



**New York City, New York
New York City Department of Health**

**Public Health Disaster Plan: Measles
Vaccination Campaigns to Decrease the
Burden of Infectious Diseases and
Future Pandemics**

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Global Health Disaster Preparedness and Response

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**NYC[™]
Health**

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Preface

Measles is a highly contagious acute respiratory infection caused by the *Measles morbillivirus* virus, which has a singular natural host- humans.¹ According to the CDC, within one to two weeks of infection, the first symptoms are typically high fever (may spike to more than 104°), cough, runny nose (coryza), and red, and watery eyes (conjunctivitis).² Tiny white spots (Koplik spots) may appear inside of the mouth within two to three days after symptoms begin. Shortly after (3-5 days after symptoms begin), a typical measles rash breaks out. The virus is considered contagious four days before and four days after the development of this characteristic rash. It begins on the face at the hairline, and spreads downwards to the neck, trunk, arms, legs, and feet, On the red raised bumps, small raised bumps may also appear. The spots become joined as they spread from the head to the rest of the body. This is the point when infected people typically spike a fever of 104° Fahrenheit or more.

Measles can be dangerous, especially for babies and young children. Young children and adults



older than 20 years of age are the most likely to have serious complications from measles, such as ear infections and diarrhea. More serious complications include pneumonia and encephalitis.³

While the introduction of the *Measles, Mumps, and Rubella* (MMR) vaccine's licensing in 1963 led to rapidly decreasing infection rates worldwide; however, in recent years, there has been an increase in cases due to inconsistent vaccination of children.¹ The United States (US) announced the elimination of measles in 2000, yet just 20 years later New York City (NYC) was home to the largest measles outbreak in the US since the 1990s.⁴ This latest NYC outbreak originated from

an international traveler.⁴ Due to this most recent outbreak, the focus of this plan is on the introduction of measles vaccination campaigns in NYC. These were introduced starting in 2019⁴ to decrease the risk of future outbreaks due to unique aspects of the NYC population, which potentially increases the risk of "imported" infections with rapid spread to unvaccinated New Yorkers.¹

Some of the unique aspects of New York City that may inadvertently increase the risk of importation and spread include its size. As the largest and most diverse city in the US, it has a densely populated and densely housed population of roughly 8,900,000 people spread out over approximately 300 square miles across the city's five boroughs.² New York City is the most densely populated major city in the United States, more than three times as populous, for example, Los Angeles.⁵ In addition to the nearly 9 million people, in 2019, more than 66 million people visited the city, 13.5 million of whom were international citizens.⁶ This large and highly transient population increases the risk of disease spread. This risk is intensified by the under-vaccination in the youngest members of the NYC population; **in 2020 during the midst of the COVID-19 pandemic, MMR vaccinations decreased by 63% in children and by 91% in children over two years old.**⁷ This New York City Department of Health (NYCDOH) disaster plan is focused on vaccination against Measles *morbillivirus* to prevent future outbreaks and epidemics in NYC. This plan should act as a guide to mitigate the impact of such an event on not only the residents of New York City but also the federal and local governments and businesses operating within the city.

The management plan will outline preventative measures taken before an epidemic along with detailed instructions on responsive actions during an infection to reduce the spread of the virus. Additionally, methods of vaccination and treatment will be discussed regarding the duration of an outbreak.

Approval and Signature Page

THE UNDERSIGNED STAFF AGREES WITH THE JURISDICTIONAL AND DEPARTMENTAL FEATURES OF THE FOLLOWING BIOTERRORISM DISASTER PLAN GUIDE.

Assistant Emergency Management Coordinator

Date

The New York City Health Department

Assistant Director, Office of Emergency Preparedness

Date

New York City Department of Health

Director, Office of Emergency Preparedness

Date

New York City Department of Health

The New York City Department of Health

February 15th, 2023

Mission⁸

The New York City Department of Health and Mental Hygiene's (NYCDOHMH) mission is to safeguard and promote the health of the nearly 9 million New Yorkers through a broad range of programs. This takes many forms, from the inspection grades of food services, the licenses dogs wear, the community and income-based health clinics in each neighborhood, and the provision of birth certificates for the newest New Yorkers. The DOH also works behind the scenes, investigating suspicious clusters of illness and developing preventive strategies. DOHMH epidemiologists study the patterns, origins, and outcomes of health and infection conditions in New York City neighborhoods. These studies shape policy decisions and the City's health agenda.

NYC faces many challenges, ranging from obesity, diabetes, and heart disease to HIV/AIDS, tobacco addiction, substance use, and the potential for bioterrorism. DOHMH also works to address health disparities in minority communities. Structural racism is at the root of these health inequities, which is why DOHMH prioritizes racial justice in healthcare.

