

# “Playing God”<sup>1</sup>: Analyzing the Bioethics of Triage from Hurricane Katrina and Haiti’s Earthquake to Covid-19



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## **Abstract**

As the world experiences more mass-casualty incidents, such as extreme weather events or pandemics, health systems are put under pressure to treat those in need, generating the problem of scarcity of vital resources. The allocation of scarce resources is done via triage, the assigning of priority order to persons on the basis of where resources can be best used, are most needed, or are most likely to achieve success. This article analyzes the ethics of three potential triage models—the survival model, social worth model, and lottery model—as a means of assessing the benefits and drawbacks of the models in relation to the United States healthcare system. Hurricane Katrina, the 2010 Haiti earthquake, and COVID-19 are utilized as case studies to present success and failures of implementation of existing triage models, focusing on how models trade off between efficacy and efficiency. While the initial intent of this research was to determine if there is a superior form of triage that should be adopted to maximize health for U.S. communities in the face of future disasters, as a result of analyses conducted with health and ethics experts, it is apparent that superiority is not the answer. Instead, triage should be treated as a complex and changing system, one that should be evaluated on a case-by-case basis by different providers to create the most optimal solutions.

## **Keywords**

Triage; Public Health; Bioethics; Disaster Management; Hurricane Katrina; Haiti Earthquake; COVID-19; Selective Euthanasia

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1 Sheri Fink, “Playing God,” August 21, 2015, in *Radiolab*, produced by Simon Adler and Annie McEwen, Podcast, MP3 audio, 1:03:52, <https://www.wnycstudios.org/podcasts/radiolab/articles/playing-god>.

## **Content Warning**

This article includes content that might not be suitable for some readers. It specifies how triage may negatively impact minorities, and patients with disabilities, chronic or other health conditions. Readers who may be sensitive to these elements, please take note.

## **Introduction**

On the morning of August 29, 2005, at 6:00am, Hurricane Katrina hit New Orleans. 175 miles per hour winds and 10 inches of rain swept through the city, wiping out all power. Katrina was a Category 5 Atlantic hurricane, causing over 1,800 deaths and \$125 billion in damage. It destroyed a majority of the city, with 80% of New Orleans inundated with water for weeks. Critical medical equipment became instantly unusable, and within the first ten minutes of the power outage, five of the nine patients on ventilators died.<sup>2</sup> Suddenly the question went from “Who should be evacuated first?” to “Who should be left to die?” This article sets out to explain how extreme events like Hurricane Katrina are forcing healthcare workers to answer this question more frequently, and to propose which answers are best.

Strong triage practices are becoming more vital as humans face an increase of mass-casualty incidents, with few factors threatening human health as much as climate change. This article analyzes the ethics of three potential triage models—the survivability model, the social worth model, and the lottery model—as a means of identifying the effectiveness of each model for the United States healthcare system. These models were selected from a 2013 ethics seminar hosted by Johns Hopkins University in response to the failures of Hurricane Katrina, which served to answer the questions: “How should we ration medical resources?”; “If something bad happens again, which patients do we prioritize first?”; and “Which patients don’t we prioritize?”<sup>3</sup> Drawing from interviews with public health and ethics experts, the ethics of the triage models are assessed,

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2 Sheri Fink, *Five Days at Memorial: Life and Death in a Storm-Ravaged Hospital*, (Large Print Press, 2016), 54, 59.

3 Elizabeth Daugherty Biddison, et al., “The Community Speaks: Understanding Ethical Values in Allocation of Scarce Lifesaving Resources during Disasters,” *Annals of the American Thoracic Society* 11, no. 5 (2014): 777-83, <https://doi.org/10.1513/AnnalsATS.201310-379OC>.

revealing how elements including the possibility for racial, ethnic, and gender bias, as well as practitioner subjectivity, which can influence the assessment of quality of life. The success of the models is further explored in relation to the case studies of Hurricane Katrina and the 2010 Haiti earthquake. The application of these models in disasters is explored using medical response to the COVID-19 pandemic as a demonstration of how various triage methods are integrated in the response to scarcity of resources on a global health level. While the original intent of this research was to determine which of the three triage methods is superior for standardization of care in U.S. healthcare systems, exploration of these case studies, interviews, and journals proved that ranking the effectiveness of triage models is ineffective because of the nuance of health conditions. Instead, this article resolves in demonstrating how triage models can be blended to maximize their effectiveness in providing the greatest good for the greatest number of people.

### **To Trier Is to Triage**

The term triage comes from the French verb *trier*, which means to separate, sort, or select something.<sup>4</sup> Originally, it was a reference to sorting types of coffee. However, over the last few hundred years the word began to apply to people, largely as a side effect of increased human casualties in the wake of wars and natural disasters. Triage is an assignment of degrees of urgency to patients as a means of distributing resources in a way that most efficiently maximizes the amount of lives saved.<sup>5</sup> Modern medical triage was coined by French surgeon Dominique Jean Larrey during the Napoleonic Wars, circa 1803-1815, who “treated the wounded according to the observed gravity of their injuries and the urgency for medical treatment, regardless of their rank or nationality.”<sup>6</sup> As time went on, triage transitioned from a subset of battlefield operations to the model of emergency medical service (EMS) systems in environments, such as emergency rooms and ambulance-based care. Modern triage focuses on the evaluation of the severity of a

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4 Ramesh Aacharya, Chris Gastmans, and Yvonne Denier, “Emergency Department Triage: An Ethical Analysis,” *BMC Emergency Medicine*, October 7, 2011, <https://doi.org/10.1186/1471-227x-11-16>.

5 “Triage: Prioritizing Care to Reduce Deaths,” Pan-American Health Organization, 2018, [https://www.paho.org/disasters/dmdocuments/RespToolkit\\_12\\_Tool%205\\_TriagePrioritizingCaretoReduceDeaths.pdf](https://www.paho.org/disasters/dmdocuments/RespToolkit_12_Tool%205_TriagePrioritizingCaretoReduceDeaths.pdf).

6 Peter Skandalakis, et al., “To Afford the Wounded Speedy Assistance: Dominique Jean Larrey and Napoleon,” *World Journal of Surgery* 30 (2006): 1392-99.

patient's condition or likelihood of recovery considering treatment. Patient care is sought to be rationed efficiently, with the order and priority of emergency treatment existing as a function of this outcome.<sup>7</sup> As medical technology has advanced, so have approaches to triage, which are more operative based on scientific models. Categorization of victims is generally derived from severity of triage levels, numeric scores that note the severity of a patient's condition based on physiological findings. Some models, such as the widely-used START (Simple Triage and Rapid Treatment) model utilize an algorithm to evaluate a patient's status; however, START's algorithm does not depend on the number of victims or available resources for treatment, so the implementation of this model may vary among healthcare agencies.<sup>8</sup> While models like START help to automate the triage process, they do not serve as flawless systems when resource allocation becomes critical, as seen with triage-intensive disasters like Hurricane Katrina and the COVID-19 pandemic.

According to the Pan-American Health Organization, there are three key types of triage that are essential to understanding more complex models: simple triage, advance triage, and reverse triage.<sup>9</sup> Simple triage is generally used on the scene of an accident or mass-casualty incidents (MCI) such as the 2011 Tohoku earthquake and tsunami or in 2017, Hurricane Maria. According to Linda Landesman's guide, *Public Health Management of Disasters*, simple triage is used to sort patients into groups based on "those who need critical attention and immediate transport to [healthcare services] and those with less serious injuries."<sup>10</sup>

Advanced triage is performed by trauma-specialized healthcare workers. While simple triage assesses patient status based on physiological needs alone, advanced triage is used to divert limited resources away from patients with little chance of survival as a means to increase the chance for others with higher likelihoods.<sup>11</sup> The types of treatments prioritized include medication, medical care, and medical equipment (such as ventilators). Advanced triage is often practiced in disaster settings, such as mass shootings, terrorist attacks, and natural disasters. In these situations, it is

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7 Acharya, "Emergency Department Triage."

