultation (within 4 days), and 10% of patients underwent a late palliative care consultation (after 4 days). Patients who received late palliative care consultation had a significantly increased number of procedures, total length of stay, ICU length of stay, and cost ($p < .01$, $p < .001$, $p < .05$, $p < .001$; respectively). Regarding early palliative care consultation, there were no statistically significant associations between this intervention and our outcomes of interest; however, we noted a trend towards decreased total length of stay and decreased healthcare cost.

Conclusion: In patients aged 65 years and older who presented to the ED with sepsis, early palliative consultations were associated with reduced healthcare utilization as compared to late palliative consultations.

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RESEARCH SHOWCASE

REHABILITATION AND RECOVERY

MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

Family care partner perceptions of their interactions with rehabilitation providers who treat their loved one with disorders of consciousness

Objectives: Describe family care partner (FCP) perceptions of their clinical interactions with rehabilitation practitioners (RP) when treating their loved one with disordered consciousness (DOC) after severe brain injury to better understand how to improve communication between FCPs and RPs.

Design: Qualitative phenomenology, using narrative interviewing and grounded theory methods to understand FCP perceptions of interactions with RP. Cross-disciplinary rehabilitation team including FCPs, RPs and researchers. Transcribed narrative interviews were coded, using thematic and comparative analyses, to derive themes. Each interview was coded by 2+ research team members who utilized peer debriefing, memos, and reflexivity to create trustworthiness in the coding. We used the empirical and conceptual scholarship of Mattingly (2010) and Tannen (2006) for our analyses, specifically we focused on narrative plots and communication styles that may frame clinical interactions among stakeholders in unintentional ways.

Participants: Sixteen family care partners (12 female), mostly parents (75%), with a loved one in DOC.

Results: FCPs described interactions with RPs as supportive and respectful but also challenging. FCPs valued being given information they could understand such as when a RP said “You know him better than anybody.” They also appreciated acknowledgement of their loved one’s personhood such as “[Patient] writes his own chapters”. But felt that personhood was dismissed by RPs when FCPs heard “I’ve seen 300 cases like this” and their own observations not valued when hearing “it’s just a reflex.” In these situations, FCPs perceived RPs to be unsupportive and emotionally “not in tune” with them. FCPs appreciated the opportunity to share their values and preferences but also experienced RPs as authoritarian, “it’s their word or nothing,” and inflexible, “they are caught up on stats.” In those instances, FCPs perceived they were treated “like I know nothing” and were excluded from decision making saying, “they didn’t fill us in.”

Conclusions: Being a family care partner for persons in DOC is demanding and initially unfamiliar. In healthcare, communication and information exchange are important dimensions of shared decision making. Understanding family care partner perceptions of what is communicated fosters awareness of how FCPs may interpret RPs actions during their loved one's treatment and recovery. Future research should focus on strategies to engage FCPs in the process of shared decision-making.

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RESEARCH SHOWCASE

REHABILITATION AND RECOVERY

SCHOOL OF MEDICINE AND HEALTH SCIENCES

Embedding Person-Centered Measurement Principles into the Coma Recovery Scale-Revised to Develop a Recovery Ruler

The purpose of this study was to co-create a Recovery Ruler, visualizing Coma Recovery Scale-Revised (CRS-R) assessment results, reflecting five person-centered measurement principles (co-created, patient-driven, holistic, transparent, comprehensible and timely) that was ready for usability testing. The CRS-R produces ordinal measures, previous work by our team used Rasch Analysis to transform the scale into linear, equal interval measures. We used a concurrent mixed methods study design and included six family care partners as well as eight rehabilitation practitioners who have experience caring for a person with disorders of consciousness. Participants were gathered online in groups of 6 to 8 individuals to complete two sequential design groups. The first design group focused on three principles: co-created, comprehensible and timely, and patient-driven. The second design group focused on two principles: holistic and transparent. After each design group, we examined readiness for usability testing with four surveys: System Usability Scale (SUS), Acceptability of Intervention Measure (AIM), Intervention Appropriateness Measure (IAM), and Feasibility of Intervention Measure (FIM). Content analysis from the two design groups identified Recovery Ruler features that could be added, removed, or changed. Participants added a descriptive text box to incorporate the patient's preferences, suggested removing the CRS-R's rating scale category transition zones, and changed words to clarify concepts. There were significant increases on the SUS, AIM, and IAM indicating improved usability, acceptability, and appropriateness. The FIM did not show a statistically significant difference, but the median and mean average scale score indicated good feasibility. CRS-R assessment result information was embedded into a Recovery Ruler that reflects person-centered measurement principles. family care partners and rehabilitation practitioners determined the Recovery Ruler prototype is ready for usability testing.

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RESEARCH SHOWCASE

REHABILITATION AND RECOVERY

SCHOOL OF MEDICINE AND HEALTH SCIENCES

Exploring fatigue-related PASC phenotypes and evaluating the effects of social determinants of health on COVID-19 severity at diagnosis, and quality of life measures ≥ 6 months after diagnosis

The COVID-19 pandemic has been a substantial burden in the US, and longer term COVID-19 symptoms, called "post acute-sequelae of COVID-19", or PASC are being explored. Our study focuses on two distinct PASC populations: (1) those who seek physical therapy (PT) who present with ongoing fatigue, POTS (Postural Orthostatic Tachycardia Syndrome), and exercise intolerance phenotypes; (2) those who are disproportionately affected due to their social determinants of health. For both studies, records of COVID-19 patients were examined through the COVID-19 Recovery Clinic and specialist partners at George Washington University since November 2020. This database includes patient short and long-term COVID-19 outcomes in different domains including demographic information.

For (1), questionnaires are provided to patients at each PT visit that will assess their quality of life (QoL) and functional status (FS) to observe symptoms over time and if exercise interventions help with recovery. Scales used are the Modified Fatigue Impact Scale (MFIS), Neurobehavioral Symptom Inventory (NSI), Life Satisfaction -11 (Lisat-11), 6-minute walk test (6MWT), and 2-minute walk test (2MWT). Data is currently being collected. We hope to share preliminary findings soon, such that these PASC phenotypes can be better characterized. For (2), we are mainly interested in understanding the relationship between education level, income, race, ethnicity, obesity, and acute COVID-19 severity, and anxiety, depression, and quality of life ≥ 6 months post-infection. We hope to gain insight to identify gaps in care, as well as shape care for those with poor social determinants of health. We analyzed these variables using RStudio with calculations of descriptive data, odds ratios, and p-values using Fisher's exact test. In our sample (n=150), we found African Americans had greater acute COVID-19 severity (OR=7.56, 95% CI 2.22, 25.68, p=0.0015) compared to white individuals. Obesity was also preliminarily associated with higher levels of acute COVID-19 severity (OR=4.89, 95% CI 1.36, 17.60, p=0.022). No significant associations were identified with the other long-term variables: anxiety, depression, quality of life, or COVID-19 severity and persistent symptoms. These findings further emphasize pre-existing gaps in healthcare outcomes regarding poor social determinants of health. We conclude that larger studies are critical to better characterize various PASC phenotypes, as well as to understand short and long-term outcomes of COVID-19 for those disproportionately affected by the pandemic.

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RESEARCH SHOWCASE

SOCIAL SCIENCES

COLLEGE OF PROFESSIONAL STUDIES

Ranking System Intentions and Impact: Examining the Role of Public Measures in Promoting Gender Equity in the Workplace

Ranking systems have become extremely popular tools for journalists, nonprofits, and academics alike to gain attention from their target audiences. For example, the U.S. News & World Report's annual "Best Colleges" ranking system has changed the way that both institutions of higher education and prospective students approach the college application process. However, ranking systems are not unique to institutions of higher education and are being implemented by organizations like Bloomberg, the World Benchmarking Alliance, and Arizona State University's The Difference Engine to address the persistent issue of gender inequity in the workplace. Creators of gender equity ranking systems aim to hold leaders in public and private sectors accountable. However, current research exploring the intended and unintended consequences of ranking systems is limited to well-known metrics focused on institutions of higher education.

This study works to bridge the public rankings and behavior change research gap to promote gender equity in the workplace. A case study approach is applied to the 2021 Gender Benchmark Report, a tool created by the World Benchmarking Alliance to hold leaders in the apparel industry accountable. Open-ended, de-identified interviews of employees working on the Gender Benchmark Report, employees of the 2021 Gender Benchmark Report's 35 ranked organizations, and prospective employees in the apparel industry are coded for general, recurring themes related to intention, impact, and perception of the ranking system. Conclusions encourage the Gender Benchmark Report, along with other ranking systems such as Bloomberg's Gender-Equality Index and The Difference Engine's Women's Power and Influence Index, to address issues of data transparency, metric accessibility, and ranking objectivity constraints in future iterations of their indices to further advance the long-term goal of gender equality in the workplace.

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RESEARCH SHOWCASE

SOCIAL SCIENCES

COLUMBIAN COLLEGE OF ARTS AND SCIENCES

Negative Emotions and Societal Risk Perceptions as Indicators for Black Americans' Willingness to Engage in COVID-19 Protective Behaviors

In the US, Black Americans have been disproportionately affected by the COVID-19 pandemic. To reduce the pandemic's impact, individuals must engage in protective behaviors, including wearing a mask, social distancing, and quarantining, which reduce risk of contracting and transmitting the virus. Thus, there is interest in increasing protective behaviors to reduce the impact of COVID-19 on high risk populations.

Past research illustrates that African Americans perceive themselves as more at risk of COVID-19 and, thus, more actively engage in social distancing. One contributor to this is their perceived risk; studies have shown that engaging in protective behaviors is influenced by worry and risk perception of themselves and their social group.

This study examined overall stress and impact levels associated with the pandemic, average score of feelings of worry and regret over contracting the virus, as predictors of engaging in the aforementioned COVID-related protective behaviors. Furthermore, we explored whether participants' belief that their racial group is at higher risk from COVID-19 related to engaging in protective behaviors. We hypothesized that participants who experience more negative emotions regarding the pandemic and see themselves at more risk will be more likely to engage in protective behaviors.

Self-identified Black adults (N = 350; age M = 26; ages 21-35; 45.5% women) from the Mid-Atlantic region were recruited for an online survey. Multiple linear regressions, controlling for gender and income, illustrated that perceptions that Black people are at higher risk of COVID-19 significantly predicted likelihood of quarantining when sick ($\beta = .190$, $p<.001$), though feelings of worry/regret over contracting the virus and overall stress were not significant predictors. A second regression revealed that overall stress ($\beta = .156$, $p<.0035$), feeling of worry/regret over contracting the virus ($\beta = .138$, $p<.0019$) and perception of Black people being at higher risk ($\beta = .209$, $p<.001$) predicted social distancing behaviors. Finally, overall stress ($\beta = .153$, $p<.0043$) and COVID-related worry/regret ($\beta = .270$, $p<.001$) predicted mask usage.

Our results have clear intervention implications for increasing engagement in COVID-protective behaviors. Healthcare officials should consider the relationship between protective behaviors and negative emotions when it comes to encouraging people to engage in such behaviors. The data demonstrate a need for public health advocacy to address the specific needs of Black communities, as structural racism within healthcare contributes to their perception of being at higher risk.

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SOCIAL SCIENCES

COLUMBIAN COLLEGE OF ARTS AND SCIENCES

Medicaid Pay for Performance: is it Really Helping?

For many years the United States has spent a higher percentage of its GDP on healthcare than any other country, however many Americans are left with low quality care. Policymakers are asking if it's possible to improve quality with those same dollars using a system in which physicians are financially rewarded for better performance of care. Although these pay for performance programs have grown in popularity across the United States, it's unclear if they are making the impact people want to see. Using publicly available Medicaid data for the last few years, I ran a panel regression comparing the quality of healthcare across state Medicaid programs to the existence of a pay for performance system while controlling for expenditure per enrollee and Medicaid expansion. My results showed significance in only a few metrics with overall trends in quality being mostly flat or slightly positive. These findings would support the conclusions of most healthcare pay for performance reviews which find these programs to have no major impacts on quality.

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SOCIAL SCIENCES

COLUMBIAN COLLEGE OF ARTS AND SCIENCES

Paradox of Play: Psychosocial Impacts of Leaving High-Level Sports

Objective: This study highlights how former high-level athletes transition back into non-athletic life and how they describe their physical health, emotional health, and social networks throughout the transition process.

Methods: To better understand the transition experience, a qualitative case study approach was used. Former high-level athletes were defined as former NFL players or former D-1 college football players over age 30 and recruited from the existing Athlete Brain Health and Aging study database. Members of the research team developed an interview protocol, and participants were re-consented prior to the qualitative interview. Eight interviews were conducted virtually. After reading the de-identified transcripts multiple times, an open coding strategy was used to identify codes, then recurring categories and themes.

Results: Participants were four former NFL players and four former D-1 college football players in two age cohorts: 30-49 (50%) and 50+ (50%). The former athletes described their experiences across three themes: identity, communication patterns, and health. Half of the former athletes chose a negative adjective to describe their transition. Some players expressed that the hardest part of transitioning into private life was "Replacing the Thrill" of playing. They expressed frustration with losing the structure of a routine and the camaraderie of team sports. Their efforts to create a meaningful lifestyle centered around practices first learned from sports, such as exercise regimens. Families were the most common social network they relied on for support, but some former athletes experienced negative social impacts. Some players occasionally sought support from former teammates. Transitions were easier for players with low expectations about their future in high-level football. Participants were worried about current and future players and recommended they have what some players refer to as a "Plan B".

Discussion: An extension of the Athlete Brain Health and Aging study's focus groups from summer 2020, these interviews sought to identify gaps in the focus group qualitative data, especially as they relate to the players' transitions from their athletic careers into private life. This data will aid the design of programs to help players navigate the transition. We anticipate that this ongoing research will inform future research on the wellbeing of high-level athletes and survey instruments for future studies.

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SOCIAL SCIENCES

COLUMBIAN COLLEGE OF ARTS AND SCIENCES

How Teleworking due to Covid-19 has Impacted Employees' Mental Health

To slow the spread of covid-19 starting in 2020, many employers chose to transition their employees out of their offices and instead begin teleworking. While this adjustment was necessary to preserve society's physical health, the adjustment has caused negative impacts on employees' mental health. Furthermore, despite a copious amount of research conducted abroad in Europe on this topic, there has been little to no research on how American employees who began to telework due to covid-19 have faced challenges to their mental health. The current study aims to fill the gap in the literature and support the effort to create policies that help protect teleworking employees' mental health.

Using the Household Pulse Survey conducted from August 19th, 2020 to March 29th, 2021, the current study examines the impact of having at least one household adult shifting from in-person to telework due to the pandemic on an individual's mental health. Additionally, the study analyzes whether the impact of teleworking on an individual's mental health varies by race, class, age, educational attainment, gender, and household size.

Preliminary results suggest that at least one adult per household who substituted some or all of their typical in-person work for telework due to covid-19 is more likely to express at least one mental health problem. Moreover, the impact of teleworking on mental health may vary by socio-demographic characteristics.

The results suggest that the mental health of individuals is equally as important to consider as physical health when a company switches to teleworking in the pandemic. The findings help to fill the gap in literature on the impact of shift to teleworking on household member's mental health in the U.S and provide employers with evidence to create mental health resources for their employees to avoid this effect, paying extra attention to which employees of certain demographic factors facing higher impact levels and working with those employees to find the solutions best fit for them. Additionally, beyond employers, the results can be used to prove to policy makers in the public occupational health field to draft legislation tailored to employees' mental health needs which helps further normalize the discourse on mental health.