As one of the largest public health agencies in the world with more than 6,000 employees throughout the five boroughs and an annual budget of \$1.6 billion, they are also one of the nation's oldest public health agencies, with more than 200 years of leadership in the field.

Statement of Purpose

The purpose of this plan is to improve New York City's preparedness and response to prevent future measles outbreaks and epidemics by outlining effective preventative and response strategies focused on vaccination campaigns to reduce the risk of measles in NYC.

Authorities

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Definitions^{1,8,9,10}

Elimination- Defined by the CDC as the reduction of disease incidence to zero

Koplik's spots- Small bluish-white spots on the inner lining of the cheek and considered to be a diagnostic symptom of measles in the earlier stages

MMR- Measles, Mumps, and Rubella (MMR) Vaccination

DOHMH- Department of Health and Mental Hygiene

Communication Plans

- **Internal Communications:** Primary internal communications within and between the health departments for preparation and during vaccine campaigns will be through phone calls, text messages, and email correspondence. Provide closed captioning and sign language for phone calls and virtual meetings
- **External Communications:** It is essential to utilize communications that connect employees from the New York City Department of Health with employees within the organizations providing mutual aid.
 - Phone and emailing communication between organizations listed in mutual agreement and NYC DOH
 - Social Media, primarily Twitter and Facebook, make sure built in accessibility is featured
 - NYC 311, reports non-emergent issues and accessing the information on NYC governmental services

Mutual Aid Agreements

The New York City Department of Health has entered Mutual Aid Agreements with the following organizations in the New York and New Jersey area.

New York County	DHSES
Kings County	NYPD
Bronx County	FDNY

Queens County	FEMA
Richmond County	CDC
NYCEM	Government of New York City and New York

Concept of Operations

Assessing Needs

In the event of a measles outbreak in New York City, adequate communication of the outbreak and response plan are needed. The public should be informed right away, and proper control strategies should be implemented as soon as possible. Hospitals and healthcare workers would need additional personal protective equipment.

For patients who are suspected of having measles, proper control measures have to be implemented to limit the spread.¹¹ Since measles is a high-risk contagious disease, patients should stay home and not be hospitalized, unless necessary.¹¹ Patients, immediate family, and others in close contact should be guided on proper control strategies and how the disease spreads.¹² Cases should be isolated and only have contact with others who are vaccinated or have had a history of measles, as necessary.

Those who are unvaccinated and infected or who may have come into contact with a suspected case should be vaccinated as soon as possible.¹² This is especially important for unvaccinated young children. In the 2018-2019 Measles outbreak in New York City, of the 649 cases that were identified, 85.8% of the cases who were aware of their vaccination history, were not vaccinated.¹³ An analysis conducted of this event by the Columbia School of Public Health pinpointed the outbreak to a lack of vaccination in children.¹⁴ The Department of Health had an ongoing vaccination campaign during this outbreak and studies showed that this campaign reduced potential mortalities by over 90%.¹⁴

Vulnerable populations and communities might need additional social support for the response to vaccination programs to be effective.¹¹ Vulnerable populations in New York City include infants and children under one, especially those who are not vaccinated, individuals with low access to health care, hospital workers, and those who are opposed to vaccination due to religious or personal beliefs.¹¹ Vulnerable populations, especially mothers, should be educated on the need for full adherence to the vaccination series, especially for infants under nine months.¹¹

Matching Resources

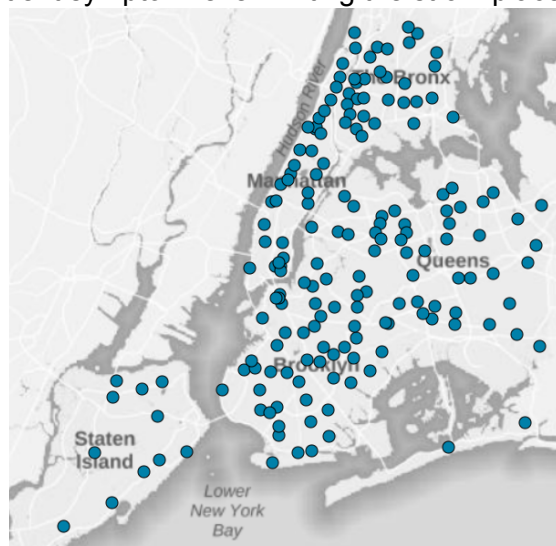
A) Prevention

In the event of a measles outbreak in New York City (NYC), the first step in implementing an emergency vaccination campaign (as opposed to a routine standard vaccination campaign) would be to alert citizens of the need for emergency vaccination of all those currently unvaccinated, especially eligible children. Campaigns promoting preventative measures in addition to promoting vaccination will be implemented as soon as possible in order to limit and further infection and spread within the community. First, the city would notify residents via