8 "Triage: Prioritizing Care to Reduce Deaths."

9 "Triage: Prioritizing Care to Reduce Deaths."

10 Linda Y. Landesman, *Public Health Management of Disasters: The Practice Guide*, (Washington, DC: American Public Health Association, 2012).

11 Landesman, *Public Health Management of Disasters*.

understood that some percentage of patients will die regardless of medical care due to the severity of injuries. A recent natural disaster that operated on an advanced triage model was the 2011 Haiti earthquake.<sup>12</sup> A patient's category of triage can also change throughout a single advanced triage assessment; for example, if a treatment is successful, patients' improvement can allow them to be re-categorized as a lower priority patient in the short term, and create more treatment opportunities for others. This does not typically occur during simple triage.<sup>13</sup>

Reverse triage takes the traditional triage model of prioritizing a person's admission to the healthcare system and applies it to the approach of discharging patients early under a stressed system. When a major wave of patients arrives at a healthcare facility, such as a hospital, hospital beds that are occupied by non-critical patients will need to be opened. Therefore, to treat the highest number of critical patients, existing patients may be triaged and discharged until a surge has dissipated, either through a decrease in treatment needs or with the creation of additional medical facilities. An example of this triage model in action is the COVID-19 pandemic, where hospitals have limited patient admission to keep intensive care unit beds open for extreme COVID cases.<sup>14</sup>

For all triage models, a scoring system is used. In the United States, it is called the Injury Severity Score (ISS).<sup>15</sup> ISS assigns a score from 0 to 75 based on the severity of an injury on the body, separated into three regions: A (face/head/neck), B (thorax, abdomen), and C (extremities/skin).<sup>16</sup> Each category of region is scored from 0 to 5 using the Abbreviated Injury Scale, defined by the Association for the Advancement of Automotive Medicine (AAAM) as "an anatomically based consensus-derived global severity scoring system that classifies each injury in every body region according to its relative severity on a six point ordinal scale: 1) Minor; 2) Moderate; 3) Serious; 4) Severe; 5) Critical; and 6) Maximal (currently untreatable, creating a default score

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12 Fink, "Playing God."

13 "Triage: Prioritizing Care to Reduce Deaths."

14 Mike Baker and Sheri Fink, "At the Top of the Covid-19 Curve, How Do Hospitals Decide Who Gets Treatment?," *The New York Times*, March 31, 2020.

15 While other countries utilize triage models with their own titles, ISS will be the model addressed for this article for it was the model used by Red Cross workers in response to the events discussed later on, Hurricane Katrina and the 2010 Haiti Earthquake.

16 Acharya, "Emergency Department Triage."

of 75).<sup>17</sup> A score of 75 may indicate either that patients are a first priority patient to receive critical care, or they will not receive treatment due to conditions being so critical that care should be conserved for more likely survivors.<sup>18</sup> Triage, and incidentally the triage scoring system, is a derivation of the theory of distributive justice “which addresses how benefits and burdens should be distributed within a population.”<sup>19</sup>

### **Utilitarianism: The Greater Good**

Distributive justice incorporates a variety of principles, but the one most relevant to triage, as supported by the International Association of Bioethics, is the principle of utilitarianism.<sup>20</sup> In his *Utilitarianism and Other Essays* Jeremy Bentham focuses heavily on the concept of hedonism, the notion of deriving maximum pleasure from a situation. Bentham’s thesis of utilitarianism builds on the theory of impartiality and draws off relativism, the understanding that an action is determined to be right or wrong relative to the situation in which the action takes place.<sup>21</sup> Utilitarianism is inextricably linked to the singular goal of triage: producing the greatest good for the greatest number of people by meeting human needs most effectively and efficiently under conditions of scarcity.<sup>22</sup> The general utilitarian concerns of the system focus on the scarcity of a vital product/service, and consequently require choosing between patients on the basis of abstract reasoning, seemingly colliding with the Hippocratic Duty of Care, which all doctors are bound to follow.<sup>23</sup>

The application of utilitarianism in contemporary bioethics originated in the 1970s through the work of Australian philosopher Peter Singer, who specializes in applied ethics from a secular

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17 Laura Camilloni, et al., “Triage and Injury Severity Scores as Predictors of Mortality and Hospital Admission for Injuries: A Validation Study,” *Accident Analysis & Prevention* 42, no. 6 (November 2010): 1958-65, <https://doi.org/10.1016/j.aap.2010.05.019>.

18 Camilloni, “Triage and Injury Severity Scores.”

19 Acharya, “Emergency Department Triage.”

20 Acharya, “Emergency Department Triage.”

21 Mark Dimmock and Andrew Fisher, “Utilitarianism,” in *Ethics for A-Level* (Cambridge, UK: Open Book Publishers, 2017), 11-20.

22 Acharya, Gastmans, and Denier, “Emergency Department Triage.”

23 The Hippocratic Oath, or Hippocratic Duty of Care, is one of the oldest binding principle in medical history. The Hippocratic Oath is an oath of ethics taken by physicians, promising to treat the ill to the best of one’s ability, to preserve a patient’s privacy, and to continue the education of medicine for future generations. The most famous quote from the Hippocratic Oath is “First, do no harm,” which binds physicians to practicing medicine with only good intentions.

utilitarian approach.<sup>24</sup> According to his *Practical Ethics* Singer's principle of equal consideration of interests "does not dictate equal treatment of all those with interests, since different interests warrant different treatment."<sup>25</sup> Singer's theories agree with Bentham on the grounds of providing the greatest amount of good; however, he argues that some lives may be worth more than others based on "concrete properties", such as a person's contribution to the greater society, or how their suffering could impact others. This principle justifies not only different treatment for different interests, but it further allows for different treatment for the same interest, drawing from the utilitarian concept of diminishing marginal utility.<sup>26</sup> This principle is therefore transferable to the field of triage, where patients with different severity of conditions are vying for the same critical resources and must be assessed based on who will receive the greatest benefit from the treatment.<sup>27</sup>

Utilitarian bioethics states that the distribution of critical resources is part of the economic theory of zero-sum game, in which no "wealth" is created or destroyed.<sup>28</sup> As a result, medical decisions should be made on the basis of a person's future value, their chances of survival, and the total resources required for their treatment.<sup>29</sup> A central element of this distribution analysis is the cost-effective analysis, a tool that determines the best possible outcome, which leads to a benefit or increased net positive outcome for society as a whole.<sup>30</sup> The most common manifestation of cost-effective analysis in healthcare is the concept of quality-adjusted life years (QALY), defined by Landsman's *Public Health Management of Disasters* as "a measure of benefit from treating or allocating resources to individuals based on each individual's outcome."<sup>31</sup> Singer's work provides

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24 Brian Duignan, "Peter Singer," *Encyclopedia Britannica*, 2019, <https://www.britannica.com/biography/Peter-Singer>.

25 Peter Singer, *Practical Ethics*, (Cambridge: Cambridge University Press, 1979), 82.

26 The law of diminishing marginal utility states that as consumption increases, the marginal utility decreases with the consumption of each additional unit, with utility being an economic term representing satisfaction or happiness (see Singer's *Practical Ethics* for more information). In the context of triage, as people consume more of a utility, such as a medication, at a certain point they reach a peak level of benefit from the utility; past that point, each increase in medication will yield a smaller increase in benefit or utility.

27 Singer, *Practical Ethics*, 91.

28 "Zero Sum Games," Stanford School of Humanities and Science, 2017, <https://cs.stanford.edu/people/eroberts/courses/soco/projects/1998-99/game-theory/zero.html>.