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SOCIAL SCIENCES

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ArtReach GW at THEARC: An Observational Evaluation

Using a research-based evaluation process, we examined four areas of interest to assess the effectiveness of ArtReach GW's online classes: self-expression and creativity, open sharing of opinions, art skills, and visual literacy. Unfortunately, it was not possible for our team to design and implement an evaluation that was congruent with ArtReach GW's semester-long class schedule. Thus, we agreed to design an observational evaluation tool, test it, and provide instructions for future implementation.

We began by performing a review of literature on art therapy programs and evaluative research to gain insight into the field and potential applications of the methodology. Following precedents set by prior evaluative research on art-based programs, we decided to conduct an observational evaluation. Next, we completed two exploratory observations to take notes on typical class structures and teaching styles. Relying on the literature, we identified characteristics and patterns that indicate successful art therapy programs and practices, such as creative freedom, scaffolding, and peer interaction. Operationally we define self-expression as the ability to translate and reflect on one's feelings or thoughts through their artwork without limitation, while creativity is operationally defined as the process of allowing individuals to use their imagination and originality without limitation.

After eight observations over a four-week period, we began constructing the evaluation tool. The tool is intended to be used across future classes to ensure comparative results. Thus, we aimed to use a standardized tabling structure with columns and rows that can be easily followed in relation to the class structure. Based on the literature we identified three main categories that drastically affect how creativity, self-expression, and open sharing of opinions are promoted within ArtReach GW. Under each category, we formulated seven to eleven standard statements using the notes from the initial exploratory observations and characteristics mentioned above.

Our first main suggestions for ArtReach GW are to increase peer interaction among students as one's peers can be heavily influential when participating in group art therapy. After members begin to form relationships among themselves, Wexler (2004) observes a change in their style of painting or colors used, which may indicate changes in moods or thoughts. The second recommendation is for tighter curricular guidance for instructors. In addition, we found that it may be effective to provide the instructors some degree of curriculum outline for class structure while still allowing for flexibility at the discretion of the instructor.

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RESEARCH SHOWCASE

SOCIAL SCIENCES

COLUMBIAN COLLEGE OF ARTS AND SCIENCES

Exclusionary Political Rhetoric and its Effects on Psychological Well-Being

Since 1994, Democrats and Republicans have become increasingly ideologically divided. One factor that could contribute to this is politicians' exclusionary political rhetoric-- the verbal degradation of parties and their candidates, members, and values. The 2016 General Election exemplified exclusionary rhetoric, involving partisan and personal attacks. Exclusionary rhetoric includes social exclusion because it targets and degrades an individual or group. Past research illustrates that social exclusion by a political outgroup (opposite political party) lowers psychological well-being and produces negative feelings towards seeking validation. However, reading political rhetoric from the in-group versus the outgroup may have different impacts because of their connectedness with their in-group (same political party). This study examined the effects of exclusionary and inclusionary statements made by political leaders regarding the opposite political party on constituents' political polarization. We hypothesized that participants who read exclusionary statements about their group from the outgroup would perceive the statements as exclusionary and report the greatest levels of feeling attacked, defensive, misunderstood, and angry. We examined whether there were differing effects after inclusionary or exclusionary statements from the ingroup vs. the outgroup.

We recruited American voting-eligible adults (N = 346; age M = 30.86; 50.6% women) who identified as Democrat or Republican. The experiment randomly assigned participants to receive inclusionary or exclusionary rhetoric, from either in-group or outgroup politicians or political pundits. After reading the quotes, participants reported their perceived levels of exclusion, feeling attacked, defensive, misunderstood, and angry.

Controlling for political party, a significant 2 (in-group vs. Outgroup) x 2 (inclusion vs. exclusion) interaction revealed that participants in the outgroup exclusionary rhetoric condition perceived the most exclusion ($p < .001$; $\eta 2p = .045$), felt more attacked ($p < .001$; $\eta 2p = .198$), defensive ($p < .001$; $\eta 2p = .127$), and angry ($p < .05$; $\eta 2p = .016$) than participants in the in-group exclusionary condition; participants in the in-group exclusion condition felt the most understood ($p < .001$; $\eta 2p = .223$) compared to all conditions.

As expected, participants who read exclusionary rhetoric from the outgroup reported the most exclusion and greatest levels of feeling misunderstood, attacked, defensive, and angry. However, participants in the in-group exclusion conditions reported feeling better understood, suggesting that reading statements from one's own party that are exclusionary towards the outgroup validate constituents' negative feelings towards that outgroup. Thus, outgroup exclusionary rhetoric could fuel political polarization by producing greater negative feelings. Controlling for political party, a significant 2 (in-group vs. Outgroup) x 2 (inclusion vs. exclusion) interaction revealed that participants in the outgroup exclusionary rhetoric condition perceived the most exclusion ($p < .001$; $\eta 2p = .045$), felt more attacked ($p < .001$; $\eta 2p = .198$), defensive ($p < .001$; $\eta 2p = .127$), and angry ($p < .05$; $\eta 2p = .016$) than participants in the in-group exclusionary rhetoric condition; participants in the in-group exclusion condition felt the most understood ($p < .001$; $\eta 2p = .223$) compared to all conditions.

As expected, participants who read exclusionary rhetoric from the outgroup reported the most exclusion and greatest levels of feeling misunderstood, attacked, defensive, and angry. However, participants in the in-group exclusion conditions reported feeling better understood, suggesting that reading statements from one's own party that are exclusionary towards the outgroup validates constituents' negative feelings towards that outgroup and fosters polarization. Thus, outgroup exclusionary rhetoric could fuel political polarization by producing greater negative feelings.

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SOCIAL SCIENCES

COLUMBIAN COLLEGE OF ARTS AND SCIENCES

The Effect of Social Media on Perceived Risk and Preventative Behaviors During the COVID-19 Pandemic

At the beginning of the COVID-19 pandemic, information began to swarm social media channels about the virus itself, as well as ways for people to protect themselves against the virus. This study aims to see if there is a relationship between social media usage and adults' aged 18-25 perceived risk of contracting COVID-19. In addition, this study aims to see if there is a relationship between the perceived risk of contracting COVID-19 and the perceived efficacy of preventative behaviors, including wearing a mask, social distancing, and getting vaccinated. Previous research indicates that higher social media usage causes people to have a higher perceived risk of contracting an infectious disease or virus. In addition, the Extended Parallel Process Model provides a theoretical framework that looks at how an individual's perceived risk and perceived efficacy affects the response they have towards an infectious disease or virus. Participants (n = 104) completed an online, cross-sectional survey where they were asked to report their social media usage, their perceived risk of contracting COVID-19, perceived efficacy of preventative behaviors, and willingness to receive the COVID-19 vaccine. A bivariate correlation revealed that contrary to previous research, results indicated that there was no correlation between social media usage and the perceived risk of contracting COVID-19. The Extended Parallel Process Model was upheld, as people who had a higher perceived risk of contracting COVID-19 also had higher perceived efficacy of preventative behaviors and were more likely to engage in a danger control that involves taking preventative measures against the virus, as opposed to a fear control or no response. These findings indicate that people are more likely to engage in preventative behaviors against COVID-19 if their perceived risk of contracting the virus is higher, but do not show that this perceived risk comes from social media usage. Further research should be done to find out what information sources are contributing to individuals' development of perceived risk, as that can help inform officials during future health crises which medium may be best for conveying public health messages.

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SOCIAL SCIENCES

COLUMBIAN COLLEGE OF ARTS AND SCIENCES

Reminisce Art Therapy with Bilateral Stimulation for an Older Adult with Dementia: Case Study

Objective: A majority of people in the United States living with Alzheimer's disease and other forms of dementia experience Behavioral and Psychological Symptoms of Dementia (BPSD), including physical aggression, anxiety, and depression. Pharmacotherapy and surgical interventions are controversial due to adverse effects. However, as a promising non-pharmacological treatment, previous research proved that bilateral stimulations, art Therapy (AT), reminiscence therapy are capable of engendering significant cognitive gains and alleviating the BPSD. Also, according to the research, natural media stimulate the instinctive desire to recall the past and give psychological stability. Therefore, this study investigates the effectiveness of bilateral stimulation with nature and reminisced-based art therapy for an institutionalized older adult with BPSD.

Methods: A single qualitative case study of a woman with BPSD was conducted at a senior living community with memory care in an urban area. The study consisted of seven 50-min- to 60-min individual art therapy sessions occurring twice weekly. The therapy utilized the creating a garden theme, including coloring and crafting with bilateral stimulations (visual, auditory, and tactile). The intervention was a co-creation with an art therapist, creating arts together to encourage people with dementia to enable a self-making process. In addition to the art therapist student's observation, the participant described her experiences and completed questionnaires from the Patient-Reported Outcomes Measurement Information System (PROMIS).

Findings: Findings suggest positive changes in three domains of the PROMIS scale: (1) cognitive function, (2) depressive symptoms, and (3) general life satisfaction. Also, through observation, there were positive changes in (1) color used in the spectrum of blue and green, (2) self-efficacy and self-esteem, (3) visual perception ability, (4) concept of space and time, and (5) sense of cooperation.

Implications: The qualitative analysis suggested that nature and reminisced-based art therapy with bilateral stimulation alleviated the participant's symptoms of depressive mood and increased cognitive function and quality of life. Also, creating art with the client encouraged the participants to engage in artmaking and enhanced her self-efficacy and self-esteem. Furthermore, the structured directive and fluid or softer resistive mediums (e.g., crayons or oil pastels) promoted the participant's fine muscle skills. However, since it is a single case study, further research is needed to support the findings.

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SOCIAL SCIENCES

COLUMBIAN COLLEGE OF ARTS AND SCIENCES

TikTok, Twitter, and mental-illness identity formation: the role of community culture and misinformation

Social media users often utilize their accounts to connect with other users and to consume entertaining content, but recently many users have turned to social media platforms in the hopes of learning as well. Through the thematic analysis of top posts for different search terms related to mental illness diagnoses, this study analyzes the most popular posts resulting from searches of "ADHD" "Anxiety" and "Borderline Personality Disorder" in order to see what commonalities occur between users of TikTok and Twitter, and how content on each platform differs. Preliminary analyses indicate that popular content on both platforms often involves the dispensing of mental illness information in which the creator attempts to teach the viewer about the illness, though such information is frequently false or misleading. Additionally, while some popular content stresses the importance of seeking treatment from licensed professionals, other posts valorize self-diagnosis, and this largely varies between search terms. On both platforms, many of the most popular posts were created by individuals who openly monetize some aspect of their social media platform, though the prevalence of social media monetization does differ between the search terms and the two platforms. Results of this study could have important therapeutic implications for licensed mental health professionals who receive clients who have consumed misleading content, as well as policy implications for content moderation on social media platforms.

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RESEARCH SHOWCASE

SOCIAL SCIENCES

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Puerto Rican College Students and Their Attitudes Towards Mental Health

With limited research on Puerto Rican college students in the United States and on the island, this study aims to examine the lives and experiences of Puerto Rican college students regarding their attitudes towards mental health and their perception of their family's attitudes. Previous literature highlights the migration patterns of Puerto Ricans (Brown and Pattern 2013). Additionally, literature highlights the marginalization of Puerto Ricans from world history and immigration research (Duany 2000), but this qualitative study is the first to be conducted on Puerto Rican college student's attitudes towards mental health and their family dynamics. The data collected is based on 12 interviews with Puerto Rican college students in the Washington, D.C. area and Puerto Rican college students in Puerto Rico. This original research with Puerto Rican college students asks: What are their attitudes towards mental health? What are their perceptions of their family's attitudes towards mental health? And what does this mean for them amidst the economic, political, and environmental crises occurring on the island? Using sociological theory as a lens to further understand the issues that plague the young academic community, we will be able to further understand the struggles and lives of Puerto Ricans.

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SOCIAL SCIENCES

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How Stress Exposure, Appraisal, and Resilience (SEAR) Combine to Determine Psychological Distress: Testing a New Model of Stress in the Context of Terrorism

Given the profound adverse effects of psychological stress on mental and physical health (Shields & Slavich, 2017), it is crucial to better understand and promote resilience to stress. Research during and after the 2002 Washington, DC sniper killings suggests that resilience may operate on both trait and stress-specific levels (Moore et al., 2014). The current research was conducted to more directly test these two potential levels of resilience using a new model incorporating stress exposure, appraisal, and resilience (SEAR) in the context of the ongoing threat of terrorism.

The sample included 327 undergraduates living in Washington, DC (Mage=19.86; SDage=1.34); 62% female, 72% White). Participants were recruited through the departmental subject pool and participated in partial fulfillment of course requirements. Participants reported their contextual exposure to terrorism (number of security screenings in past three months); threat appraisal (perceived likelihood of future terrorist attack), negative affectivity (neuroticism); cognitive coping (constructive thinking inventory [CTI]), and both a general index (K6+) and a new, terrorism-specific measure of psychological distress (Terrorism Distress Scale [TDS]).

Controlling for social desirability and potential demographic confounds, contextual terrorism exposure was significantly correlated with greater threat appraisal and terrorism-specific (but not general) distress, while appraisal was related to both distress measures. Negative affectivity was more strongly associated with more general than terrorism distress (although both were significant), while the opposite was true for cognitive coping. In a subsequent path analysis, terrorism threat appraisal mediated the effect of contextual exposure on terrorism distress, while negative affectivity strengthened the links between exposure and appraisal as well as appraisal and distress; and coping reduced the impact of threat appraisal on terrorism distress.

These results are consistent with appraisal-based approaches to stress (e.g., Alhurani et al., 2018; Lazarus & Folkman, 1984), and they provide empirical support for the mediating role of appraisal predicted by the SEAR model. In addition to supporting the construct validity of the TDS, these findings also support the notion that stress resilience can operate at both a fundamental, trait level and a more stress-specific stage. Combining these principles and methods to determine how (and where) exposure, appraisal and resilience operate to increase (or mitigate) stress—particularly ongoing stress—can produce more targeted and effective interventions to reduce or prevent psychological stress and its deleterious effects on health.

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RESEARCH SHOWCASE

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Informal roads and their influence on wildfire ignitions northwest of Lake Biakal

The Siberian taiga is undergoing rapid land cover change driven by industrial development and wildfires. Informal roads are proliferating as part of industrial development and include logging access roads and pipeline and exploratory drilling easements. Undocumented paths and trails used by locals for subsistence and other activities are also considered part of informal transportation networks. There is evidence that informal roads contribute to wildfire ignitions, however, a comprehensive understanding of interactions between wildfires and road networks requires interdisciplinary research and collaboration with local and Indigenous communities. This study examines the statistical relationship between informal roads and wildfire ignitions surrounding the Evenki village of Vershina Khandy in Irkutsk Oblast. Here, spatial statistics are applied to parse natural from anthropogenic influences on wildfire ignition during the 2016 summer season. Fire ignition points for 2016 were obtained from the Visible Infrared Imaging Radiometer Suite (VIIRS) and a spatial autocorrelation analysis was performed on the ignition points and their distance to the nearest road using a Univariate Local Moran's I. This was followed by a presence-only prediction maximum entropy (MaxEnt) model to predict and analyze wildfire ignition distribution using natural and anthropogenic variables. This analysis reveals a significant correlation between wildfire ignition and proximity to informal roads in 2016. Our results indicate that discerning the forces which drive wildfire ignitions is pivotal information for wildfire management and fire risk reduction as this information allows us to devise strategies to alleviate wildfire initiation by identifying areas at risk.