29 Aacharya, "Emergency Department Triage." This concept will be discussed further, but the idea of a "person's future value" relates to the contribution they provide to society in the form of labor, potential offspring, or cultural benefits.

30 John Broome, *Ethics out of Economics* (Cambridge, UK: Cambridge University Press, 1999), 122.

31 Landesman, *Public Health Management of Disasters*, 21.

a guiding theory on the application of utilitarianism within limited resource circumstances, giving context to the decision-making process of healthcare providers in triage environments.

### **Efficiency of Triage**

Efficiency is defined in the healthcare system as “the doing of things in the most economical way; the ratio of the output to the input of any system.”<sup>32</sup> In other words, an efficient system is one that executes a higher level of performance relative to inputs: time, money, or resources, such as equipment or medicine. Achieving efficiency centers on the theory of utilitarianism, prioritizing maximization of utility of individuals and resources.<sup>33</sup>

Efficiency within triage means allocating resources in a manner that maximizes the number of lives saved. An example of this consideration appeared during the COVID-19 pandemic, when U.S. hospitals faced a critical shortage of ventilators needed to treat intensive care patients. In a *New York Times* article from March 2020, interviews by a cohort of U.S. emergency department doctors noted that “almost all of the [triage] plans give priority to otherwise healthy people who are most likely to fully recover.”<sup>34</sup> By prioritizing patients more likely to recover, doctors concluded that they could preserve a higher number of life years among populations—a key measure of treatment success.

While efficiency is an effective method to ensure the maximization of resources, it receives common critiques. Prioritizing patients with the highest likelihood of survival entails a range of ethical issues, including social equality. Likelihood of survival measurements are generally derived from QALYs and DALYs, whose algorithms assess the value of medical interventions based on a person’s predicted long-term health outcomes.<sup>35</sup> Determinants of health that would account for a lower QALY or DALY score include gender, age, pre-existing conditions, and mental health.

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32 Enrique Burches and Marta Burches, “Efficacy, Effectiveness, and Efficiency in the Health Care: The Need for an Agreement to Clarify its Meaning,” *International Archives of Public Health and Community Medicine* 4, no 1 (2020): 1-3, <https://doi.org/10.23937/2643-4512/1710035>.

33 Dimmock and Fisher, “Utilitarianism.”

34 Baker and Fink, “At the Top of the Covid-19 Curve.”

35 DALY stands for Disability-Adjusted Life Years; a measure of overall disease burden, expressed as the number of years lost due to ill-health, disability, or early death.



This creates an inherent algorithmic bias against persons with negative markers.<sup>36</sup> As testified in the *New York Times* interviews, dictating the order of triage based on these algorithms makes it so that “people with underlying medical problems may get ranked lower, yet low-income people and people of color often have more health problems because they cannot afford top-notch care.”<sup>37</sup> Additionally, QALYs and DALYs are criticized as being biased, putting people with disabilities at a disadvantage since they are seen as abnormalities and requiring more resources to function than those who are not physically and/or mentally disabled.<sup>38</sup> By prioritizing efficiency, triage systems inherently fail to protect a community’s most vulnerable populations.

### **The Lottery Model**

The lottery model of triage is an egalitarian approach, whose founding principle is the intent of giving every patient an equal chance at receiving access to scarce resources in the form of treatment, equipment, or care. The lottery model operates on the Kantian concept of respect for persons, asserting that each person’s value is the same regardless of identifying characteristics, such as race, gender, or socioeconomic status (SES).<sup>39</sup> In a traditional emergency department setting, lotteries for scarce resources are executed by pooling names of patients, and randomly selecting a predetermined number of patients, allocated based on the critical level of desired resources within a hospital. For a lottery to be properly executed, patients entered into the pool must have similar prognosis who cannot be separated.<sup>40</sup>

The first major advantage of the lottery model is its ability to eliminate practitioner bias. Elimination of practitioner bias appeals to the notion of justice within a triage system, ensuring that no person is given a higher chance of receiving treatment because of pre-existing circumstances

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36 Luis Prieto and José Sacristán, “Problems and Solutions in Calculating Quality-Adjusted Life Years (QALYs),” *Health and Quality of Life Outcomes* 1, no. 80 (December 19, 2003): 1-8, <https://www.doi.org/10.1186/1477-7525-1-80>.

37 Baker and Fink, “At the Top of the Covid-19 Curve.”

38 Mike Baker, “Whose Life is Worth Saving? In Washington State, People with Disabilities Are Afraid They Won’t Make the Cut,” *New York Times*, March 23, 2020.

39 John D. Hodson, *The Ethics of Legal Coercion* (Dordrecht: D. Reidel Publishing Company, 1983), 7.

40 Douglas B. White and Derek C. Angus, “A Proposed Lottery System to Allocate Scarce COVID-19 Medications: Promoting Fairness and Generating Knowledge,” *JAMA* 324, no. 4 (July 28, 2020): 329-30, <https://www.doi.org/10.1001/jama.2020.11464>.

when their chance of survival parallels others in the system. A second advantage of the lottery model is that it allows for a more efficient decision-making process, enabling healthcare workers to move patients into assessment and treatment phases of the emergency response.

The lottery model possesses a number of disadvantages as well. The lottery model potentially conflicts with the core goal of triage, producing the greatest good for the greatest number of people. Lotteries are often used as a means of allocating resources between those with most similar circumstances (i.e. prognoses), serving as a tie-breaker between thresholds.<sup>41</sup> Individual prognoses are influenced by pre-existing conditions, including SES, genetics, and pre-existing medical conditions—a majority of which are conditions out of the patients' control and pre-determined by the family they were born into. A lottery model eliminates the direct influence of practitioner bias, but it shows the crack in the healthcare system, creating algorithmic biases against patients whose health was negatively impacted by factors that lie outside of their control.

Additionally, the concept of chance is incredibly valuable, but it also creates inevitable losses. Bioethicist Joseph Millum argues “[w]hen a patient from a socially privileged group -- someone who has already had more chances in life -- wins the lottery, a patient from a disadvantaged group goes untreated.”<sup>42</sup> It can be argued that this flaw inherently prohibits the lottery model from meeting the *greatest number of people* component of the triage goal, for by allocating resources to low-chance survival patients, a limited number of preserved life years would be generated relative to what would be preserved should high-chance survival patients receive them.

### **Quality of Life Model**

The quality of life model of triage is one derived from the QALY assessment model, used as a generic measure of disease burden, including quality and quantity of life lived. The quality of life model assigns patients a triage score, which is calculated based on their immediate chance of survival, as well as a person's quality of life post-treatment, calculated by using the QALY model. The assessment of a patient's chance of survival is a cornerstone element of any triage mode, but

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<sup>41</sup> Interview with Gal Kober, Professor of Ethics, February 4, 2021.

<sup>42</sup> Joseph Millum, “Against Weighted Lotteries for Scarce COVID-19 Treatments,” *Health Affairs*, October 26, 2020, <https://www.healthaffairs.org/doi/10.1377/hblog20201021.995306/full/>.