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The Effect of Stimulant Medications On Growth Development

The rise in the prevalence of ADHD has resulted in a steep increase of prescribed stimulant medications in children and adolescents. These medications have been linked to hindered growth development. An initial review of published literature revealed a lack of research on growth trends (using body mass index, BMI) of children with ADHD who use stimulant medications compared to children not diagnosed with ADHD and not taking stimulant medication, matched for birth weight, gender, and gestational age. The aim of this research is to determine the effects of long-term stimulant medication use on physical developmental growth for children with ADHD. To study this research question, a regression analysis will be conducted to understand trends in BMI, height and weight from a child's initial prescription of stimulant medications to their adolescent years. We will then compare this data to BMI, height and weight trends for children who do not use stimulant medications to see if there is a significant difference. The sample data are from the Early Growth and Development Study, a prospective adoption study aimed at exploring heritable and environmental influences on children's health and development. This project includes 355 pediatric medical records. The study collected and abstracted data from these records to examine children's general health and well-being. Twenty percent of children were diagnosed with ADHD and 17% were prescribed stimulant medication. We hypothesize that the BMI, height and weight trends for children diagnosed with ADHD who use stimulant medications will have a slower growth rate compared to trends for children with no ADHD diagnosis not taking stimulant medications. Results can contribute to understanding the long-term physical side effects of stimulant usage during childhood.

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Inclusion From Afar: The Impact of Virtual Work on the Experience of Inclusion

Many of today's organizations operate in a global context where leaders are challenged by increasing demographic diversity in the workforce and more reliance on communication technologies (e.g., video conference) and virtual work environments (e.g., working from home). Recently, there have been calls for a better understanding of how diversity and inclusion can be properly managed amidst the widespread digitalization of work. The purpose of this dissertation is to understand how virtual work environments help or hinder inclusive leaders to promote follower performance and reduce workgroup discrimination. A sample of 244 adults working full-time in the U.S. were recruited from Amazon Mechanical Turk, and data was collected via an online questionnaire. Results suggest that the ability of inclusive leadership to improve employee performance is impeded by some but not all aspects of virtual work. For example, inclusive leadership is most effective for improving follower performance when leaders and followers work from the same location (e.g., in the same office) but is not impacted by the overall extent to which leaders and followers rely on technology to communicate. In addition, results imply that both inclusive leadership and workgroup inclusion are unrelated to workgroup discrimination, suggesting that inclusion may be ineffective for reducing discrimination in the workplace. These findings have implications for future research on the role of virtuality in workplace inclusion and the impact of inclusion on discrimination. They also offer insight into the extent to which organizations should consider the impact of virtual work arrangements on diversity, equity, and inclusion strategies.

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Conscientiousness protects visual search performance from the impact of fatigue

Visual search—looking for targets among distractors—underlies many critical professions (e.g., radiology, aviation security) that demand optimal performance. As such, it is important to identify, understand, and ameliorate negative factors such as fatigue—mental and/or physical tiredness that leads to diminished function. One way to reduce the detrimental effects is to minimize fatigue itself (e.g., scheduled breaks, adjust pre-shift behaviors), but this is not always possible or sufficient. The current study explored whether some individuals are less susceptible to the impact of fatigue than others; specifically, if conscientiousness, the ability to control impulses and plan, moderates fatigue's impact. Participants (N=374) self-reported their energy (i.e., the inverse of fatigue) and conscientiousness levels and completed a search task. Self-report measures were gathered prior to completing the search task, and were collected as part of a large set of surveys so that participants could not anticipate any particular research question. Preregistered linear mixed effect analyses revealed main effects of energy level (lower energy, i.e., higher fatigue, reduces accuracy) and conscientiousness (more conscientiousness increases accuracy), and, critically, a significant interaction between energy level and conscientiousness. A follow-up analysis divided participants into above- vs. below-mean conscientiousness groups, revealing a significant negative relationship between energy level and accuracy for the below-mean, but not above-mean, group. The results raise intriguing operational possibilities for visual search professions, with the most direct implication being the incorporation of conscientiousness measures to personnel selection processes.

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Examining the Feasibility and Acceptability of a Virtual Wellness Group for African American Mothers during COVID-19

Introduction: Perinatal depression is a significant public health issue among African American (AA) mothers with young children, who experience racial disparities in physical and mental health. This pilot study examines the feasibility and acceptability of delivering a virtual group intervention to reduce depressive and anxiety symptoms and increase parenting competence and social support among AA postpartum mothers.

Methods: Participants were recruited from the HealthySteps-DC program, a pediatric primary care program that promotes the health and well-being of babies and toddlers, with an emphasis on low-income families in Washington, DC. The Healthy Steps Moms Virtual Wellness Group was designed to address the social isolation experienced during COVID-19, when staff were not able to see their clients in-person. This group includes eight weekly sessions delivered remotely, utilizing cognitive behavioral and mindfulness-based strategies to manage stress. The intervention was piloted with six AA mothers with young children (ages 3 weeks to 2 years) guided by two clinicians. Participants ranged in age from 23 to 39 years (M=29.3 years) and the majority were single (83%) and parenting with a partner (67%). Depression and anxiety were assessed via the Edinburgh Postnatal Depression Scale (EPDS) and the Generalized Anxiety Disorder (GAD-7), respectively. Parenting competence was assessed using the Parenting Sense of Competence Scale (PSOC). Quantitative measures were completed at pre- and post-intervention; results are reported here for pre- and post-intervention. Additionally, a focus group was conducted 1 week post-intervention to elicit qualitative feedback regarding intervention experiences. Acceptability and feasibility were assessed using intervention attendance, participant self report measures, and focus group data, respectively.

Results: Six participants attended an average of 5.4 classes (SD = .74). Quantitatively, participants' levels of anxiety, depression, stress, perceived social support, or resilience did not differ significantly from pre- to post-intervention. Participants reported a significant increase in parenting competence after completing the intervention. During the focus group, mothers reported generally positive experiences participating in the intervention. Common themes were that the intervention: (a) a place to connect with and receive support from other moms; (b) provided a "judgment free" zone, (c) increased feelings of empowerment.

Conclusions: Overall, a virtual group intervention to support AA mothers with young children was feasible and acceptable. These findings will inform future adaptations and implementation of the Virtual Wellness Group, providing an opportunity to reduce mental health disparities that disproportionately affects AA mothers with young children.

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RESEARCH SHOWCASE

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Investigating Polling Place Accessibility in Georgia Through Isochrone Analysis

Polling locations during a presidential election year are designed to serve populations of residents based on their density and disbursement within a given geographic boundary, where voting precincts are determined by relative geographic position. In the state of Georgia, accessibility to polling places is crucial as the outcomes of the state's elections in the last six years have become critical for presidential and congressional candidates. However, precise measurement of access to these polling locations have historically proven to be complicated in recording accurate time requirements in traveling to polling locations. It is therefore necessary to investigate how travel time to polling locations over multiple election years changes in a given area. Through use of isochrones (accessibility measurements via walking, driving, or cycling time) access to polling place locations can be quantified in terms of time-to-location for voters. An isochrone analysis is conducted to determine travel time-based polygons that measure the physical accessibility of polling places within Georgia. This analysis contextualizes the effect of the number and location of polling places across the state following the decision of the Supreme Court in 2013 to strike down a preclearance requirement of the Voting Rights Act for key state elections, like Georgia. As a result, trends in the measure of accessibility for voters provide a view of the changing political climate and the direction in which government officials are headed that frame potential disenfranchisement efforts of key demographics in Georgia.

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SOCIAL SCIENCES

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Art Therapy for Returning Citizens' Self-Efficacy: Program Evaluation

Objective: Self-efficacy is an essential part of re-entering society after prison to promote rehabilitation and prevent future recidivism. Art therapy can help returning citizens develop self-efficacy. The purpose of this project is to enhance self-efficacy by reinforcing related skills such as mindfulness techniques, anger management, and substance abuse treatment.

Method: A qualitative study reviewed a seven-week art therapy group at a female transitional housing facility for returning citizens. Each session was one hour, had 4-8 members, and addressed the following: mindfulness (sessions 1-2), anger management (sessions 3-4), substance abuse (sessions 5-6). A final group (session 7) discussed the outcomes and effects of the group. In addition to observation notes about the participants' experiences in the group, additional data included participants' behavior in the facility and progression on goals, such as job retention.

Findings: This study is currently ongoing. Participant attendance at the self-efficacy group has been inconsistent due to scheduling conflicts. A case study of one participant who attended the majority of sessions demonstrated that her artwork has shown an increase in thoughtfulness when creating, as well as personal meaning behind the work. In addition, several staff members remarked that her attitude towards successfully completing the program has improved significantly.

Implications: Implications of this study support a need for mental health care for returning citizens focused on self-efficacy to support their confidence in their abilities to remain sober and maintain a life outside of incarceration. In particular, art therapy helped clients to identify thoughts and feelings that they would not have been able to verbalize, as well as give them a physical object to turn to as a coping mechanism. The group was able to foster a safe environment for the participants to be open with the art therapist and their peers.

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Digital and In-Store experiences: An Unlikely Marriage in the Luxury Fashion Industry

Since the outbreak of Covid-19, the retail fashion luxury industry has leaned towards a digital client communication framework. Clients have become better at purchasing products via technology, with the ubiquitous use of their devices and digital platforms. Ironically, very few luxury brands have implemented digital transformation within their next steps. With this said, it is crucial for luxury brands to adopt innovative digital marketing strategies to maintain customer engagement. Previous researchers have found that emotional branding is a critical factor in developing brand loyalty, which -- in conjunction with technology innovation -- has revolutionized the luxury market landscape.

80 MTurk workers (54.3% males and 45.7% females, avg age: 20.4 years) participated in a study measuring the impact of retail animation, e-commerce, digital experience, and customer engagement – on reactions to luxury brands and likelihood of purchase. Participants completed a multi-item survey with 5-point Likert-type, and open-ended items.

H1: as retail animation increased, likelihood of purchase did not significantly change (Beta = 0.0062, $p < 0.974$); H2: as retail animation increased, so did brand engagement (Beta = 0.434, $p < 0.001$); H3: as digital experience increased, so did likelihood of purchase (Beta = 0.085, $p < 0.0105$); H4: as digital experience increased, brand engagement did not significantly change (Beta = 0.015, $p < 0.495$); and H5: as in-store customer engagement increased, likelihood of purchase did not significantly change (Beta = - 0.275, $p < 0.128$).

As it turns out, individuals who enjoy online shopping on luxury brand websites tend to purchase more items, and those who experience more retail animation tend to be dynamically engaged with the brand. As it turns out, in-store customer engagement does not actually equate to a higher likelihood of purchase; and, with companies struggling to turn a profit, strategies for growth are essential. Improvements in retail animation and e-commerce platforms will likely lead to an enhancement in the digital experience, which will increase one's brand engagement and purchasing intentions. Customers will remain loyal to the luxury fashion brand, as long as they are satisfied with the digital experience. Moving forward, luxury fashion brands should continue to harness the power of social media without fearing any loss in exclusivity of their brands.

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COVID-19 Vaccine-related Cognitive Integration Patterns Using Information Integration Theory and the Dual-Process Model

Vaccination hesitancy is a threat to achieving herd immunity. A proposed way to lower hesitancy is incentivizing the COVID-19 vaccine (i.e., compensation; Mankiw, 2020). This study aims to assess the cognitive integration that occurs when compensation information about the COVID-19 vaccine is given and how that relates to vaccine cognitions. Using Information Integration Theory (IIT; Anderson, 1981) it's possible to examine this decision-making process pattern (additive, averaging, multiplicative) and conscientiousness' role across compensation levels and vaccine-related cognitions.

Data from 154 US adults 18-74 (M=37.6; SD=18.43) were collected online (March-April 2021). Participants answered vaccination cognitions questions (i.e., anxiety, hesitancy, side effects and their severity) following a COVID-19 vaccine-related scenario. The scenario was presented four times with differing (and randomized) compensation information (baseline, $10, $200, $500). Participants also completed a conscientiousness measure (John & Srivastava, 1999). Conscientiousness was trichotomized and the marginal means for each level of compensation were graphed; the patterns were examined for each outcome to determine cognitive integration type (additive, averaging, multiplicative).

The findings demonstrated that side effects (a "V" shape) and severity (inverted "V" shape) had no IIT pattern, but are inverse of each other–where, for side effects, high and low conscientiousness have similar levels of perceived side effects, higher than the medium level (which has the lowest) consistent across compensation levels (vice versa for severity). Anxiety was marginally parallel, though the compensation order was not sequential, therefore, no discernible IIT pattern could be determined. Finally, hesitancy was parallel and after conducting a critical test (examining baseline), had an averaging IIT pattern.

These findings help demonstrate the importance of individual differences (i.e., conscientiousness) on decision making regarding the COVID-19 vaccine. Side effects and severity had the opposite patterns, and although did not show a clear IIT pattern, they were inverse from one another; moreover, the anticipated pattern from varying levels of conscientiousness was not consistent with previous literature. A potential explanation for this could be the Dual Process Model (Tversky & Kahneman, 1974), which posits the relationship between cognition and emotion. For anxiety, although marginally parallel, due to the order of compensation levels, discussing it in terms of being additive did not make sense–future research should assess this pattern more clearly. Finally, hesitancy showed an averaging pattern, explaining how compensation information per conscientiousness can be integrated–which is important in outlining how to create targeted interventions to decrease hesitancy.

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Ownership of Ideas

In this study we analyze how children and adults view ownership of objects versus ownership of ideas. Are ideas as concrete as physical objects, or do we treat them differently in terms of ownership? What can be considered public knowledge? These questions could have important effects of legal processes regarding patents and copyright. We started with the Public/Generic configurations for the experiment. There are 16 total configurations, 8 male and 8 female configurations, in which all variables are randomized (for example: the order of names, which condition is shown first). Every configuration has two conditions, one that is about ownership of ideas and one about ownership of objects. In the ideas condition, a child has seen a story about a bear playing on a beach on the television and they share it with a friend. Then the friend tells the story again. This indicates a "first possessor" of the story and a "second possessor" of the story. The object condition is the same but uses a ball in a toy store instead of a story seen on television. At the end of each of the conditions, there is a question: "Who's story/ball is this? (Child's Name), (Child's Name), or everyone/no one?" We expect that most of the participants will answer "everyone" for the story, and "no one" for the ball, although we predict some will answer with the first possessor child's name. We do not think many people will respond with the second possessor, and so far data is consistent with our expectations. This supports our predictions regarding the shared nature of stories in public media.

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Counterintelligence and SDS at George Washington University

On April 23, 1969, George Washington University's Maury Hall was taken over by members of the GW chapter of Students for a Democratic Society (SDS). The protesters demanded an end to the Sino-Soviet Institute, a research institute responsible for policy proposals justifying the ongoing Vietnam War, which was housed within Maury Hall. Hundreds of students flocked to Maury Hall to observe a standoff between administration officials and radical protesters. Fraternity brothers who disagreed with the takeover took their frustrations out on supporters, throwing punches and starting brawls. Inside, desks and cabinets were used to blockade the doors, filing cabinets were broken into, and the protestors debated their next course of action. Under threat of arrest, the students eventually left Maury Hall, only to face extreme disciplinary action at the hands of GW, resulting in their eventual expulsion. 50 years later, the president of GW SDS at the time of the takeover who led students into Maury Hall, Nick Greer, looked over pictures of the event. Pointing at one photograph of two protestors at a window calling out to the crowd below, he says "oh there's me, and the guy next to me was a cop". The objective of this research is to uncover both the history of GW SDS and the role various law enforcement agencies, including the FBI, the Secret Service, and MPD played in surveilling GW SDS and curtailing their activities, and seeks to uncover the extent of federal infiltration within GW SDS. Research was conducted through various databases of FBI internal memos, letters, and progress reports regarding surveillance, archival newspapers, including the Evening Star and Hatchet, as well as through oral interviews with former SDS members such as Nick Greer. This research has determined that because GW SDS was a powerful political organization on campus and part of the New Left more broadly, police acted as agitators and provecteurs during the takeover of Maury Hall to discredit SDS. Law enforcement agencies spent considerable effort surveilling and derailing GW SDS, which fits a pattern of organizational sabotage consistent with federal action against the New Left as part of their COINTELPRO program. By examining the GW SDS chapter and fitting it in a larger framework of police retaliation against New Left revolutionary groups, this research sheds light on the local struggles of GW SDS and the tactics used by law enforcement to discredit the New Left nationally.