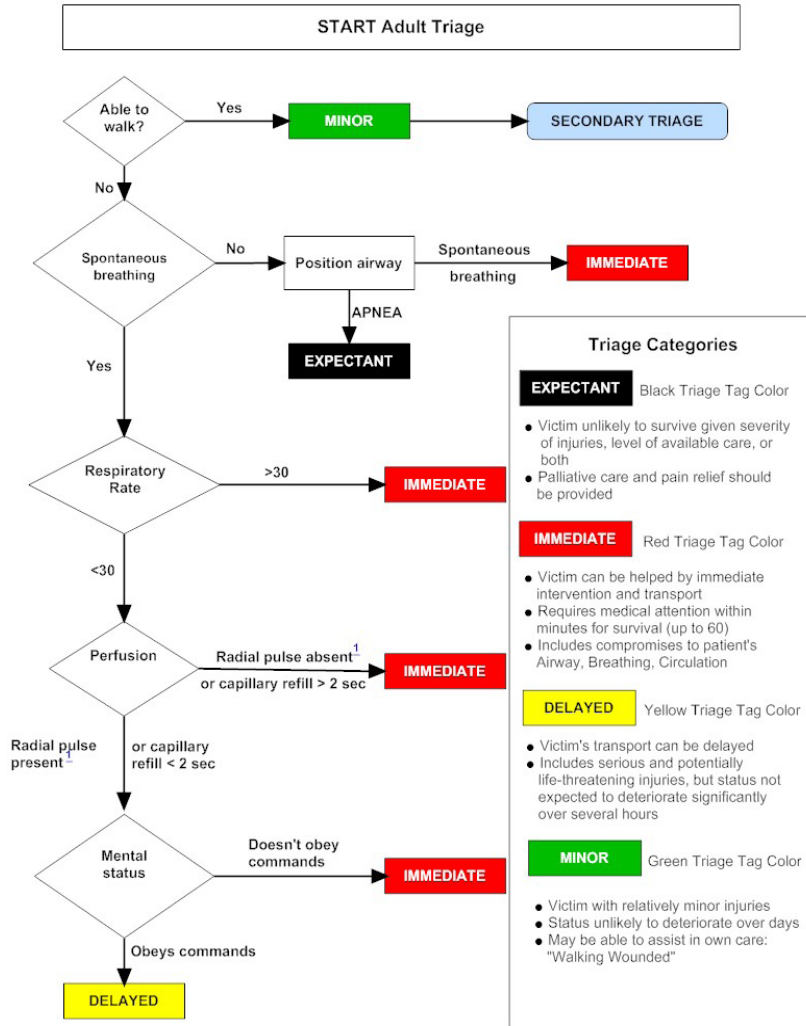


Image 1: *START Model of Triage*, NIH, 2020

the addition of a QALY score incorporates an assessment of factors outside the immediate health incident. The chance of survival is determined using the START model (see Image 1), with the immediacy of treatment assessed in tandem with the severity of condition.<sup>43</sup> The graph demonstrates how a quick assessment would be performed to determine the level of triage needed for a patient, with the flow chart originating at “Able to walk?” and ending with “Mental Status.”

Depending on a patient's condition, the chart directs a provider to the level of triage needed: Expectant, Immediate, Delayed, or Minor, and how to tag the condition accordingly. For example, a patient with just a fractured arm would be placed in Category 2: Delayed. A patient experiencing a heart attack would be placed in Category 3: Immediate, for the condition will likely worsen and requires rapid intervention.

QALYs are modeled assuming that health is a function of length of life and quality of life, combining these values into a single index number. However, who is to decide what is and what is not worth living for? Through the quality of life model, QALYs extend this decision-making process to medical professionals, assessing a patient's given conditions. QALYs are combined with

<sup>43</sup> “Triage: Prioritizing Care to Reduce Deaths.”

data on medical costs for a cost-utility analysis, estimating the cost-per-QALY for an intervention.<sup>44</sup>

The quality of life model has been controversial throughout the past few decades. The model centers on benefit maximization, allocating resources in a manner that would enable the largest number of lives to be saved. Healthcare workers generally agree that using QALYs helps eliminate direct practitioner bias from the patient selection process: the QALY model calculates the effect of each health factor in a predetermined weighted algorithm, which has been widely approved since the algorithm's creation in 1968, removing the need for physicians to make subjective assessments on a case-by-case basis.<sup>45</sup> Some critics state that the method of ranking interventions and their recipients on the grounds of incremental-cost-effectiveness ratios (ICERs) is quasi-utilitarian and removes more nuanced consideration of resource allocation, "treating patients as purely numbers, rather than as people."<sup>46</sup> However, QALY supporters argue that, "since healthcare resources are inevitably limited, this method enables [resources] to be allocated in the way that is optimal for society, including most patients."<sup>47</sup> Furthermore, the use of QALYs enables the quality of life model to compare value benchmarks between different potential health outcomes: For instance, a healthcare worker would be able to assess who would have a longer life outcome if given access to a scarce resource such as a ventilator: a 45 year old patient who is a life-long smoker, or a 67 year old patient with diabetes. QALYs streamline this assessment process, and the ability to measure success of an intervention by life years creates a qualitative assessment of providing the greatest good to the greatest number of people.

In their article, published in *Value in Health*, the authors note a key problem with QALYs and the quality of life model:

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44 "A statistic used in cost-effectiveness analysis to summarize the cost-effectiveness of a health care intervention. ICERs [incremental-cost-effectiveness ratios] are defined by the difference in cost between two possible interventions, divided by the difference in their effect. It represents the average incremental cost associated with one additional unit of the measure of effect." Milton C. Weinstein, George Torrence, and Alistair McGuire, "QALYs: The Basics," *Value in Health* 12, supplement 1 (March/April 2009): S5-S9, <https://doi.org/10.1111/j.1524-4733.2009.00515.x>.

45 Weinstein, "QALYs: The Basics."

46 Michael Schlander, "Measures of Efficiency in Healthcare: QALMs about QALYs?," *Zeitschrift für Evidenz, Fortbildung und Qualität im Gesundheitswesen* 104, no. 3 (2010): 214-26, <https://www.doi.org/10.1016/j.zefq.2010.03.012>.

47 Schlander, "Measures of Efficiency in Healthcare."

Valuing health gains in terms of QALYs means that life-years gained in full health—through, for instance, prevention of fatal accidents in people in normal health—are counted as more valuable than life-years gained by those who are chronically ill or disabled—for instance, by averting fatal episodes in people with asthma, heart disease, or mental illness.<sup>48</sup>

These weighted evaluations assign lower scores to patients with chronic illnesses, including any mental or physical disabilities, operating under the definition of “quality” being equivalent to perfect health. This algorithm generates implicit bias against people with disabilities, assuming that quality can only be measured by length of life and cost it takes to maintain it, seeing a disabled state as one not worth living relative to a non-disabled state. Additionally, QALYs assign persons with higher ages a lower score, undervaluing treatments that benefit the elderly, for they generate fewer life years relative to treatments for younger patients. The weaknesses in the quality of life model are derived from quality’s quantitative definition, and to correct the flaws would require a re-evaluation of the weights associated with particular health states. In summation, the quality of life model aims at preserving the greatest number of QALYs for a person and community, but it comes at the expense of at-risk populations whose health is adversely impacted by underlying factors, such as SES, pre-existing conditions, race, and age.

### **The Social Worth Model**

A social worth model is one that seeks to allocate resources based on patients’ “anticipated contribution to society were their lives saved.”<sup>49</sup> The first major consideration of the use of the social model appeared in 1962 during a highly publicized instance from the Seattle Artificial Kidney Center, who appointed a committee to decide who would receive dialysis treatment. Components of social worth included a person’s occupation, education status, and their leadership within a community.<sup>50</sup> In the experiment, individuals deemed valuable to society would receive life-sustaining treatment, allowing them to return to their jobs, families, and civic duties. Social worth turned out to be as subjective as it sounds, and “bioethicists immediately condemned

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48 Erik Nord, Norman Daniels, and Mark Kamlet, “QALYs: Some Challenges,” *Value in Health* 12, supplement 1 (March/April 2009): S10-S15, <https://www.doi.org/10.1111/j.1524-4733.2009.00516.x>.

49 Albert R. Jonsen and Kelly A. Edwards, “Resource Allocation,” UW Medicine, Department of Bioethics and Humanities, 2018, <https://depts.washington.edu/bhdept/ethics-medicine/bioethics-topics/articles/resource-allocation>.

50 Jonsen, Edwards, “Resource Allocation.”

the practice as highly discriminatory and derided the committee as a ‘God Panel.’”<sup>51</sup>

There is a modifiable algorithm in determining a person’s social worth. This algorithm accounts for the impact a person has on society as a whole, and whether more lives will be saved and improved should they receive treatment. At first glance, the social worth model is easy to condemn for its highly-subjective nature, allowing for implicit and explicit bias. However, the U.S. is currently witnessing a version of a social worth model in action through the rollout policies of the COVID-19 vaccine. With vaccine rollout plans created by each state rather than the federal government, the U.S. is engaging in what could arguably be a modified version of the 1962 Seattle Artificial Kidney Center experiment. While state governments are not vaccinating citizens based on education status, they are assessing people’s priorities relative to their occupation and leadership role in communities. In all states, healthcare workers were prioritized for the first round of vaccines, with leadership stating that efforts to stop the spread of the disease would be pointless without protecting healthcare workers, who are by nature of their work, the most at-risk for exposure to COVID-19.<sup>52</sup> However, the order of priority becomes subjective to each state after that. U.S. states are struggling to decide how to prioritize within the extensive list of essential workers, which includes professions such as teachers, agriculture workers, childcare and retail employees, and public transit staff. In some states, such as Oregon, teachers have been prioritized over the elderly for vaccines, with leadership arguing that immunizing teachers would allow for schools and businesses to reopen faster, thus benefiting the health of students and parents.<sup>53</sup> Oklahoma prioritized residents of nursing homes, stating that limiting the spread of COVID among high-risk populations would reduce the state’s death rate, giving the community a better chance at reopening businesses sooner.<sup>54</sup> New York included transit workers in their earlier rollout, while Georgia excluded this demographic but included law enforcement and persons over 65 years of

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51 Will Ross, “God Panels and the History of Hemodialysis in America: A Cautionary Tale,” *Virtual Mentor* 14, no. 11 (November 1, 2012): 890-96, <https://doi.org/10.1001/virtualmentor.2012.14.11.mhst1-1211>.

52 Natasha Singer, “Where do Vaccine Doses Go, and Who Gets Them? The Algorithms Decide,” *New York Times*, February 7, 2021.

53 Singer, “Where do Vaccine Doses Go, and Who Gets Them?”

54 Singer, “Where do Vaccine Doses Go, and Who Gets Them?”

age.<sup>55</sup> These differences in rankings reflect the SES and cultural values of individual states. While a social worth model in a perfect simulation would meet the goal of maximizing benefit for the greater good, the allowance of subjectivity and error has made healthcare workers wary of pursuing it as a long-term evaluation method.<sup>56</sup>

## **Hurricane Katrina: A City in Ruins**

While thousands of people fled Hurricane Katrina, a large number of New Orleans residents stayed behind—largely the poorest and oldest residents, who were stranded due to restrictive access to transportation. On the morning of August 29, more than 50 levees failed, and a surge of flood water poured into the city, destroying houses, roads, hospitals, and a majority of the city’s power grid.<sup>57</sup>

One of the most famous hospitals in New Orleans is Memorial Medical Center, built in 1926 in one of the geographically lowest parts of the city.<sup>58</sup> While the



Image 2: *A Birds-Eye View of Memorial Medical Center Post-Katrina, The New York Times, 2013*

hospital remained stable during the city’s first power outage, thanks to a backup generator, the situation changed after the levees broke. Memorial’s backup generator was housed on the second floor of the building, but the circuitry ran throughout the hospital. When the levees failed, so did the generator. As the water pooled around Memorial, doctors knew they had to act fast. For the first 24 hours, Memorial staff worked endlessly to evacuate intensive care patients via helicopter,

55 Georgia Department of Public Health, “COVID-19 Vaccine Rollout Plan,” 2021, <https://dph.georgia.gov/covid-19-vaccine-rollout-plan>.

56 Ross, “God Panels.”

57 Barnaby Feder, “Hurricane Katrina: The Power Grid,” *The New York Times*, September 1, 2005, <https://www.nytimes.com/2005/09/01/business/hurricane-katrina-the-power-grid-utility-workers-come-from-afar-to.html>.

58 Fink, “Playing God.”

eventually evacuating 60 ICU and NICU patients.<sup>59</sup> As darkness fell over Memorial, an exhausted staff laid down on cots to sleep for the night; but then at around 2:00am, water began leaking into the basement and “the buzz of the generators suddenly just [...] stopped.”<sup>60</sup> It was at this point that Memorial’s medical staff switched into full-blown triage mode. The head of the triage efforts was Dr. Anna Pou, a head and neck surgeon who was revered and respected by Memorial staff.<sup>61</sup> The triage plan created by Dr. Pou is outlined below, as reported by Sheri Fink:

She and another doctor stationed themselves on the landing where the patients were brought down to on that second floor. And as the nurses would bring them, they would look quickly at the patient’s chart, look at the patient, and decide on a number. And the nurses would take a magic marker and a piece of paper and write either “one,” “two” or “three” on that paper. And then they would tape that number [...] onto the patient’s gown. So the “ones” that were your relatively healthy patients [...] they could be discharged. The “ones” would be rescued by boat, presumably among the first. The “twos” were your more typical hospital patients. A patient who wasn’t fully recovered, who would need ongoing care. They would go by helicopter, presumably second. And then the “threes” were those super-sick patients or anyone with a Do Not Resuscitate order.<sup>62</sup>

This triage method is a derivation of the quality of life model. By establishing the severity of a patient’s current condition, Dr. Pou was quickly assessing their chance of survival, the first of two assessments in the model. In her interviews with Memorial staff, Fink asked a doctor, whose name was kept anonymous in the publication, “Why did you choose the sickest patients to go last?” To which he replied, “Well, I figured anyone with a Do Not Resuscitate (DNR) order would have a terminal or irreversible condition [...] I thought that that patient would have ‘the least to lose.’”<sup>63</sup> The doctor’s connection between a DNR and a terminal or irreversible condition is false, as Fink notes in her interview; a DNR is appointed by a patient for a number of reasons, none of which are listed on the order form.<sup>64</sup> This choice was derived from a utilitarian lens. While the doctor’s connection between the DNR and a patient’s potential long-term condition may be false, the rationale behind it falls in line with the second element of the quality of life model, QALY. In this case, the doctor

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59 ICU stands for Intensive Care Unit, and NICU stands for Neonatal Intensive Care Unit.

60 Fink, “Playing God.”

61 Sheri Fink, “The Deadly Choices at Memorial,” *The New York Times*, August 1, 2009, <https://www.nytimes.com/2009/08/30/magazine/30doctors.html>.

62 Fink, *Five Days at Memorial*.

63 Fink, *Five Days at Memorial*.

64 “Do-Not-Resuscitate Order,” Medline Plus, US National Library of Medicine, 2021, <https://medlineplus.gov/ency/patientinstructions/000473.htm>.



assigned DNR patients a lower QALY score based on his assessment that a chronic/terminal illness



Image 3: *Inside Memorial during Hurricane Katrina, EMS Solutions, 2016*

lowers the quality of life of a patient; and if this patient were to receive treatment over a non-DNR patient, they would have a lower quality of life.