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The Transformational and Charismatic Leadership of Malcolm X

Objective: The leaders of the American Civil Rights movement represent an understudied subsect of organizational science research. Malcolm X, a notable and controversial figure, is known for his unique leadership and for using incendiary language that often-contrasted more mainstream Civil Rights leaders, like Martin Luther King Jr. However, the tendency to associate his leadership with fiery language that results in behavior such as violent protest, is an oversimplification of the leadership process that requires further analysis.

Methods: To help understand the relationship Malcolm X has with his followers and to understand how leaders influence behavior, the research uses a qualitative approach an archival study of 15 of Malcolm X's most prominent speeches. Each speech is coded for instances of incendiary language, based on keywords and/or key phrases and broken down by date, target audience, overall tone, incendiary language use count, incendiary language use type, and location. Additionally meta trends are extracted which may or may not have to do with incendiary language. The speeches are compared to each other for final thematic coding and sorted in connection to riotous events around the same time. With each event, the speeches are checked to see if there is messaging congruency, or explicit behavioral congruency between the words Malcolm X used, and the behavior the followers exhibited.

Findings: The results show Malcolm X had a very visible role which played into the concept of him being a leader. His relationship with the press also further drove the idea of him being a highly effective leader, as they were drawn in by his use of incendiary language as a counter narrative to the nonviolent protests in the south. But outside of that, his use of incendiary language served more as commentary on recent riotous events as opposed to being foundational, for starting them.

The implications of this type of revelation shatter our preconceived notions of leadership and represent a darker side of the transformational and charismatic leadership process. The process of leadership for Malcolm X included a unique relationship with the media and press, and followers who are conflicted about his words. With a study of this sort, no causal inferences can be made on the topic of whether explicit language incendiary or not, can lead to riotous behavior, but understanding the patterns in speech, can provide enough data to make predictions about follower behavior, and leadership trajectory. Additionally we can build on the discussion of how theories of leadership in race related contexts inform us on how leaders implement change on a societal level.

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Genetic and Environmental Contributions to Parental Warmth Across the Preschool Years

We examined genetic and environmental contributions to rank-order stability and change in parental warmth from ages 3 through 5 using a longitudinal twin design. The sample included 310 twin pairs (n = 620) and their primary caregivers. The twins' primary caregivers,Äô reported on their own warmth via the Parent Feelings Questionnaire (PFQ). A Biometric common pathway was used to estimate genetic, shared environmental and nonshared environmental contributions to a latent warmth factor that accounted for variance in parental warmth across all three ages (i.e., stability), as well as age-specific residual variance in parental warmth (i.e., change). Results showed that parental warmth demonstrates moderate rank order stability from ages 3 to 5. Shared environmental factors explained most variance in the latent parental warmth factor, while genetic and non-shared environmental factors accounted for modest variance. In regard to age-specific variance in parental warmth, shared environmental factors accounted for most variance at all ages. However, at age 5, genetic factors also explained age-specific variance. The findings indicate that shared environmental factors play a key role in parental warmth and its stability over time, as well as age-specific changes over time. Children's genetic makeup also influences parental warmth, but to a lesser degree.

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RESEARCH SHOWCASE

SOCIAL SCIENCES

COLUMBIAN COLLEGE OF ARTS AND SCIENCES

"It Stays With You": The Disorientation of University Females with Eating Disorders

Eating disorders are a silent epidemic that plague many college-aged females. Eating disturbances like anorexia, bulimia, and more, are leaving many girls lethargic, depressed, and alone while attempting to navigate college. Even those in recovery find it more difficult to maintain their recovery because of the stress and lack of routine experience at college. Better understanding the experiences of these university students can help inform peers, teachers, and family so that they can have conversations with each other, and help those they see are suffering, rather than letting it pass by due to lack of understanding. This study hopes to lead to greater understanding of the unique experiences of female college students with eating disorders and their recoveries.

This study adds a qualitative contribution to the current research available and specifically contributes to the topic by providing in depth explanations of real experiences of college females with eating disorders. Eight GW female undergraduate students who were in recovery from eating disorders were interviewed about their experiences. Interviews conducted showed that these females find themselves disoriented when moving from home life to college life, and struggle to manage their eating disorders while navigating this turbulence.

Four main themes were found through this study: GW females with eating disorders make sense of their food experiences through the lens of the food behaviors and culture in their families, GW females experience nourishment confusion in college, GW females with eating disorders experience feelings of a lack of control in their lives, and that experiences with different kinds of disclosure (Accidental or forced disclosure, disclosure as a coping mechanism, and fear of disclosure) help make sense of how GW college females navigate their eating disorders and recoveries in college. These findings imply that students see a correlation between their eating disturbances and the state of their lives at college, and that there are underlying issues that are not addressed at institutions when it comes to dining plans and student nutrition.

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SOCIAL SCIENCES

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History in the Making: The Virginia Domestic Workers' Bill of Rights

The Virginia Domestic Workers' Bill of Rights is the 10th domestic workers' bill of rights to pass in the United States and is the most recent one. These bills extend preexisting workers' protections to domestic workers. It encompasses the issues of workplace discrimination, health and workplace safety, and payment of wages. Domestic workers were excluded from most labor protections and rights by the Fair Labor Standards Act of 1938. Domestic workers are majority women, primarily immigrant women of color. Only ten states have amended this and passed their versions of domestic worker bills of rights.

Domestic work is a dimension of social reproduction that has always been undervalued and underappreciated. The VA bill of rights continues the long and rich history of domestic workers' movements here in the United States. Through the work of feminist scholars such as Premilla Nadasen, Rhacel Salazar Parreñas, and Sheila Bapat, work has been laid out for foundation for the history of the domestic workers' movement and the intersectional analysis of domestic work in relation to race, gender, class, and other factors of identity and experience.

Through the analysis of Virginia Senate legislative hearings and of existing texts on the domestic workers' movement, this research aims to locate and situate the VA domestic workers' bill of rights in the ongoing history of domestic workers' movements as well as to investigate the conditions that lead to the bills' formulation and passage. Due to the recency of the bill of rights, this research will also delve into their implementation and what further work is needed to address the issues not covered by the bills.

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RESEARCH SHOWCASE

SOCIAL SCIENCES

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For Imposters, By Imposters: Community-Engaged Research to Mitigate Imposter Phenomenon Prevalence in Peer Tutors

While writing center (WC) scholarship has begun to explore writers' confidence and belief in themselves as writers (Mackiewicz & Thompson), little, if any, WC research has investigated imposter phenomenon (IP) — the intellectual phonineness individuals often feel when achieving success (Clance & Imes, 1978). Imposters — individuals who are experiencing IP — often feel their success was achieved by mistake or luck, and soon they will be outed as intellectual fakes (Clance & Imes, 1978). This experience may lead to heightened incidences of anxiety and low self-esteem (Cokely et al., 2013). Previous literature suggests that individuals experience IP in both academic and professional settings, which may hold strong implications for peer tutors who occupy both realms (Clance & Imes, 1978; Parkman, 2016).

Throughout Spring 2022, I am conducting an IRB-governed study on IP among WC tutors at the George Washington University Writing Center. My research will quantitatively identify how many participating tutors experience symptoms of IP by using validated IP scales. Furthermore, I will develop an intervention — a workshop that provides peer tutors with tools to address their IP experience.

I hope to find that IP prevalence will be mitigated by a targeted intervention, leading to more confident peer tutors. At the research showcase, I would present my literature review, an overview of the intervention workshop, and initial findings, so that a) peer tutors can identify what might work for them, b) WC researchers can expand upon the IP literature and c), administrators can identify systemic changes to make in WCs to mitigate IP prevalence across peer tutor populations.

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Imagery, Arousal, and Choice

Introduction: Previous research outlines four indicators of advertisement effectiveness: attention, emotion, memory, and preference (Pozharliev, Verbeke, & Bagozzi, 2017). Advertisements also play a crucial role in driving consumers' decisions (Kumar & Raju, 2013; Gesser, Keeler & Young, 2018). The current study examines the impact of imagery (arousal level) on choice-related items (product likeability and purchase intentions). HYPOTHESES: As arousal increases, (H1) participants will be more impulsive; and (H2) take more risks; (H3) product likeability and (H4) purchase intention will increase; and, as state anxiety increases, (H5) product likeability and (H6) purchase intention will increase.

Methods: 50 Amazon MTurk workers participated in an online study examining the impact of imagery-arousal level (low vs. moderate) on decision-making, via time-delay and probability discounting choice-sets. In addition, participants' state-anxiety and impulsivity preferences were measured, using the State-Trait Anxiety Inventory (STAI-T; Spielberger et al., 1983; Zsido et al., 2020) and Eysenck Personality Questionnaire – on Impulsivity (EPQ-I; Eysenck & Eysenck, 1977, 1980). The goal was to explore how imagery might impact consumers' responses to choice-sets, product likeability and purchase intentions (e.g., $30 tonight or $85 in 14 days). RESULTS: As arousal increased, and inconsistent with H1, participants' impulsivity did not change (chi-square df = 1 = 1.159, $p < 0.75$); consistent with H2, participants took more risks (choosing lower probability, higher reward options; chi-square df = 1 = 4.348, $p < 0.05$); inconsistent with H3, product likeability did not change (t df = 48 = -1.044, $p < 0.302$, Ms: low arousal = 2.852, moderate arousal = 3.096); inconsistent with H4, purchase intention did not change (t df = 48 = -0.976, $p < 0.334$, Ms: low arousal = 2.738, moderate arousal = 2.974); and inconsistent with H5 and H6, as state anxiety increased, product likeability (Beta = 0.017, $p = 0.291$) and purchase intention (Beta = 0.012, $p = 0.440$) did not change. Finally, product likeability and purchase intention were correlated (Beta = 0.899, $p < 0.0001$).

Discussion: The only moment when image-induced arousal was linked with risk-taking was when people were given a chance to select low probability outcomes with higher rewards (50% chance of $75). It appears that - when it comes to choices in the consumer world - probability is more of a driver of decisional outcomes than timeframe. As the arousal level of an image increases, so does one's desire to embrace risky decisions.

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SOCIAL SCIENCES

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Program Evaluation on GW Votes: Voter Registration Strategies and Voter Engagement at George Washington University

The year 2020 catapulted society into a tumultuous "new normal." There was a spiking death toll due to the COVID-19 pandemic, an uproar of political unrest with the Black Lives Matter protests and a transition in presidential leadership. The 2020 election presented a key opportunity for young people to have their voices heard through voting. One of the highest turnout rates in decades was seen for 18 to 29 year olds, but there is still a gap in college student voter registration. George Washington University (GWU) is one of the most politically active universities, but there are still unregistered students and students who are registered but do not vote. GW Votes is a nonpartisan coalition of students, faculty and staff that encourages voter registration and voting among GWU students. This program evaluation was conducted in 2021 to determine whether GW Votes is using the most efficient and effective strategies to register students and mobilize student voters. A survey was distributed to GWU students to determine: 1) issues that mobilize students, 2) methods of engagement utilized by GW Votes, and 3) associated levels of student engagement. The evaluation revealed differential engagement between students in different fields of study as well as amongst the different grade levels. Students affirmed the use of new voter registration tactics, most notably in-class presentations. Our findings suggest that reconsidering voter registration strategies, tailoring engagement methods to the diverse student population, maintaining relevance and visibility on-campus through events and social media, and furthering data collection can lead to improvements in voter registration and participation.

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SOCIAL SCIENCES

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Gender Stereotypes and Leader Prototypes in Male-Dominated Organizations

The current study is driven by the desire to understand the insufficient representation of women within male-dominated organizations, focusing on the incongruency of female stereotypes and leader prototypes within male-dominated organizations. Since female stereotypes do not align with leader prototypes, female leaders are oftentimes disregarded for career opportunities at male-dominated companies. The incongruency between female stereotypes and leader prototypes can explain the workplace barriers that women experience and organizational outcomes such as gender representation.

The present study investigated possible explanations for limited representation using the National Football League (NFL) as a case study. Recently, the NFL has been criticized for the organization's lack of gender diversity in the league. To assess gender stereotypes, leader prototypes, and workplace barriers that women experience working in the NFL, archival data were analyzed. Interviews and online articles regarding the perceptions and experiences of NFL employees from all 32 teams was thematically coded. Specifically, articles from local news websites, national news websites, Sports Illustrated, the NFL website, team websites, ESPN, and other news sources were analyzed to find general themes and trends. Gender diversity hiring grades from the 2021 National Football League Racial and Gender Report Card were analyzed to see the implications of the incongruity between female stereotypes and leader prototypes on organizational outcomes.

According to the data, the most common female stereotypes amongst NFL employees were that it was unnatural for females to be in the NFL environment and that females were timid. These stereotypes align with commonly held beliefs about women and sports. Regarding leader prototypes, it was found that NFL employees saw leaders as dedicated and intelligent. Such leader prototypes align with the traditional leader prototypes. Therefore, it appears that there is role incongruity within the NFL because traditional female stereotypes do not align with the traditional leader prototypes. This incongruity may explain lack of job satisfaction and poor image of the industry that women hold of the NFL. In addition, this phenomenon can possibly explain low success rate of the NFL with gender diversity hiring. The current research can provide male-dominated organizations an understanding of why their workforce may lack female representation. Male-dominated organizations could create trainings which aim to reduce gender stereotypes amongst employees and demonstrate that women are capable of being effective leaders. As a result of gender and leadership trainings, women could have more opportunities for leadership roles within industries that lack female representation.

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Measuring the Impact of Climate Change on Tourism on French Departments located on the Mediterranean Coast

Tourist destinations can generally be defined by their local climate, with many destinations relying on persistent temperatures in order to attract tourists whether for going to the beach or for skiing down a mountain. Due to tourist destinations being reliant on certain weather conditions to remain popular, it goes without question that climate change will impact their attractiveness for visitors. Climate change has the potential to impact tourist destinations in a variety of ways, from environmental degradation to the increased frequency of natural disasters. While some of the effects of climate change will have an indirect effect on tourists, such as environmental attractiveness, the temperature will have a direct effect on tourists by impacting their physical comfort while in the destination. As global temperatures have been predicted to increase around the globe, what will the effect of higher temperatures caused by climate change have on the number of tourists visiting a particular destination? This study seeks to assess the impact of temperature on overnight stays in seven French departments located on the southern coast of France from 2011 to 2019 using a fixed-effects regression. In the model for foreign overnight stays, a 1 °C increase in the maximum mean temperature would increase overnight stays by 0.9% while a 1 °C increase in the minimum mean temperature would decrease overnight stays by 1.8%. The model would then imply that increases in the maximum temperature would increase overnight stays to a lesser degree than an increase in the minimum temperature which would decrease overnight stays. In the model for domestic overnight stays (Table 3), only the minimum temperature was statistically significant with a respective p-value of 0.047, implying a 1°C increase in the minimum temperature would result in a 0.6% change. Results showed that an increase in the average minimum temperature can lead to a decline in tourism from both domestic and foreign tourists. The effect of changes in minimum average temperature had a larger effect on foreign tourists than domestic tourists, signaling that foreign tourists have stricter preferences for temperature. As the effects of climate change become increasingly extreme; it is likely that future tourism flows in the departments studied will be affected by temperature which will require tourist destinations to provide alternative outdoor and indoor attractions with milder temperatures to remain popular among visitors.