Memorial staff operated on a form of the quality of life model for their triage efforts during Hurricane Katrina, but

the model transformed as staffers made decisions if people would be, for lack of better words, better off dead. Entering day three with no power, Memorial quickly descended into an unlivable state. Staff noted that the building was reaching 100°F, with the hurricane's waters pushing sewage back into the building through toilets onto floors.<sup>65</sup> As the hospital faced extreme conditions, the staff and patients were simultaneously isolated from the outside world, only receiving information about the state of New Orleans from hand-held radios. During interviews, Memorial employees stated that essentially "You don't know how many rescue resources are going to come, it's night time. Your colleague walks up to you and says, you know, 'We're euthanizing the pets to put them out of their misery. What about these suffering patients? Shouldn't we put some of them out of their misery?'"<sup>66</sup> Responses to the proposal of selective euthanasia were split, with some staffers supporting the idea, seeing it as the most humane option to relieve suffering, and others deeming it unethical, seeing it as a form of homicide.

Regardless of the divisive nature of the proposal, people took action. After the hurricane

65 Amanda Schaffer, "The Moral Dilemmas of Doctors During Disasters," *The New Yorker*, September 12, 2013.

66 Fink, *Five Days at Memorial*.

subsided, 45 bodies were found inside Memorial. 21 of these patients received “either morphine Versed, a powerful sedative, or a combination of the two in a short time period on September 1, 2005.”<sup>67</sup> In a 2006 *60 Minutes* interview, Dr. Pou flatly denied euthanizing patients, stating “[i]t completely ripped my heart out because my entire life I have tried to do good [...] I have given everything that I have within me to take care of my patients.”<sup>68</sup> But in an interview with Fink, Dr. Ewing Cook, another Memorial colleague who specializes in end-of-life-care, was much more open about the decisions made in Memorial during the disaster. Fink shares Dr. Cook’s experiences in an interview with *Radiolab*:

He had gone upstairs, visited Mrs. Burgess, [a cancer patient], to see how she was doing. And he was just thinking to himself, she’s so, so sick. She’s got advanced cancer; I can’t imagine she would have more than maybe a week to live in the best of circumstances. She is weighted down with fluid, which can happen toward the end of life, so she weighs a lot. She’s on the eighth floor, so we’d have to carry her downstairs. Plus, there’s four nurses up here taking care of her. Couldn’t we use them somewhere else? So, he literally turned to one of the nurses and said, “Can you give her enough morphine till she goes.” And that nurse charted a huge increase in morphine for her and she died. And that was his thought [...] He said to me he thought it was desperate. He saw only two choices, quicken their deaths or abandon them. I mean, if that was the situation, there’s some ethicists would say either of those choices would be, you know, not justified, but excusable.<sup>69</sup>

But in a state of emergency like that at Memorial? These hard rules suddenly become malleable, with no singular agreed-upon course of action. Dr. Cook’s decision to administer morphine was founded on the belief that he was giving his patient the most optimal outcome. In reviewing the reports of these Memorial patients, it became apparent that once the decision is made to essentially give up on one patient in the name of the greater good, it becomes easier to rationalize doing the same for more.

Another patient, Emmet Everett, was a 61-year old man who weighed 380 pounds. He was located on the seventh floor of Memorial when Katrina struck. In an interview with Fink, Cheri Landry, a Memorial ICU nurse, reported:

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67 Fink, “Playing God.”

68 Daniel Schorn, “Was It Murder?,” CBS 60 Minutes, September 21, 2006, <https://www.cbsnews.com/news/was-it-murder/>.

69 Fink, “Playing God.”

He was conscious, alert, fed himself breakfast, asked his nurses, “Are we ready to rock and roll?” He said to one nurse, who never forgot it, “Cindy, don’t let them leave me behind. Don’t let them leave me behind.” But he had had a spinal cord stroke, he couldn’t walk, he was on the seventh floor of a hospital with no working elevators. The staff told me they couldn’t imagine how they would carry him down those flights of stairs, let alone would a helicopter take a man of his size. And he was one of the patients who was found with this drug combination in his body.<sup>70</sup>

Interviews conducted during investigation into deaths at Memorial noted that a group of five employees were a part of the conversation to decide Everett’s fate -- “he had been designated a ‘3’ on the triage scale...and the group speculated that helicopters would not take him.”<sup>71</sup> Would Everett’s quality of life have truly been worse off than other patients had resources been allocated from treating other patients to transport his body? Would he have truly been left behind? Several medical staff members who led the boat and helicopter transport efforts stated that “they would certainly have found a way to evacuate Everett...[but] they were never made aware of his presence.”<sup>72</sup> Everett’s case is a prime example of the subjective fallacies in the quality of life model. By not pooling a team to move Everett from the seventh floor the doctors decided to allocate resources to other patients who would require less care with higher chances of survival. This decision is derived from the first half of the quality of life model, assessment of chance of survival. However, the deciding factors against Everett were his weight and pre-existing condition, the spinal cord stroke. These are factors that reduce a person’s QALY score, both overtly through the model and through practitioner bias. Everett was a patient that could have been saved; however, this life was deemed less worth living than other patients because of health indicators that are influenced by factors outside of his control, such as SES, genetics, and healthcare services.<sup>73</sup>

The choice to not save Everett, and 44 others in the bottom of the triage tier, allowed Memorial staff to evacuate and save 205 other patients. In the eyes of the medical team and

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70 Fink, “Playing God.”

71 Fink, “The Deadly Choices at Memorial.”

72 Fink, “The Deadly Choices at Memorial.”

73 Investigations and lawsuits were filed against Dr. Pou and co-workers, citing that euthanasia tactics were a form of homicide. However, the cases were thrown out after deliberation because of ambiguous evidence and the intent of actions being founded on harm-reduction. This article focuses on the internal events at Memorial, for further information on the aftermath of events, refer to Fink’s *Five Days at Memorial* for a comprehensive overview.

survivors, this was the right call: families of survivors have thanked staff for decisions made that day, arguing that the team was being persecuted for merely “trying to save lives,” with some stating that they would feel the same had their family member not survived the experience.<sup>74</sup> In a CNN interview however, Carrie Everett, Emmett Everett’s widow, spoke out against the Memorial staff: “Who gave them the right to play God? Who gave them the right?”<sup>75</sup>

### **A Fair and Equal Chance?**

The triage decisions at Memorial were made out of necessity in an environment facing chaos. Katrina served as a wake-up call for the medical community to reconsider triage. A primary concern was the absence of some form of guidelines, “a checklist, something doctors could follow in the case of future emergencies.”<sup>76</sup> Research panels were held by a number of healthcare organizations, with a notable 2013 conference conducted by the state of Maryland in partnership with Johns Hopkins University.<sup>77</sup> A concern was raised with regard to forcing of one person to make the triage decisions. Fink, who observed this panel, noted that a common sentiment among participants was “even if we don’t like the choices that are made [...] overall, if you know that there’s a protocol out there and this is the rule [...] here’s why we had to adopt this rule, it’s being applied to everybody and you’re not going to be advantaged or disadvantaged over money or over all of these other things [...] it helps you accept it.”<sup>78</sup>

### **A Fatal Quake**

On January 12, 2010, four and a half years after Hurricane Katrina, a catastrophic 7.0  $M_w$  earthquake struck Léogâne, the most populous region within the Haitian city of Port-au-Prince. The earthquake’s damage shocked the world—at least three million people were impacted by the quake, one third of Haiti’s population. Vital structures were severely damaged, including all

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74 Fink, “The Deadly Choices at Memorial.”

75 Paula Zahn, “Katrina: Storm of a Lifetime,” CNN, August 29, 2006, <https://transcripts.cnn.com/show/pzn/date/2006-08-29/segment/01>.

76 Fink, “Playing God.”

77 Biddison, “The Community Speaks.”

78 Fink, “Playing God.”

hospitals.<sup>79</sup> As buildings collapsed, hundreds of thousands of civilians were trapped in the ruins, left homeless and critically injured. In the aftermath of the earthquake, efforts by citizens and aid organizations were limited because of the collapse of the power system, destruction of roads, ports, and airports, and the leveling of Haiti's central hospitals. One million Haitians were left homeless, an estimated 300,000 were killed in the aftermath of the earthquake, and hundreds of thousands were injured. Because Haitian hospitals were destroyed, survivors were forced to wait for days for treatment, isolated from adequate food, water, and sanitation. The absence of medical staff and supplies worsened many survivors' initial conditions, contributing to the death toll and an unprecedented health crisis.<sup>80</sup>

### **The Luck of the Draw: Cholera Vaccines in Haiti**

In the aftermath of the quake, Haiti was faced with the most severe cholera outbreak in recent history, with resulting injuries and deaths overwhelming Haiti's public health systems. The extreme number of casualties forced first responders and doctors to execute triage operations without any formal guidance from local, national, or international healthcare leadership.<sup>81</sup> Cholera is an acute diarrheal disease that has the capacity to kill its host within hours. The World Health Organization notes that "cholera transmission is closely linked to inadequate access to clean water and sanitation facilities. Typical at-risk areas include peri-urban slums and camps for internally displaced persons or refugees, where minimum requirements of clean water and sanitation are not met."<sup>82</sup> On October 20, 2010, nine months after the earthquake, officials confirmed the first outbreak of cholera.<sup>83</sup>

The outbreak was caused by human activity. In the wake of the earthquake, waves of international workers came to Haiti to help in recovery efforts, with a number of them coming from

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79 Christian Fraser, "Haitians Show Fortitude in the Face of Disaster," *BBC News*, 24 January 2010.

80 Richard Pallardy, "2010 Haiti Earthquake," *Britannica*, 2010, <https://www.britannica.com/event/2010-Haiti-earthquake/Humanitarian-aid>. Because of the ensuing chaos, Haitian officials were unable to establish an official death and/or injury toll, and there are still disputes about reported numbers.

81 Fink, "Playing God."

82 "Cholera," World Health Organization, February 5, 2021, <https://www.who.int/news-room/fact-sheets/detail/cholera>. Diarrheal diseases are generally associated with infections in the intestinal tract, which can be caused by a variety of bacterial, viral, and parasitic organisms.

83 "Cholera," Center for Disease Control, 2020, <https://www.cdc.gov/cholera/haiti/index.html>.

countries where cholera is endemic. These workers regularly dumped waste into the Artibonite River, the longest river in Haiti that divides the country with the Dominican Republic. The spread of the disease was unintentional; it came as a result of contamination of the Meye Tributary System of the Artibonite River.<sup>84</sup>

Because cholera is a highly communicable disease that spreads through contaminated water, Haiti was in a prime position to see the onset of an epidemic thanks to the lack of sufficient infrastructure or sanitation supplies. By the end of the first ten weeks, cholera had spread to all ten of Haiti's provinces. By March 2011, cholera had killed 4,672 people, and hospitalized thousands more. By August 2012, that number crept to 7,490 deaths, with 586,625 cases in total. In January 2020, the ten-year anniversary of the earthquake, Haiti reported 820,000 cases and 10,000 deaths—the largest outbreak of the last century. Hundreds of thousands of dollars were dedicated towards eradicating cholera in Haiti, but unsanitary conditions and further climate disasters have allowed for transmission to continue.<sup>85</sup>

As Haiti attempted to quell the epidemic through sanitary measures, it became apparent that the lack of basic necessities made a vaccine necessary to combat the disease. By 2012, two cholera vaccines were developed for global use and distributed in the rural areas of Bocozele and Grand Saline in the Artibonite River Valley. These locations were selected because rural isolation combined with poor roads made access to health services difficult and reflected the risks faced by other Haitian communities. Additionally, the communities are located close to the Artibonite River, with inhabitants frequently interacting with contaminated water. These elements put the communities at an equal risk of contracting cholera, thereby creating a pool of patients with similar prognoses, a condition for the lottery model. This allowed the vaccines to be distributed at random, operating on a lottery model form of vaccination triage. The randomization process was selected in order to ensure that the vaccines will remain continually refrigerated before and during transportation, and will remain cold during storage until actually used (what is called cold chain

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84 Daniel Lantagne, et al., "The Cholera Outbreak in Haiti: Where and How Did it Begin?," *Current Topics in Microbiology and Immunology* 379 (2014): 145–164, [https://doi.org/10.1007/82\\_2013\\_331](https://doi.org/10.1007/82_2013_331).

85 Pallardy, "2010 Haiti Earthquake."

success). Vaccine distribution lasted six weeks in total, with 90.8% of participants receiving a second dose of vaccine. At the end of the distribution, researchers measured community coverage in Bocozel and Grand Saline through census data and self-reporting surveys, producing an estimated community coverage of 79.2%.<sup>86</sup>

In a number of ways, the cholera vaccination efforts were a success, and are a strong argument in favor of the lottery system of triage. By administering the vaccine via randomization, health officials effectively eliminated any major differences in the vaccine recipients based on sex. Of those persons who received the initial dose, 49.4% were female and 50.5% were male, demonstrating no significant differences in distribution between the sample population's two sexes.<sup>87</sup> The distribution of the vaccine showed a limited difference between vaccine recipients' ages and population demographics, with 43.9% of the population registered as under the age of 18 in a 2010 census, and 41.5% of vaccine recipients under the age of 18 at the time of administration.<sup>88</sup> These results demonstrate that the efficacy of vaccination efforts was high, largely due to the extensive planning put in place to ensure fair and equal access to vaccines through the multi-step randomization process.

Conversely, the rollout for this vaccine took over two years of planning, from the onset of the cholera epidemic, to the creation of the vaccines, and lastly to the distribution of vaccines within Bocozel and Grand Saline. Because vaccines required refrigeration, public health officials were additionally tasked with creating reliable methods of transportation and storage that would ensure the most limited amount of vaccine wastage of less than .5%.<sup>89</sup> The rollout time required for this effective triage strategy came with a cost—with 586,625 cases and 7,490 deaths reported during the two year period prior to rollout.<sup>90</sup> While the vaccine was distributed in an equitable manner, researchers stated that the slow pace of the rollout creates “a fear of scarcity” during an epidemic,

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86 Louise C. Ivers et al., “Use of Oral Cholera Vaccine in Haiti: A Rural Demonstration Project,” *American Journal of Tropical Medicine and Hygiene* 89, no. 4 (October 2013): 617-624, <https://www.doi.org/10.4269/ajtmh.13-0183>.

87 Statistically significant differences for the purpose of this article is defined by a p-value greater than .05.

88 “Demographic Yearbook,” United Nations Department of Economic and Social Affairs, 2019, <https://unstats.un.org/unsd/demographic-social/products/dyb/dybssets/2019.pdf>.

89 Ivers, “Use of Oral Cholera Vaccine in Haiti.”

90 Lantagne, “The Cholera Outbreak in Haiti.”

potentially “preventing those who most need the [vaccine] from receiving it in a timely manner.”<sup>91</sup> These concerns suggest that the lottery model may potentially prevent healthcare workers from providing the greatest good for the greatest number of people. Could these deaths have been prevented had a different triage system been selected, such as one that prioritized timeliness over equity, like that of Dr. Pou’s during Hurricane Katrina?

### **Triage Choices**

The question of whether more deaths could have been prevented by changes in triage methods in cases like Hurricane Katrina and the Haiti earthquake is a difficult one to answer. If Memorial staff were to wait until they could have received external input on the process, how many more patients would have died? 100? 200? Faced with these potential death rates, the team opted for efficiency over efficacy by operating on the quality of life model. Haiti experienced the inverse, trading efficiency for efficacy. Waiting to distribute vaccines until they could design a rollout plan that would maximize community coverage and immunity to cholera contributed to the vaccine’s notably high efficacy rate. This lottery-style triage plan was selected because of the large amount of input solicited from community leaders, but it required a two-year rollout during which over 7,000 persons died of cholera in the country.