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Role of Daily Gratitude Interventions in Stress-Related Alcohol Consumption

Purpose: Emerging adults (18 – 29) are particularly vulnerable to the development of problem drinking behaviors and alcohol use disorder. This is partially due to stress caused by role transitions coupled with the increase in accessibility of alcoholic drinks. However, due to the demands of daily life during this period, there are challenges in adhering to the intensive protocols that allow individuals to manage this stress in a constructive manner, i.e. in keeping their appointments with therapists.

Previous studies indicate that brief daily intervention (particularly those targeting gratitude) may be especially beneficial to emerging adults in the treatment of depression symptoms and improvement in overall well-being. However, these interventions are seldom studied and their role in reducing binge-drinking behaviors is poorly understood. This study aims to examine the effect of brief, daily gratitude intervention on the relation between daily stress and daily alcohol consumption among emerging adults exhibiting binge-drinking behaviors using an ecological momentary assessment design.

Method: 40 emerging adults who report weekly binge drinking behaviors are being recruited to participate in a 4-week diary study in which entries are added from Friday to Monday. From Friday to Sunday, participants are asked to write down "thing(s) in their life that they are grateful for" in the late afternoon. Each participant serves as their own control during the first week of data collection (no gratitude intervention is administered), then the number of grateful things they are requested to list is increased gradually over the remaining three weeks. Blood alcohol concentration (BAC), the outcome, is assessed on the next morning from Saturday to Monday. Statistical software, SAS will be used to examine the moderating daily effect of gratitude on the daily relation between stress and alcohol use by employing the mixed-effects within-person moderation model. Data collection is ongoing and analysis will be conducted in March.

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SOCIAL SCIENCES

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A Research Proposal: Isolation and Haptic Art Therapy Techniques During the COVID-19 Pandemic

The COVID-19 pandemic created unprecedented feelings of loneliness, increased substance use, and decreased mental health worldwide. Art therapy and haptic techniques have proven beneficial during similar human struggles with isolation and the negative consequences of epidemics. This research paper has scientific and ethical goals in using haptic art therapy techniques to mitigate symptoms of isolation and loneliness during the ongoing COVID-19 pandemic with adult participants with substance use disorders in a group recovery setting. The goals of this proposal are to decrease symptoms of loneliness and isolation caused from the COVID-19 pandemic using a single session haptic clay-based art therapy experiential. To answer this question the researcher analyzed the participants' feelings of loneliness using a standardized Loneliness Scale pre and post art intervention. The results of the research indicate an overall increase of social connection in the participants and revealed the decrease of symptoms of isolation and loneliness after taking part in the haptic art therapy directive. The research concludes that haptic art therapy techniques can influence feelings of isolation and loneliness while increasing feelings of social connection during the COVID-19 pandemic.

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SOCIAL SCIENCES

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Addressing cultural mistrust between an African American art therapy student and client: Case study

Objective: Cultural mistrust involves African Americans' lack of trust in White individuals. With this concept, African Americans express discomfort, apprehension, and avoidance with sharing information and interacting with White individuals due to their fear of betrayal or exploitation. This concept is the result of historical and contemporary racial trauma which has caused many African Americans to mistrust the healthcare system, including therapy. The current study explores African American clients' comfort and openness when working with an African American art therapist.

Method: A qualitative case study will explore the interactions and implications between an African American client and African American art therapy student. The sessions will follow art therapy treatment as usual through telehealth. In addition to art therapy student observation, the Inventory of Attitude Toward Seeking Mental Health Services will be used as a pre and post measure to determine the client's comfort level with and feelings about seeking therapy.

Findings: The study is still in progress. Preliminary themes include: 1) countertransference due to racial, gender, and therapeutic content similarities; 2) the concept of a "strong Black woman" and hiding emotions from others; and 3) being vulnerable through crying.

Implications: Further investigation during this case study will add to the limited research on engaging with African American clients in art therapy and what cultural content, behaviors, thought processes, etc. might arise within the sessions. Additional implications could support the need for more African American art therapists in the field who are aware and knowledgeable of the previously mentioned culturally-specific experiences and issues. Finally, this study could depict the need for African American art therapy students/therapists to be trained in potential countertransference from working with African American clients.

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RESEARCH SHOWCASE

SOCIAL SCIENCES

COLUMBIAN COLLEGE OF ARTS AND SCIENCES

Climate Variability in Coastal Regions: A Case Study of the La Plata Shelf Region in Brazil

Studies by the IPCC have shown global temperature rising at an increased rate since the mid-nineteenth century with evidence supporting anthropogenic activity as the cause. Certain regions are more vulnerable to the effects of global climate change. Land located along coasts are of particular concern. The purpose of this study is investigating the impacts of climate variability on geography, population, and infrastructure in Brazil. Specifically, it focuses on the state of Rio Grande do Sul located on the La Plata Shelf in the southernmost part of the country. Land surrounding Lagoa dos Patos is of particular interest. Data was gathered from various openly available government and privately owned databases and imported into ArcGIS software to get a preliminary overview of the areas at risk to the effects of climate fluctuations. We overlaid this data using moderate (SSP245) and extreme (SSP585) projected pathway scenarios from CMIP6 which show radiative forcing at 4.5W/m2 and 8.5W/m2, respectively. We were able to identify areas most at risk for climate change impacts on population and infrastructure. In further studies we hope to gain a better understanding of the vulnerability of coastal regions in Brazil to climate variability and the potentially adverse consequences to the human population it may cause.

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SOCIAL SCIENCES

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Discrimination and Latinx adolescents' depressive symptoms and externalizing behaviors: The role of parental support

Introduction: Experiences of discrimination are not only reported, but expected by Latinx adolescents and their parents (Romero et al., 2015). Discrimination in schools, by peers, and in general has been associated with increased depressive symptoms and externalizing behaviors (Behnke et al., 2011; Bennett et al., 2020; Lopez et al., 2016; Wright & Harper, 2019). Family factors, such as family positivity and parental involvement, protect against symptoms of depression and externalizing behavior in response to discrimination (Calzada et al., 2020; Lazarevic et al., 2021; Lorenzo-Blanco et al., 2019; Ramos et al., 2021). However, few have examined the protective effects of parent support in the link between discrimination and emotional and behavioral adjustment for Latinx adolescents. Moreover, despite evidence that the protective effect of parent support varies for girls and boys (e.g., Calzada et al., 2020), few have examined sex differences in the protective effect of parent support against discrimination for Latinx adolescents. The current study addresses these gaps by examining whether parental support attenuates the association between Latinx adolescents' experiences with discrimination and their depressive symptoms and externalizing behaviors, and whether the effect of parent support differs for girls and boys.

Method: Participants were 404 Latinx adolescents (Mage = 15.26, 58.4% female) who reported about discrimination, depressive symptoms, externalizing behaviors, and parent support at two timepoints, 6 months apart. Hierarchical linear regression was used to analyze the moderating effect of parent support and whether the moderating effect of parent support differed by sex. Mean-deviated product terms were used to compute two-way and three-way interactions between discrimination, parent support and adolescent sex to test study aims.

Results: For depressive symptoms and externalizing behavior, the discrimination X support X adolescent sex interaction was significant (depressive symptoms: $t = -2.89$, $p < .01$; externalizing behavior: $t = -2.66$, $p < .01$) such that parent support moderated the association between discrimination and adjustment for boys but not for girls. Examination of simple slopes showed that for boys, the association between discrimination and depressive and externalizing symptoms was positive when parental support was low, and negative when parental support was high demonstrating the protective effect. For girls, parent support did not protect against discrimination's effects on depressive symptoms or externalizing behavior.

Conclusion: Results suggest that parenting interventions targeting discrimination effects may need to be tailored for girls and boys. Future research should explore other family factors that might be more helpful for girls' experience with discrimination.

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SOCIAL SCIENCES

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Perceived stress and emotion dysregulation as mediators of mental health in camouflaging among autistic adults

Prior studies suggest camouflaging (behaviors that mask social "challenges") is associated with anxiety and depression in autistic adults; however, what drives this link is unclear. Prime candidates are 1) perceived stress, based on autistic adults reporting stress related to camouflaging and 2) emotion dysregulation based on its prevalence in autism spectrum disorder (ASD) and links to depression and anxiety.

Examine whether perceived stress and emotion dysregulation drive links between camouflaging and elevated depression and anxiety in autistic adults. 787 autistic adults aged 18-78 years (M=40.2, SD=13.7) were recruited via Simons Powering Autism Research and Knowledge Research Match to complete online questionnaires. These included the Camouflaging Autistic Traits Questionnaire (CAT-Q), and measures of depression (Patient Health Questionnaire-9, PHQ-9), anxiety (Generalized Anxiety Disorder-7, GAD-7), perceived stress (Perceived Stress Scale, PSS), and emotion dysregulation (Self-Regulation of Emotions subscale of the Barkley Deficits in Executive Functioning Scale, BDEFS-SRE). Using PROCESS, four moderated mediation models were tested. CAT-Q total score was the independent variable, and the moderator variable was birth-sex, with age and AQ-28 score as covariates. The dependent variable was PHQ-9 or GAD-7 total score, and the mediator variable was the PSS or BDEFS-SRE score. Modeling implemented bootstrap confidence intervals using 10,000 bootstrap samples. Confidence intervals not including zero were considered significant.

Perceived stress as mediator: Camouflaging showed significant conditional direct and indirect effects on depressive symptoms through an effect on perceived stress. Camouflaging also showed a significant conditional direct effect on anxious symptoms and an indirect effect via perceived stress. The only significant moderated mediation effect was revealed here, where male sex negatively moderated the indirect effect of camouflaging on anxiety through perceived stress.

Emotion dysregulation as mediator: Camouflaging showed a significant conditional direct and indirect effect on depressive symptoms via emotion dysregulation. Camouflaging also showed a significant conditional direct effect on anxious symptoms through its effect on emotion dysregulation.

For the first time, we present evidence for two potential drivers (perceived stress and emotion dysregulation) in the association between camouflaging and elevated anxiety and depression in ASD. Birth-sex was included as a moderator; age and autistic features were controlled for. Heightened perceived stress and emotion dysregulation appear in longstanding models of depression and anxiety in the general population. These models, with literature reporting stress from camouflaging, and associations of emotion dysregulation with poorer mental health in ASD, provide theo

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SOCIAL SCIENCES

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Associative binding occurs for both task-relevant and task-irrelevant features in visual search

Visual search—looking for targets among distractors—underlies many critical professions (e.g., aviation security, radiology), making it important to understand the mechanisms that govern performance. Previous research has demonstrated that repeating features benefit search performance, however this has not been thoroughly studied through the lens of associative binding, wherein co-occurring information links into singular memory representations that strengthen encoding. Complex visual search tasks, arguably, provide a highly sensitive window into associative binding mechanisms that can potentially inform an open debate about whether associative binding operates over task-irrelevant information (e.g., backgrounds, distractors). The "associative blocking" account suggests only task-relevant and highly salient features bind with targets. Yet, recent findings of trial sequence effects in search suggest that even task-irrelevant information impacts subsequent performance. Accordingly, the current study hypothesized that search performance is influenced by a unitary mechanism wherein all information, regardless of task relevance, is processed and available for binding. Performance was assessed across consecutive trials, wherein both task-relevant and task-irrelevant features co-occurred. Data were drawn from a massive (>3.8B trials, >15.5M participants) visual search dataset (Airport Scanner; Kedlin Co.). In line with the prediction that associative binding can operate over task-irrelevant features in search, the co-occurrence of both task-irrelevant and task-relevant information influenced performance. Specifically, the performance advantage for consecutive trials containing the same target and same irrelevant feature (e.g., bag type) exceeded the summed benefit of a repeated target or repeated bag individually. The results suggest that binding may be a natural consequence of visual processing that is strengthened by, but not reliant on, relevance. This research may also provide insights into existing debates surrounding associative blocking; suggesting that attentional selection is nonessential for associative binding. In sum, these results suggest that implicit learning, even of associations, can profoundly shape behavior without conscious awareness or attention.

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RESEARCH SHOWCASE

SOCIAL SCIENCES

COLUMBIAN COLLEGE OF ARTS AND SCIENCES

Natural Hazards and Informal Road Networks North of Lake Baikal

Throughout large parts of Siberia formal roads are rare and many communities depend on informal road networks to connect with others, access traditional subsistence resources, and other cultural sites. Within the area surrounding the Lake Baikal region, Indigenous Evenk populations and communities utilize an expansive informal road network including abandoned roads, access roads, hunting trails and other paths not recognized or maintained by the government. Lack of regular maintenance increases these roads' vulnerability to a variety of natural hazards such as subsidence, mudslides, and washouts threatening safe long-term use of this road network. These challenges are amplified in areas of mountainous topography, seismic activity, and permafrost subject to climatic variability. This study presents a hazard assessment of informal roads in a study area surrounding the city of Severobaikalsk in the Baikal Mountains. Over 350 km of informal roads were identified and digitized via satellite images within the study area. Relevant hazards were chosen based on hazards observed, or expressed as concerning, by community members in interviews gathered within the Informal Roads project. These hazards were then accounted for and combined using GIS software to identify areas of the road network most at risk. Climate trends and projections were analyzed using the IPCC CMIP6 model. Initial results indicate that 36% of roads intersect high risk zones. Maps and accompanying data will be shared with the community. By incorporating GIS tools with local and Indigenous knowledge, this hazard assessment provides a more holistic understanding of risks present in this region.

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Board Diversity, Diversity, Equity, and Inclusion Communication, and Financial Performance of Top 500 US Companies

Diversity, equity, and inclusion (DEI) has been commonly researched in organizational contexts, but no research currently exists on firms' messaging about DEI or its impact on financial outcomes. The question is whether DEI communication has a notable impact on organizational performance. Using messages from a sample of Fortune 500 corporate websites, as well as financial data and photographs of their boards of directors, this study explored the relationships between different kinds of DEI messaging, board diversity, and financial performance in organizations. For this study, DEI messaging is categorized as symbolic DEI messaging (mentioning a concern for or commitment to DEI), substantive DEI messaging (describing specific actions directed towards DEI), and performative DEI messaging (the gap between symbolic and substantive DEI messaging). Based on existing research, this study expected to find that organizations with more DEI messaging have higher financial performance via moderated regressions, and that companies with less diverse boards have more performative DEI messaging via a correlation analysis. Results did not support the main hypotheses but a post-hoc analysis found a positive relationship between board diversity and substantive DEI messaging, suggesting that the diversity of board members may influence the quantity and variance of DEI programs within organizations. This paper brings a new perspective to research on diversity in organizations which is important to explore further.

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"Natural but not Neutral: Resources, Poverty, and What the Government Isn't Doing"

The failure of Texas' private electrical grid system during the record-breaking February 2021 winter storm led to the deaths of over 700 people, as well as caused infrastructure destruction that remains unresolved today. Despite regulatory agencies suggesting winterization updates for at least two decades prior, legislative incompetence and loophole schemes created the devastation that induced a prolonged state of emergency that left many without power and heat for weeks after the storm. Similar trends of resource mismanagement have plagued America for most of the 2000s and threaten to spill into international territory. Resource mismanagement in the U.S. is concentrated primarily in low-income and rural areas, where regulatory presence as well as funding are slim (Allaire 2018.) This information, as well as Texas regulators' failure to protect their citizens, are more closely connected than one may think. The lack of federal accountability taken is the overwhelming cause of aforementioned corruption on the local and state level.

By doing this research, I aim to draw concrete connections between a lack of government oversight, and local corruption of resource allocation and management. The purpose of this thesis is to shed light on the responsibility of the government to take accountability for state and local distribution of natural resources. This also creates an argument for the targeting of low-income, rural, and minority communities, which are hit harder by these short-comings (Wescoat 2007.) In order to create constructive policy, the public must be aware of the deliberate lack of action within governments to handle resources and data collection infrastructure properly. Re-framing this inequality as corruption is necessary to provoke action as it poses a more personal affront to citizens and their rights to access safe and equal resources.

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SOCIAL SCIENCES

COLUMBIAN COLLEGE OF ARTS AND SCIENCES

A Case Study on the Benefits of Origami in Art Therapy

Objective: Literature from various fields such as education and occupational therapy have demonstrated that creating origami provides physical, cognitive, emotional, and expressive benefits. However, there is little research and documentation on using origami in art therapy. Thus, this study focused on systematically studying the benefits of creating origami in art therapy sessions.

Methods: A qualitative case study with an adult woman with autism spectrum disorder took place during her regular weekly art therapy sessions. A different origami project was created each session while the art therapy intern made origami alongside her. Themes that related to the benefits from previous literature were extracted from discussions with the participant during and after making each origami piece.

Findings: Initially, the participant was nervous and frustrated with learning how to fold origami, but after a few sessions, she was content with not making perfect folds and appeared to be less frustrated and more confident. The participant also enjoyed being able to decorate her creations. Having the art therapy intern create origami with the artist also promoted socialization and support.

Implications: Some of the benefits from past literature were demonstrated in this study, specifically frustration tolerance and creative expression. Because the social aspect of making origami seemed to help promote the other benefits, making origami in a group setting might be helpful. This study also indicated that creating origami could be beneficial for people who have autism spectrum disorder, especially with some accommodations such as watching someone create folds multiple times and having hands-on support.

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RESEARCH SHOWCASE

SOCIAL SCIENCES

COLUMBIAN COLLEGE OF ARTS AND SCIENCES

Captive Communities: An Examination of the Distribution of Dollar General Stores in Rural and Low-income Communities

Although it is no secret that Dollar General markets itself to low-income communities, recent study suggests there may be a predatory relationship between Dollar General stores and poverty. In 2019, the Institute of Local Self-Reliance conducted a national study of US cities and found that dollar stores often inundate low-income neighborhoods (Donahue and Bonestroo, 2019.) Further study suggests that this inundation can negatively affect these communities through the perpetuation of food deserts and the elimination of jobs through consumer redlining (Woods- Waight et al, 2021, Vargas, 2021.) However, this research has examined dollar stores indiscriminately and focused on more urban areas. Research focusing on the distribution of dollar stores in rural areas is notably lacking, though anecdotal evidence suggests Dollar General stores concentrate in rural areas. Therefore, this study seeks to clarify if rural communities contain a disproportionate number of Dollar General stores. Using county level demographic data from the 2014-2018 American Community Survey via the Census Bureau and Dollar General coordinates from the business data firm SimplyAnalytics, I compare county level population density and median household income with Dollar General distribution across five midwestern states (IL, IN, MI, OH, WI.) Preliminary results suggest independent negative correlations between median household income, population density, and quantity of Dollar General stores, though the interaction between these variables is more nuanced. The implications of these findings clarify what kind of community is most likely to get a Dollar General store and prompt further research on the effects of these stores on the communities they join.

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RESEARCH SHOWCASE

SOCIAL SCIENCES

ELLIOTT SCHOOL OF INTERNATIONAL AFFAIRS

Prosperous FuturesL Major Determinants of Poverty Reduction for Smallholder Farmers in Siem Reap, Cambodia

Across the globe, it has been found that there are strong ties between agricultural sector growth and poverty reduction. Furthermore, many households with the least access to resources and capital in low and middle income countries practice smallholder farming. This study focuses particularly on smallholder farmers in Siem Reap, Cambodia. Over the last several decades, Cambodia has embraced a period of poverty reduction, yet close to a third of the population lives beneath the poverty line or are extremely vulnerable to negative economic shocks. Hence, this study poses the question: what are the key determinants of higher income for smallholder farmers in Siem, Reap Cambodia?

In order to answer the research question, a survey was deployed to Krabei Real commune to collect quantitive data on demographics, education, infrastructure, and agricultural practices. Secondly, long-form qualitative questionnaires were used to gain a deeper understanding of agricultural decision-making with scare resources and to validate quantitative data. Finally, key informant interviews were held virtually with key stakeholders such as researchers, development actors, NGOs, and government officials to gather a contextual understanding of the agro-economic climate in Cambodia and further validate quantitative conclusions. Based on the data and subsequent conclusions, there are several insights for policy makers. Most notably, encouraging vegetable production as opposed to rice production has the potential to reduce poverty for households in Siem Reap. Additionally, agricultural cooperatives can be utilized to improve access to key market information for smallholders and improve access to irrigation that is needed for profitable horticultural cultivation.

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RESEARCH SHOWCASE

SOCIAL SCIENCES

ELLIOTT SCHOOL OF INTERNATIONAL AFFAIRS

Public Art, Public Grief, and Public Stigma : The AIDS Quilt and In America: Remember Compared

In the month of September 2021, 701,133 flags spread across the National Mall in Washington DC to represent the lives lost to COVID-19. Today, the lives lost to COVID-19 total over 950,000 people. The In America: Remember art exhibit is one of the largest participatory exhibitions since the AIDS Quilt in 1987. The research presented in this paper examines the commonalities and differences between the participatory art exhibits of the AIDS Quilt and the In America: Remember installation. In addition to focusing on the participatory aspect of the exhibits, the paper addresses the discrimination and stigma behind both public health crises, analyzing the respective efforts to visualize lives lost to both the epidemic and pandemic. In doing so, it illustrates how public art, like the AIDS Quilt and In America: Remember, seeks to raise knowledge and combat stigma while also giving surviving family and friends an opportunity to grieve collectively.

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RESEARCH SHOWCASE

SOCIAL SCIENCES

ELLIOTT SCHOOL OF INTERNATIONAL AFFAIRS

Transit-Oriented Development in the D.C. Area: How Demographic and Built Environment Factors Affect Local Rail Station Ridership

Transit-oriented development (TOD) is an urban form that typically includes a mix of commercial, residential, office, and entertainment spaces anchored by a central transit station. TOD leverages both public transit accessibility and dense concentrations of housing, businesses, and amenities to reduce automobile trips and its associated negative environmental effects as well as promote neighborhood growth, vitality, and investment. TOD is a notable departure from long-standing trends in U.S. urban planning that have emphasized single-use zoning regulations and automobile usage.

Previous research shows that, in general, transit ridership increases with TOD. The amount ridership increases, however, is subject to high variation, and the specific factors that are most highly influential on transit ridership in TOD areas remain unclear. This project addresses this question by analyzing the impact of many physical and demographic factors on rail ridership in areas surrounding Washington Metropolitan Area Transit Authority (WMATA) Metrorail stations.

Demographic data was collected from the U.S. Census Bureau's 2014-2019 American Community Survey and physical data was obtained from Walk Score, a company which provides proprietary data on walkability characteristics. All data was processed and aggregated in geographic information systems software and a variety of regressions were conducted to examine the relationship between this data and WMATA Metrorail ridership. Additional analysis focused on comparing station areas that meet a predetermined definition of TOD and those that do not.

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SOCIAL SCIENCES

GRADUATE SCHOOL OF EDUCATION AND HUMAN DEVELOPMENT

Applied Organizational Theories in United States Government Organizations

This paper seeks to examine the application of organizational theories to include organizational learning and knowledge transfer in the context of United States Government organizations. The newly created law to ensure evidence-based research or statistical data in U.S. Government policymaking represents a lens to understand the application of both theories. In March 2016, congress enacted a commission to understand the data collection process across government to improve processes (U.S. Congress, 2018). The commission made dozens of recommendations on the topics of data access, and evidence building capacity upon completion of the study by September 2017. The success of the commission led to the introduction of the "Foundations for Evidence-Based Policymaking Act", signed into law in 2019 (U.S. Congress, 2018).

Another example of applied organizational theory in U.S Government organizations is the Department of Housing and Urban Development's (HUD) effort to reduce public spending while also preventing the removal of critical safety measures in society. In 2010, HUD conducted a cost-analysis and determined that incentivizing permanent housing reduced the larger cost for managing homeless populations across the United States. In addition to lowering taxes, that evidence-based policy decision yielded a 27 percent reduction in homelessness between 2010 and 2016 (Abraham, 2017).

The application of organizational learning theories in government policy has implications for both researchers and practitioners. For researchers, the example of the example of evidence-based policymaking suggests an attempt to use theory to overcome complex challenges with organizational culture in government (Chatman & Cha, 2003). Strong cultures can create silos, which limits communication across the organization, and supports the need for knowledge transfer theory. However, organizational learning challenges the status quo (Callen, 2016). In the case of HUD, functional relationships between researchers and decision-makers aided effective policymaking (Lugo-Gil, 2019). Ultimately, the application of organizational theories such as knowledge transfer were likely applied to increase understanding of policy problems across the organization (Gaglardi, 1990).

For practitioners, applying organizational learning theories to government organizations will aid understanding of the devolvement of organization processes and behavioral patterns. The process of knowledge transfer requires reflection on individual assumptions and expectations in the context of decision-making and inference in organizations (Mezirov, 2000). The policymaking process represents a practical (and critical) method for examining the application of organizational theories in Government organizations.

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GRADUATE SCHOOL OF EDUCATION AND HUMAN DEVELOPMENT

The Experiences of Disabled Supervisees and the Enactment of a Disability-Affirmative Supervision Environment

Disability is an overlooked topic in counselor education and supervision. Most counselors and supervisors do not receive much education or training in disability outside of rehabilitation counseling and are not prepared to work with disabled clients, nor with disabled peers or supervisees. As a result, disabled supervisees experience disability-related barriers and discrimination in clinical supervision. This literature review begins with an understanding of supervision and disability; the status of disability in counselor education; the challenges that disabled supervisees face, including ableism, stigma, perceived competence of disabled counselors and supervisees, and other physical and social barriers; literature assessing the current state of disability competence in counselor education, including that of students, instructors and supervisors; concluding with the recognition of a documented gap in supervisor disability cultural competence; the application of a culturally responsive, disability-affirmative approach to the supervisory environment, rooted in socially just precepts; and a discussion of these findings and their implications.

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RESEARCH SHOWCASE

SOCIAL SCIENCES

GRADUATE SCHOOL OF EDUCATION AND HUMAN DEVELOPMENT

The Mediating Effect of Coping Styles Between Perceived Fear of Infection and Health Behaviors in the Context of the 2015 MERS-CoV Outbreak in South Korea

This study examines coping styles (empathic responding, social support seeking, wishful thinking) as a mediator between perceived fear of the MERS threat and health behaviors in a sample of 450 adults over the age of 29 during the 2015 MERS outbreak in South Korea. The results of this study showed correlation between all the variables including perceived fear, coping styles and MERS-related health behaviors (avoiding public places, avoiding people, and taking effective health precautions). Mediation analysis revealed that empathic responding and social support seeking fully mediated links between perceived fear and taking effective health precautions. Social support seeking also partially mediated the relationship between perceived fear and avoiding people. Wishful thinking partially mediated the relationship between perceived fear and all three health behaviors. These results support the importance of empathy, as it allows the engager to look upon other people not as objects to be avoided or as potential virus carriers, but as human beings who require care and protection. Implications are discussed in light of the current worldwide COVID-19 pandemic.

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RESEARCH SHOWCASE

SOCIAL SCIENCES

GRADUATE SCHOOL OF EDUCATION AND HUMAN DEVELOPMENT

Employee Green Behavior in Higher Education: A Systematic Literature review

Sustainability research in higher education guides a wide range of sustainability initiatives, this systematic literature review seeks to examine an emerging body of knowledge on employee green behavior in higher education institutions (HEIs). Employees (faculty, staff, and administrators) form the foundation of higher education processes making them a valuable site of investigation for employee green behaviors. The review begins with a thorough search of applicable databases using a combination of various search terms. By reading the titles and abstracts of over 500+ articles, a criterion was developed to ensure that articles fit the purpose of the literature review. Through this process, 46 articles were selected for further review. Using a staged approach (starting with abstracts and then moving to a deeper read), the articles were analyzed and organized into a conceptual model to visualize the themes that exist between articles. In this ongoing research project, preliminary themes are focused on two distinct areas of thought: 1) Research that discusses in-role (required) and extra-role (above required) green behavior in HEIs and 2) Research that discusses the internal and external factors that affect employee green behavior. Internal factors are further broken down to include a discussion of norms, values, attitudes, knowledge, motivations, and intentions whereas external factors include a discussion of policies, procedures, management practices and leadership that has been studied in relation to employee green behavior. Upon analysis of these themes, it can be said that behavior change is a complex and dynamic process that is influenced heavily by the given context. The findings of this literature review provide both practitioners and scholars with a comprehensive overview of the research that has occurred on employee green behaviors in the context of HEIs. In doing so, this paper can be used as a tool by various stakeholders to inform future research and practice including the development of sustainability initiatives and research studies.

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SOCIAL SCIENCES

GRADUATE SCHOOL OF EDUCATION AND HUMAN DEVELOPMENT

Women Leadership in Central Eurasia: Implications for HRD in Azerbaijan

While women's participation in the workforce has increased, and women have begun to exceed men in higher education, women are still underrepresented in leadership positions in many countries around the world (European Commission, 2019). In Azerbaijan, although the participation of women in the workforce reached 48% (State Statistics Committee of Azerbaijan Republic, 2018), leadership positions are mostly held by men. The United Nations Population Fund (UNFPA) (2018) study revealed that in Azerbaijan there is a need for a significant shift in social norms to address disparities in gender representation in leadership. According to Ismail and Ford (2010), there is a dearth of leadership studies conducted in Central Eurasia. The review of the literature in the past ten years since Ismail's and Ford's (2010) literature review study showed little evidence of leadership studies conducted in Central Eurasian countries.

The purpose of this literature review study is to understand women's leadership in Central Eurasia in order to derive implications for the role of human resource development in supporting women leadership in Azerbaijan. To accomplish the purpose, a literature search was conducted using Cseh's (2020) guidelines. The initial search included the combination of the search terms: leader or leadership or "leadership development" AND woman or women or female or females AND Azerbaijan or Kyrgyzstan or Kazakhstan or Turkmenistan or Tajikistan or Uzbekistan or Armenia or Georgia in the titles, abstracts, and keywords of the sources provided by Gelman Library. The literature review also included international reports, gender assessments, and country reports about Azerbaijan prepared by international organizations.

The search yielded 52 articles and 16 international reports. Following the selection of the 44 abstracts, we read each article, and despite the rigorous selection of the abstracts, we still found 9 articles that were irrelevant to our study (e.g., some of the authors described "the political leadership after the collapse of the Soviet Union. Themes that emerged from the analysis of these articles and their implications for Human Resource Development will be presented in the final paper.

The findings of this literature review will be significant for the leadership journeys of women who are leaders or aspire to become leaders in Azerbaijan as well as for organizations that are looking to develop structures, policies, and processes to support women's leadership. The study will also inform the work of Human Resource Development professionals in organizations to support women's leadership development in Azerbaijan.