The aforementioned models on their own are not flawless, making it difficult to advocate for the standardization of a single model across all healthcare settings. However, the case studies demonstrate that there are significant benefits to each model, which could be blended by practitioners to optimize outcomes. Physicians were asked if it would be possible to synthesize these two models, taking the best of each to create a standard system of triage that maximizes both efficacy and efficiency. The resounding answer was no, not because the systems cannot be combined, but because of the bureaucracy required to standardize healthcare. “Don’t get me wrong,” Mike Skovira, an emergency care Physician’s Assistant, said during a phone interview, driving back from a late shift at Greenwich Hospital, “bureaucracy does great when regulating things like procedures and treatment guidelines. But to let bureaucrats decide how triage happens

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91 Ivers, “Use of Oral Cholera Vaccine in Haiti.”



in practice? It's impossible."<sup>92</sup>

Professor Gal Kober, a bioethicist, backed these concerns from a bioethics perspective, noting that “standardization of care will rely heavily on algorithms, such as QALYs, which are biased against persons with disabilities, pre-existing conditions, and lower socioeconomic statuses.”<sup>93</sup> Reliance on these algorithms are dangerous, for they potentially isolate a significant portion of patients from receiving care during scarce conditions if left entirely up to bureaucracy. That being said, these arguments are not ones in favor of abandoning the quality of life model in favor of a lottery model. Professor Kober expressed support for consideration of the model, identifying the overlying issue that the lottery model “requires patients to have similar prognoses when executing triage measures,” which is impossible to ensure in the case of MCIs.<sup>94</sup> Skovira notes “when you're not in the field, standardization seems easy. But each case is so unique. It requires specialized consideration and evaluation by practitioners, which just cannot be done by a panel of administrators.”<sup>95</sup> “There's no one right answer,” Dr. Richard Berkowitz stated at the end of an interview, “it's about *how* these methods are applied to a situation, and the innovation required by healthcare workers to understand what a crisis requires.”<sup>96</sup>

Prior to 2020, the word “triage” was not one commonly heard in day-to-day life outside of the healthcare field. However, 2020 was a year for the history books, marking the onset of the COVID-19 global pandemic. COVID-19 is a contagious disease with various symptoms, including fever, cough, fatigue, breathing difficulties, and a loss of taste and smell.<sup>97</sup> While approximately 81% of those who contract COVID-19 develop mild-to-moderate symptoms, the remaining 14% develop severe symptoms involving hypoxia and dyspnea, and 5% suffer from critical symptoms like respiratory failure.<sup>98</sup> As the disease swept through the world at an alarming rate, healthcare workers had been faced with an ongoing fear of scarcity of resources, specifically pertaining to

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92 Interview with Michael Skovira, Emergency Care Physician Assistant, January 25, 2021.

93 Interview with Gal Kober.

94 Interview with Gal Kober.

95 Interview with Michael Skovira.

96 Interview with Richard Berkowitz, OBGYN, February 10, 2021.

97 Baker and Fink, “At the Top of the Covid-19 Curve.”

98 Hypoxia, a condition in which the body or a region of the body is deprived of adequate oxygen supply at the tissue level. Dyspnea, shortness of breath, a feeling of not being able to breathe.

allocation of hospital beds, ventilators, and limited medications to treat the more severe cases of COVID-19—all of which must be allocated according to triage systems.<sup>99</sup> As of March 2021, triage response to COVID-19 had varied by states within the U.S., demonstrating a fusion between various triage methods discussed in this article.

Regarding the allocation of ventilators, a number of states took an approach that mirrored the quality of life model. In the state of Washington, doctors were allowed to “consider withholding advanced care for patients with ‘severe congestive heart failure,’ ‘severe chronic lung disease,’ as well as other major problems with a poor prognosis for recovery.”<sup>100</sup> Louisiana dictated that patients with severe dementia may be excluded from receiving treatment. Maryland’s guidelines “would score patients with a combination of factors that largely seek to assess both short-term and long-term survivability. In the event that two patients have the same estimated survivability, the scoring protocols give younger people better odds of getting treatment, with the ‘lowest priority’ given to patients 85 and older.”<sup>101</sup> These triage guidelines drew from the quality of life model, combining measures of survivability with QALYs. Like Memorial during Hurricane Katrina, U.S. hospitals were faced with an overwhelming number of critical COVID-19 patients with an extremely limited time frame to determine whom to treat. Mirroring Memorial staff, many U.S. states opted for an efficiency tactic that would maximize the number of life years saved, evident by younger patients and those without pre-existing conditions being given priority access to care. Like the triage efforts from Katrina, these strategies were met with opposition on behalf of persons with disabilities and the geriatric population, population groups who both would be systematically ranked lower for treatment with this standardization.

A lottery model of triage appeared during May and June of 2020 as doctors were forced to answer the question of how critical medication deemed effective in treating COVID would be distributed.

Various U.S. health leaders proposed a lottery-style allocation of remdesivir. The first

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99 Baker and Fink, “At the Top of the Covid-19 Curve.”

100 Baker and Fink, “At the Top of the Covid-19 Curve.”

101 Baker and Fink, “At the Top of the Covid-19 Curve.”

defense of the proposition was that without careful planning, the rollout of an emergency drug like remdesivir risked being done in an unfair manner, with certain communities gaining access to the medication faster, due to influences like wealth. Additionally, because critical cases of COVID-19 require rapid treatment, a lottery system would allow for a faster rollout of the medication. Some critics of the proposal argued that this would reduce the efficacy of the drug, taking treatment opportunities from people who could gain more QALYs from it. However, defenders of the distribution proposal argued that random allocation gives healthcare workers the additional opportunity to assess the effectiveness of the drug outside of a Randomized Control Trial (RCT) setting.<sup>102</sup>

The ongoing distribution of the COVID-19 vaccine is a fusion of the quality of life and social worth models. The rollout models are integrating the quality of life model's assessments of chance of survival and QALYs with those who would have a harder recovery from COVID-19 due to pre-existing conditions, like cancer or diabetes, given earlier access to the vaccine to increase their chance of recovery. This element of the quality-of-life model manifests differently than it did for ventilator allocation or the case of Memorial, for vaccines are viewed by health officials as a mechanism to equalize the quality of health of at-risk individuals, for it benefits the greater good of the society through herd immunity. Conversely, vaccine distribution accounts for occupations, with states varying in what order they provide access to each professional group. This is reflective of the social worth model, which gives access to scarce resources based on people's value in a society, either in how they contribute to the greater good, or how they affect the greater healthcare system. The COVID-19 vaccine rollout is a prime example of how triage models do not exist in isolation from one another; instead, they can be combined to create innovative systems that maximize access to essential resources. The COVID-19 pandemic demonstrates how large-scale health events require a myriad of triage responses. Additionally, the pandemic is evidence that the triage case studies derived from climate disasters are not narrow in application; triage will be a regular part of healthcare conversations, with scarcity proving as a challenge in the face of future

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102 White and Angus, "A Proposed Lottery System."

infectious diseases, extreme weather events, and changes in human production of resources.

In conclusion, triage should be treated as a complex and changing system, one that should be evaluated on a case-by-case basis by different providers to create the most optimal solutions. These evaluations will require understanding of cultural and SES factors on local, national, and international levels, and an understanding of how these factors influence health outcomes. As health conditions continue to change, so do healthcare systems and structures within them. Triage is not a static system, meant to serve as a permanent fixture of healthcare response; rather, it is as dynamic as human health, intended to evolve as we do.

### **Acknowledgments**

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