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SOCIAL SCIENCES

GRADUATE SCHOOL OF EDUCATION AND HUMAN DEVELOPMENT

Leader Identity Development: Experiences of Women Leaders in Corporate Law Firms

There is a growing scholarly inquiry focusing on leader identity development. However, so far leader identity research has evolved largely as gender-neutral and there are no studies on leader identity development in the legal profession. Women are consistently underrepresented in leadership positions are corporate law firms. The purpose of this basic interpretive qualitative study was to understand how, despite all structural and organizational barriers, women were developing their leader identity in corporate law firms. The study looked at women lawyers' leader identity development using integrative theory of leader development and role congruity theory. A basic qualitative methodology was chosen for this study. 21 participants representing women leaders in governance committees of 50 top U.S. law firms were interviewed. The study found that leader identity development is a lifelong process occurring through challenging professional experiences, and reflecting on and learning from these experiences. Role models, informal mentors, and organizational environment of masculine-gendered law firms were found to influence women lawyers' leader identity development. The findings provide a general direction for aspiring women leaders in law firms to intentionally seek developmental leadership experiences and the help of role models who would provide access to challenging professional experiences and offer guidance and assistance in learning the ropes of leadership. Corporate law firms' management should look critically at their organizational environment and implement changes conducive to women leader identity development. The study findings contribute to the nascent scholarly conversation on women leader identity development and scholarship focused on professional services firms. Further research should focus on other organizational environments and, as women are not a monolith, on their diversity.

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RESEARCH SHOWCASE

SOCIAL SCIENCES

SCHOOL OF BUSINESS

Social Algorithms & Ideological Polarization: The need for Algorithmic Shades

Whistleblower Frances Haugen argued that a byproduct of Facebook's content amplification model is ideological polarization. She claimed this was due to an organizational divide, where monetization and moderation practices cancel each other out. Our research focused on bridging that divide in order to lower the amplification of misinformative and hatefully divisive content.

We first leveled the inequality between the amplification and moderation metrics, and acknowledged the limitations of data extraction technologies. Based on that, we then identified the circumstantial factors leading to unrecognized ideological homogenization.

We defined the differences between information privacy laws and the role data structuring has on amplification moderation. While the invasive behavioral data collected is what leads to biases, they are also what maintain its safety systems.

We recommend a paradigm shift towards partisan preferences on the role of media, Fiduciary (L) Venue (R). Our bipartisan consensus suggests a representative informative environment, and a moderation system based on consensual exposure.

Our solution, Algorithmic Shades, is the only moderation model with the ability to ethically increase behavioral data, making more profit by regulating the platform. It wishes to provide users more control over surrendered data while not compromising on the individual liberties of privacy, speech, and safety. By giving the user more direct control of the maneuverability of data structuring, they are able to break away from ideology perpetuated by the algorithms.

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RESEARCH SHOWCASE

SOCIAL SCIENCES

SCHOOL OF MEDIA & PUBLIC AFFAIRS

Unusual Suspects: The Growing Prominence of Trans-Exclusionary Feminism in Anti-Trans Politics in the United Kingdom and United States

Recent years have seen new heights in anti-trans sentiment with trans identity and bodies being increasingly surveilled in social life and legislation. While the pathologizing of trans identity is being driven by the usual suspects (those with a largely conservative and/or Christian ideological slant), a social movement of unusual suspects is gaining prominence in anti-trans politics, as well: trans-exclusionary feminists. With historical roots in second-wave feminism, trans-exclusionary feminists—also known as gender critical, trans-exclusionary radical, lesbian radical, or simply radical feminists—have long disparaged, undermined, and dismissed the identities of trans people, and trans women more specifically, through a rigid reading of the sex/gender binary and an essentialized understanding of "authentic" womanhood. Now, as trans rights have become the new frontier of the culture wars, trans-exclusionary feminism is gaining prominence in broader anti-trans advocacy movements. Despite this trend, limited research has investigated the extent to which trans-exclusionary feminism has infiltrated the larger anti-trans advocacy landscape and their relationship to organizational politics. This study conducts a comparative analysis of 20 anti-trans advocacy organizations across the United Kingdom and United States to analyze the role of trans-exclusionary feminism in the larger anti-trans advocacy landscapes. Results indicate that trans-exclusionary feminist organizations dominate anti-trans advocacy in the United Kingdom but play a more supportive—though still essential—role in the United States. Furthermore, trans-exclusionary feminist ideology and rhetoric is increasingly utilized by conservative and/or Christian organizations. These findings have implications on the neoliberalization of feminism and other liberatory movements, the enfranchisement of fringe ideologies in mainstream politics, and the rise of right-wing ideology and fascist tendencies in liberal democracies.

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SOCIAL SCIENCES

SCHOOL OF MEDIA & PUBLIC AFFAIRS

The Impact of Media Consumption on Political Knowledge

A thriving, “marketplace of ideas,” is critical to maintain a healthy democracy. Unfortunately, this marketplace has become increasingly imperiled in the United States as leading politicians and media figures spread disinformation to advance their preferred narrative at the expense of their own integrity and the truth itself. In recent years, we have seen the consequences of this trend, as the proliferation of disinformation across an increasingly diversified media landscape has sharpened divisions within the American electorate. Debates over policy often devolve into accusations of "fake news" and disagreements over what separates fact from fiction. This study investigates this phenomenon by analyzing how Americans' political knowledge varies by their media consumption habits. Political knowledge is measured based upon survey questions asked on the ANES 2020 Social Media Study and November 2019 Pew Research Center's American Trends Panel survey. This study's findings seek to explain what relationship exists-- if any-- between these two categories and identify what parties share an outsized role in deceiving their audience by propagating false information on their platforms. I expect to find that media consumers who primarily receive news from right-leaning outlets and social media will demonstrate lower levels of political knowledge than those who do not cite these mediums as their primary source of information.

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RESEARCH SHOWCASE

SOCIAL SCIENCES

SCHOOL OF MEDIA & PUBLIC AFFAIRS

The Politics of "Defund the Police": A Study of the Dispersion of Left-Wing Messaging in 2020's U.S. House Elections

In 2020, as national Democrats celebrated winning control of the presidency and Congress, the party mourned the loss of 14 incumbent House members. These swing-district moderates lost in areas like rural New Mexico, suburban California, and Staten Island, even after treading a fine line on hot-button liberal issues. The newly-ousted members blamed these losses on the proliferation of prominent left-wing activist terminology used in social media discourse, like "Defund the Police," while progressives attested to the political value of this language. In the aftermath of the election, this research uses a content analysis approach through case studies to see if these results were the result of typical election waves, or if Republican efforts to rile up their base and persuade swing voters through portrayals of these terms infiltrated these races. The research uses three forms of such research – Facebook advertisements, local media articles, and campaign materials – to measure the level, tone, and frame of such "Defund the Police" messages. It presents two primary theories, either that "Defund" messaging significantly infiltrated election discourse among these House swing seats, or that normative factors, like election waves, led to such a wave. Given increased polarization, this study measures key factors like cultural conservatism, media framing, the nationalization of party politics, and the impact of campaign advertising and messaging. Through its methodical research, it aims to make a larger assertion on the effects of fear-based campaigning, the realities of mainstream media narratives, and how political concepts infiltrate (or fail to infilitrate) rural, suburban, and urban communities across the U.S.

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RESEARCH SHOWCASE

SOCIAL SCIENCES

SCHOOL OF MEDIA & PUBLIC AFFAIRS

Principles or Partisans? An Analysis of Media Coverage of Redistricting

Decennial congressional and state redistricting profoundly affects representation and political control in the United States. A recent push for independent redistricting commissions to control the redrawing of legislative districts led to additional states adopting these commissions during the most recent redistricting cycle. Some argue independent commissions create more competitive districts and limit partisan gerrymandering, while others question their ability to move completely beyond politics. In the wake of some failed attempts at establishing truly independent commissions through referendums or partisan loopholes, some advocates question how best to implement new commissions and encourage public support for independent redistricting. This study focuses on these public perceptions of redistricting, attempting instead to understand how individuals come to view redistricting by examining media coverage of the process. It seeks to understand how the public perceives independent versus partisan redistricting processes, using state and national media coverage to understand the messages that inform public opinion. Specifically, this analysis will focus on whether coverage of the process is systematically different in those states with independent redistricting commissions and those states in which the process is controlled by the legislature. Using content analysis of available media coverage of the redistricting process from eight states (four which use an independent commission and four which use partisan redistricting), this study analyzes the presence of six major media frames—race, judiciary, game-frames, institutional process, population metrics, and fair representation. The data analysis will look for differences between state and national media sources, as well as differences between states with independent commissions and political processes. It is the expectation of the author that national coverage will focus more on partisan game-frames, race, and the judiciary than state-specific coverage and that states with independent commissions will experience fewer partisan game-frames that those with political processes. These results will help establish greater understanding about media coverage of redistricting for political communication strategists, policymakers, and advocates as well as set the stage for redistricting reforms before the 2030 cycle.

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RESEARCH SHOWCASE

SOCIAL SCIENCES

TRACHTENBERG SCHOOL OF PUBLIC POLICY AND PUBLIC ADMINISTRATION

The Semiotics of Urban Redevelopment: The Policy Agenda of Public Murals in Historically Black Neighborhoods in Washington, D.C.

Historically Black neighborhoods in Washington, D.C. have been the sites of urban resurgence in the 21st century and often feature a high concentration of art for public consumption. The D.C. government has a stated policy agenda of funding public murals to promote neighborhood beautification; however, the significance of the mural's themes to the policy goals of the City's political economy has gone largely unexplored. This paper utilizes a semiotic approach to examine the significance of the signs and symbols in the public murals as a policy mechanism for the D.C. Government to address the tensions with racial inequity in urban redevelopment. Data collection was completed by visiting three spaces with a high concentration of public murals in historically Black neighborhoods and cataloging their characteristics. The results demonstrate that while there are strong demographic trends, primarily the representation of Black subjects, the semiotic policy goals of the murals differed between the spaces in relation to the nature of private urban redevelopment in each place.

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RESEARCH SHOWCASE

SOCIAL SCIENCES

TRACHTENBERG SCHOOL OF PUBLIC POLICY AND PUBLIC ADMINISTRATION

Living Like We're Dead: Existential Anxiety, Climate Change Perceptions, and Pro-Environmental Behavior.

Terror Management Theory (TMT) describes the internal and observed psychological defense mechanisms utilized to cope with Mortality Salience(MS), or humanities' ability to acknowledge the certainty of our future death.

The cognitive suppression of MS occurs through the amplification of an individual's cultural worldview to validate the conceptualization of self and our unique contributions to the greater social and cultural structures we subscribe to. The subconscious sequence, known as the Dual Defense Model, increases self-esteem by assuring an induvial's significance and substantiating one's figurative and literal legacies that fulfill social and cultural standards.

The existing literary body observes subconscious death anxiety to increase one's desire to obtain and purchase resource-intensive, status striving material goods and increases one's willingness to view humanity as an isolated entity from the natural world. This paper wishes to review these branches of the TMT literature and propose a 2-part study to evaluate the significance of TMT's defense mechanisms in the context of human perceptions and behavioral responses to climate change, a crisis simultaneously threatening humanity's survival and the consumer-centric values of western culture.

The proposed model utilizes a widely aired Energy Transfer commercial titled "Life Runs on…Oil and Natural Gas," presenting the integration of renewable energy as a threat to the existence of material products with fossil-fuel-dependent supply chains. In doing so, this paper aims to examine the potential applications of TMT in the formation of communication strategies and outreach efforts seeking to increase rates of sustainable consumption, support for climate change mitigation policies, and other derivatives of environmental behavior.

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RESEARCH SHOWCASE

WOMEN/CHILD HEALTH

DUAL PA/MPH PROGRAM

Addressing FGM/C Knowledge in Law Enforcement and Child Protective Services in the DMV

Female genital mutilation and cutting (FGM/C) affects woman and girls on a national and global scale. The World Health Organization defines FGM/C as the removal of the external female genitalia partially, or in full without medical indication. High instances of stigma and taboo surrounding the topic of FGM/C keep women and girls from speaking about their experience, disclose their status or seek out help. The goal of this project is to create resources for the prevention and treatment of FGM/C among key interested parties. Qualitative techniques were used to assess the perceived role of each potential key interested party in the prevention of FGM/C, evaluate the most effective methods of engaging them in the prevention of FGM/C, and creating targeted webinar trainings and continued web development for the GWU FGM/C toolkit (www.fgmtoolkit.gwu.edu). This presentation will present the findings from key informant interviews conducted with law enforcement or child protective service representatives located in the Washington DC Metropolitan Area (DMV). Guided thematic analyses were conducted using Dedoose software and findings indicate local law enforcement and child protective service agents in the DMV area would benefit from additional education and training regarding FGM/C in their communities. In addition, key informants discussed needing greater awareness of state laws regarding FGM/C. These key informants further expressed a need for resource lists that include local organizations, hotlines, and other supportive resources for their own use and to provide to the community. The information gained from this project will aid to improve community knowledge and develop engagement in the secondary prevention of FGM/C for women and girls in the DMV.

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RESEARCH SHOWCASE

WOMEN/CHILD HEALTH

MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

Program to Educate and Empower Preteens (PEEPs): Reducing Maternal Mortality in Girls in Birnin, Kebbi, Nigeria

Maternal mortality is a critical public health issue impacting girls and women around the world, especially in low-income countries; 95% of maternal mortalities occur in these countries, and Nigeria ranks highest with 814 deaths per 100,000 live births. In Kebbi, Nigeria, girls are especially at increased risk of severe complications and death during pregnancy; lack of autonomy, high rates of child marriage, and underutilization of science-based health services for prenatal care contribute to the increased incidence of maternal mortality in girls aged 10-14 in Birnin.

PEEPS, the Program to Educate and Empower Preteens, was developed using the framework for the Sista2Sista program; this initiative focuses on communication skill development, knowledge attainment, and bolstering self-confidence in Nigerian girls. PEEPs takes this framework but addresses the content to both girls and their mothers to expand its circle of influence. The intervention is a skill-building program to be delivered at the Girls and Women's Power Initiative (NANA) in Birnin; it focuses on empowering girls and mothers to gain knowledge on sexual health, enhance autonomy to seek evidence-based health care, and promote self-efficacy for daughters to make informed decisions and mothers to safeguard their daughters. PEEPs delivers weekly communication exercises and activities focused on club culture, reproductive health, and social, financial, and self-awareness.

The program incorporates three behavioral theories: Social Support Theory, Theory of Planned Behavior, and Diffusion of Innovations Theory. To effectively deliver curriculum and aid in the development of skills, PEEPs is delivered in four phases: Staff Recruitment, Participant Recruitment, Implementation, and Evaluation. Staff is made up of the following: program manager, assistant program manager, adult and young adult mentor, educational and evaluation consultant, and community health workers. Consciously developed to be both cost effective and resource efficient, the total intervention budget comes to $53,856 over five years.

To ensure quality assurance and program fidelity, a number of evaluation questions were developed; to assess these questions and identify trends, surveys, group interviews, and mortality data will be collected and analyzed over a period of three years following implementation. Results will be disseminated to the public for future research and improved interventions.

Women's equality around the world still suffers greatly and has a significant impact on maternal health. PEEPs targets the empowerment of girls and their mothers through mentorship and education addressing their sexual health, with the ultimate goal of delaying young pregnancies and reducing maternal mortality in Kebbi, Nigeria.

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RESEARCH SHOWCASE

WOMEN/CHILD HEALTH

MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

Deconstructing History: Understanding the Legacy of Black Girls' and Women's Sexual & Reproductive Health

The purpose of this investigation is to explore the relationship between the history of racism and the occurrence of poor reproductive health outcomes experienced by Black girls and women in the United States. By situating slavery, the Jim Crow Era, the Civil Rights Movement, and the Post-Civil Rights Era within the context of Black girls' and women's sexual health, this literature review will interrogate how racism in the United States contributes to sexual and reproductive health inequalities. Ultimately, this paper will outline a hypothetical Black Feminist/Womanist intervention, See. Speak. Share., that can be applied in the health care setting to combat racism against Black girls and women. This research is critical to public health and the future of Black girls' and women's health. Understanding colonialism and white supremacy in the United States is fundamental to deconstructing racist healthcare practices, thus bringing health equity to Black girls and women.

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RESEARCH SHOWCASE

WOMEN/CHILD HEALTH

MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

Explanatory Pathways of Female Genital Mutilation/Cutting among Women with Daughters in Kenya: The Modifying Effect of Law

Background: Female genital mutilation/cutting (FGM/C) is a human rights violation and form of violence perpetrated against women and girls. Currently, there is limited research on the explanatory pathways by which FGM/C occurs among girls. In particular, it is unclear how national anti-FGM/C laws affect those mechanisms. Kenya has enacted a comprehensive national anti-FGM/C law and was used in this study to assess the explanatory pathways for FGM/C among daughters before and after the law.

Methods: Kenya Demographic and Health Surveys from 2008-9 and 2014 were used to test whether household decision-making, regular media exposure, belief that FGM/C is a religious requirement (FGM/C belief), and women's FGM/C status influenced whether a woman had any daughters that had FGM/C (daughters' FGM/C). Attitude on the continuation of FGM/C (FGM/C attitude) was included and tested as a mediator in each pathway. A subsequent model was fit to determine whether the anti-FGM/C law had a modifying effect on any of the explanatory pathways.

Results: FGM/C attitude significantly mediated the relationship between FGM/C belief and daughters' FGM/C. It also mediated the relationship between woman's FGM/C status and daughters' FGM/C. The effects of FGM/C belief and woman's FGM/C status remained significant even when stratified by law context. Regular media exposure had significant effects on daughters' FGM/C status post-law. The results supported the anti-FGM/C law's modifying effect on woman's FGM/C status and regular media exposure pre- to post-law with media as more salient, while women's FGM/C status was less salient to daughters' FGM/C.

Conclusions: Shifting harmful beliefs regarding religion and FGM/C, focusing on women who have experienced FGM/C, and using media to promote anti-FGM/C attitudes are essential to prevention efforts and interventions. Additionally, as Kenya's comprehensive national law appears to support change on FGM/C pathways, other countries should consider stronger legislation as a key avenue to enhance anti-FGM/C efforts.

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RESEARCH SHOWCASE

WOMEN/CHILD HEALTH

MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

Masked Maltreatment: A Study of Child Abuse Reporting in Berks County, Pennsylvania During COVID-19

Overview: This study is a quantitative and qualitative examination of child abuse reporting in Berks County during the COVID-19 pandemic.

Methods: This study categorized child abuse as the neglect, drug-related maltreatment, or physical, mental, or sexual abuse of a person under the age of 18. All of the data utilized was specific to Berks County, Pennsylvania. A preliminary analysis was conducted on child abuse reports made by Tower Health Reading Hospital employees, abuse statistics from Berks County Children Services, child fatality and near fatality cases from the PA Department of Human Services, and expert testimonies from Berks County child service experts. Additional observations were made using COVID-19 statistics and county unemployment rates from the Covid Act Now Coalition and PA Department of Labor & Industry.

Results: This study found conservative decreases in medical child abuse reports which coincided with an increase in home visits from public school officials, and a steep decline in child abuse cases overseen by the Berks County Detectives Office. Conservative increases in mental abuse, drug-related maltreatment, and general concerns were documented in 2020 with additional increases in sexual abuse and neglect during 2021. An increased male to female victim ratio was also observed. Child fatality and near fatality cases also appeared to increase during 2020. A potential negative association was found between medical child abuse reports and the Berks County unemployment rate, however there was no clear correlation between child abuse reports and COVID-19 cases. Expert testimonies posit the extent of COVID-19's effects on child abuse will be more visible as more victims come forward within the coming years. These findings, paired with a steady rise in alleged child abuse incidents in 2021, prompt the need for further research on the effects of the COVID-19 pandemic on child abuse reporting.

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RESEARCH SHOWCASE

WOMEN/CHILD HEALTH

MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

Women's Empowerment and Contraception Use in The Gambia

The purpose of this study was to investigate whether women's self-perceived empowerment was associated with contraceptive use and unmet contraceptive need using the 2019-2020 Gambia Demographic and Health Survey. A high prevalence of unmet contraceptive needs contributes to an unmet need for family planning, in turn family planning is important for preventing unintended pregnancies, unsafe abortions, and reducing pregnancy risks. The results of our study indicate that 45% of unmarried sexually active women of reproductive age and 24% of married women have an unmet need for family planning. Despite the increase in the use of modern contraceptives, The Gambia in comparison to other sub-Saharan African countries has one of the lowest contraceptive prevalence rates. Age, level of education, and marital status were statistically significant and were positively associated with contraceptive use. Marital status (β= 1.381, OR=.105, 95% CI 3.238 to 4.884) had a strong positive association with contraceptive use. Marital status (β=2.545, OR=12.746, 95% CI 10.027 to 16.204) was the only statistically significant variable and strongly increased the odds of women having an unmet contraceptive need. The results of the study indicate that women perceived empowerment indicators (acceptance of wife-beating, participation in decision making, and female genital mutilation), when adjusted in the regression analysis, were not statistically significant for contraceptive use or unmet contraceptive need. Sociodemographic characteristics (age, level of education, and marital status) were statistically significant and had a greater impact on both contraceptive use and unmet contraceptive need than women's empowerment indicators. Therefore, programs to meet contraceptive need need to move beyond the clinic setting and focus on addressing social determinants of health to improve contraceptive use and reduce unmet contraceptive needs.

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RESEARCH SHOWCASE

WOMEN/CHILD HEALTH

MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

Responsive feeding for preterm and low birthweight infants: a systematic review and meta-analysis

Context: Responsive feeding may improve health outcomes in preterm and low birth weight (LBW) infants

Objective: To assess effects of responsive compared to scheduled feeding in preterm and LBW infants.

Study selection: Randomized trials were screened. Primary outcomes were mortality, morbidity, growth, neurodevelopment. Secondary outcomes were feed intolerance and duration of hospitalization.

Data Extraction: Data were extracted and pooled with random-effects models.

Results: Eleven eligible studies were identified, and data from eight RCTs with 455 participants were pooled in the meta-analyses. At discharge the mean difference in body weight between the intervention (responsive feeding) and comparison (scheduled feeding) was -2.80 g/day (95% CI -3.39 to -2.22, I2=0%, low certainty evidence, 4 trials, 213 participants); -0.99 g/kg/day (95% CI -2.45 to 0.46, I2=74%, very low certainty evidence, 5 trials, 372 participants); -22.21 g (95% CI -130.63 to 86.21, I2=41%, low certainty evidence, 3 trials, 183 participants). The mean difference in duration of hospitalization was -1.42 days (95% CI -5.43 to 2.59, I2=88%, very low certainty evidence, 5 trials, 342 participants). There were no trials assessing other growth outcomes (e.g. length, head circumference) mortality, morbidity or neurodevelopment.

Limitations: High risk of bias, heterogeneity, and small sample size in included studies.

Conclusion: Overall, responsive feeding may decrease in-hospital weight gain. Although the evidence is very uncertain, responsive feeding may slightly decrease the duration of hospitalization. Evidence was insufficient to understand the effects of responsive compared to scheduled feeding on mortality, morbidity, linear growth and neurodevelopmental outcomes in preterm and LBW infants.

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RESEARCH SHOWCASE

WOMEN/CHILD HEALTH

MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

Analysis of Pregnant People's Perceptions of Their Ideal Weight Gain During Pregnancy and Their Healthcare Provider's Communication of the IOM Weight Gain Recommendations

Background. While official guidelines from the Institute of Medicine (IOM) on pregnancy weight gain exist, many people's perceptions of pregnancy weight vary depending on racial and cultural factors. Variations of perceptions and agreeance with the IOM guidelines show persistent lack of communication between the provider and the patient, and a need for cultural awareness. Provider-patient counseling on weight loss, weight gain, and physical activity guidelines is severely lacking, with only one-quarter of patients who receive adequate counseling actively trying to gain appropriate weight for pregnancy. Common reasons that providers avoid weight counseling include insufficient training, sensitivity of the topic, and feeling that weight counseling is not effective. While excess weight gain is persistent in the US and has numerous negative birth outcomes, insufficient weight gain and eating disordered behaviors triggered by pregnancy are also associated with negative birth outcomes.

Purpose. To investigate the association between provider communication of weight goals and women's success of adhering to the IOM pregnancy weight gain guidelines.

Methods. Data for this study was collected using surveys disseminated across the greater Washington, DC area. The survey was advertised to currently pregnant and recently pregnant people at several obstetric clinics, the labor and delivery unit of the George Washington University, as well as various Facebook groups with large audiences of pregnant people. The survey was designed by a team of researchers at the Milken Institute School of Public Health to investigate pregnant people's perceptions of healthy weight gain and exercise behavior during pregnancy, as well as prevalence of patient-provider counseling. Items in the survey were drawn from the ACOG guidelines for weight gain during pregnancy, the Sleep Scale from the Medical Outcomes Study, and the Perceived Stress Scale, among others.

Results. Data collection and analysis is ongoing in part with a team of graduate students completing their Culminating Experience. Anticipated results will be available to present during research day.

Conclusion. It is anticipated that the results will show an association between provider counseling and likelihood of success in adhering to the IOM pregnancy weight gain guidelines. Results will be discussed, suggestions for future research will be made, and associations may be extrapolated to the national population of pregnant people.

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RESEARCH SHOWCASE

WOMEN/CHILD HEALTH

MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

Fast feed advancement for preterm and low birthweight infants: a systematic review and meta-analysis

Background: Fast feed advancement may reduce hospital stay and infection but may increase the risk of necrotizing enterocolitis in preterm and low birthweight infants. Given the potential benefits and risks of fast feed advancement, the optimal rate of feed advancement remains unclear in clinical practice.

Methods: We searched databases including Medline, Scopus, Web of Science, CINAHL, and Index Medicus to identify randomized controlled trials that compared the effects of fast (≥30ml/kg/day) versus slow feed advancement (<30ml/kg/day) on mortality, morbidity, growth, and neurodevelopmental outcomes in preterm and low birthweight infants. We systematically extracted data from eligible studies and pooled the relative risks or mean differences comparing fast versus slow feeding advancement using Dersimonian and Laird random-effects model. We assessed the risk of bias using Cochrane's Risk of Bias 2 tool and summarized the overall quality of the evidence using the Grading of Recommendations, Assessment, Development and Evaluations (GRADE) method.

Results: A total of 12 RCTs with 4291 participants were included. At discharge, there was moderate certainty evidence that fast advancement likely slightly reduces the risk of: mortality (relative risk [RR] 0.93, 95% confidence interval [95% CI] 0.73 to 1.18, I2=18%, 11 trials, 4132 participants); necrotizing enterocolitis (RR 0.89, 95% CI 0.68 to 1.15, I2=0%, 12 trials, 4291 participants); sepsis (RR 0.92, 95% CI 0.83 to 1.03, I2=0%, 9 trials, 3648 participants); and feed intolerance (RR 0.92, 95% CI 0.77 to 1.10, I2=0%, 8 trials, 1114 participants). Fast feed advancement may also reduce the risk of apnea (RR 0.72, 95% CI 0.47 to 1.12, I2=0%, low certainty, 2 trials, 153 participants). Fast feed advancement decreases time to regain birthweight (mean difference [MD] -3.69 days, 95% CI -4.44 to -2.95, I2= 70%, high certainty, 6 trials, 993 participants,) and likely reduces the duration of hospitalization (MD -3.08 days, 95% CI -4.34 to -1.81, I2=77%, moderate certainty, 7 trials, 3864 participants). However, there may be a slightly increased risk of neurodevelopmental disability at 24 months corrected age (RR 1.12, 95% CI 0.98 to 1.27, I2=NA, low certainty, 1 trial, 2325 participants).

Conclusion: Fast feed advancement reduces time to regain birthweight and likely reduces the length of hospital stay; it also likely reduces the risk of neonatal morbidity and mortality slightly. However, it may increase the risk of neurodevelopmental disability slightly. More studies are needed to understand the long-term effects of fast feed advancement.

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RESEARCH SHOWCASE

WOMEN/CHILD HEALTH

SCHOOL OF MEDICINE AND HEALTH SCIENCES

Knowledge, Attitude, and Beliefs of Medication Use in Pregnancy in an Urban Tertiary Care Center

Introduction: Medication use in pregnancy is common. However, there is a gap in the literature assessing the knowledge of pregnant persons on medication use in pregnancy. The aim of our study is to assess the knowledge, attitudes and beliefs of pregnant people on medication use in pregnancy.

Methods: We conducted a cross-sectional survey questionnaire that was completed by pregnant patients from December 2021 till January 2022.

Results: 150 participants completed the survey. 52.7% of patients reported that a person should know that medication use for chronic diseases must be modified in pregnancy and 70.7% reported that medications can be used in any trimester in pregnancy. 55.3% reported that medication use can lead to fetal growth restriction, while 48.7% reported bleeding as the most common adverse event for the pregnant patient. 81.3% of patients reported that they would not take medications not prescribed by a physician citing risk of for the pregnant person (43.3%), waiting for a medical consultation (45.9%), or fear of side effects (32.0%) as most common reasons. Among patients who reported taking medication not prescribed by physician, most respondents cited pharmacist's advice as the reason (53.0%). The most common cited sources for patient to obtain information about medication use were provider (66.7%), internet (35.3%), and pharmacist (21.3%). About 66% of patients reported reading the "pregnancy and lactation" section of the medical leaflet and rated the utility of the section with an average 5.8 out of 10 where 10 being most useful. Similarly, 66% of patient reported the need for more information about medication use in pregnancy.

Conclusion: Even though medication use in pregnancy is common, it is an area of concern to pregnant patients. More research on identifying risks of different medicines used in pregnancy is thus needed.

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RESEARCH SHOWCASE

WOMEN/CHILD HEALTH

SCHOOL OF MEDICINE AND HEALTH SCIENCES

Penetrating Trauma in Women

Introduction: Penetrating trauma occurs less frequently in women than men. Studies on penetrating injuries are male-oriented. We aim to elucidate the demographics and outcomes of penetrating trauma, particularly GSWs, in women to provide optimal care for this population.

Methods: A six-year retrospective analysis was performed using an urban ACS verified level 1 trauma center registry. Women with penetrating trauma were separated into GSW and non-GSW; and compared to male cohorts to analyze demographics and outcomes. Descriptive statistics were employed as appropriate.

Results: Women suffer fewer GSWs compared to men (40% vs. 52%, p<0.01). Overall, women were more likely to be shot outside their home (56% vs. 36%, p<0.01), use Medicaid as primary insurance (68% vs. 47%, p<0.01), and have lower alcohol concentration (97 vs.169 mg/dL, p=0.05). Women had higher ISS (4 vs 1, p=0.012), a longer median hospital LOS (3 vs. 1, p<0.01), lower rate of surgical interventions (14% vs. 23%, p<0.01), and were more likely to die from their injuries compared to men (6.3% vs. 1.6%, p<0.01). Compared to non-GSW penetrating wound victims, women GSW victims required more blood products for resuscitation (60% vs. 49%, p<0.01) and had higher mortality rates (6.3% vs. 1.6%, p<0.01).

Conclusion: Women with GSWs have higher mortality compared to men and to women with non-GSW penetrating injuries. Trauma services should allocate resources to reduce mortality and improve outcomes in this patient population.

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