emergency broadcasting about an outbreak and the steps individuals can take to prevent infection- vaccination, mask use, isolation, etc. The initial enactment of a vaccination campaign would likely begin here. Post-COVID-19, the city has a \$900 million stockpile of personal protective equipment (PPE) that it can utilize to maintain the safety of not only residents but also medical staff who will be taking care of patients during this emergency.¹⁵ In addition to the NYC PPE stockpile, the United States has national stockpiles, such as the strategic national stockpile and the UNICEF emergency vaccination stockpile¹⁶, that are ready to be distributed in the event of an emergency and which can be utilized in campaigns such as a measles vaccination campaign. While all may be at risk of illness in the event of a measles outbreak in NYC, the unvaccinated population, specifically unvaccinated children and unvaccinated pregnant women, are the most vulnerable to disease. Delegating a specific stockpile of vaccinations for children is a general method of assuring susceptible populations are matched with the resources necessary to prevent infection. Additionally, the isolation of children from one another via the utilization of online learning and healthcare (through Zoom) can greatly influence the exposure rates of vulnerable populations to the potentially fatal viral infection.

B) Treatment

Concurrent with the enhanced preventative measures taken by the city, NYC would enact a specific plan to treat the infected patients in a concise and safe manner. The national stockpile (SNS) could be mobilized depending on the scope of the outbreak to provide additional PPE to the city along with materials to screen for infection and antibiotics used to treat those already infected.¹⁷ New York City has already identified over 160 distribution centers ready to be opened in the event of a large-scale emergency to use in distributing these necessary materials. These centers supply important resources to vulnerable populations because they are within walking distance throughout the city and require no formal identification or limitation for services rendered.¹⁸ These centers are accessible to all regardless of income, mobility, or citizen status eliminating the financial burden of preventive and protective care for all families. Moreover, as NYC has 11 public hospitals,¹⁹ the burden of caring for and housing patients is greatly reduced as patients can be distributed throughout the city depending on hospital availability and patient symptom level limiting the strain placed on individual hospitals.



Map of 165 emergency distribution centers ready to be active at a moment's notice.²⁰

Reducing Impact

Evaluating the effectiveness of the disaster response

To effectively evaluate the response to a measles outbreak, it is crucial to ensure consistent and accurate data collection and information. This includes accurately tracking the number of cases, virus samples, and vaccination records to assess the outbreak situation properly. Coordination between the city and statewide health departments is also essential, as well as accurate decision-making. Additionally, continuous surveillance of outbreak clusters, patient tracking, and isolation of those infected are crucial in evaluating the effectiveness of interventions.

In addition to ensuring consistent and accurate data collection and information, there are other important factors to consider when evaluating the effectiveness of the disaster response to a measles outbreak. One such factor is the availability and accessibility of vaccines. Implementing vaccination campaigns and other preventive measures, such as travel restrictions and quarantine measures, can effectively contain the spread of the disease.^{21,22}

Another factor to consider is the capacity and preparedness of healthcare systems to respond to an outbreak. This includes having adequate medical supplies, personnel, treatment facilities, and clear protocols for handling outbreaks.²³ It is also essential to ensure that healthcare workers are trained on the appropriate measures for preventing and treating measles and have access to the necessary resources and equipment. Importantly, measles vaccination status must be ascertained for all direct contact healthcare professionals, nursery school and school teachers caregivers (grandparents etc.) and boosters may be needed if records are not obtainable.

Effective communication and public awareness campaigns can also play a critical role in controlling the spread of the disease. These campaigns can help to increase awareness of the disease, promote preventive measures, and encourage individuals to seek medical care if they suspect they have been infected.²⁴

Overall, evaluating the effectiveness of the disaster response to a measles outbreak requires a multi-leveled approach that considers a number of factors such as data collection, vaccination campaigns, healthcare system capacity, and communication efforts. By considering these factors, public health officials can identify areas where the response can be improved and develop more effective strategies for preventing and controlling future outbreaks.

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Annex I

Threat and Hazards Assessment Table: Hazards and Threats Posed By Measles Outbreak New York Department of Health, New York City

Natural	Technological	Human-caused
Resulting from acts of nature	Involves accidents or the failures of systems and structures	Caused by the intentional actions of an adversary
<ul style="list-style-type: none"> ● New outbreak- The large and dense population of the city makes the possibility of a new outbreak very dangerous as it would be easily spread through the population. ● Winter Storms- Winter storms are common in NYC and the severity may alter the resources available to and the mobility of the population. ● Flooding- Flooding from hurricanes in the NYC area could result in loss/damage of home and property. Flooding could also lead to deaths of inhabitants and technological issues. ● Rats- Rats in the city are a big problem as they can invade homes/cause sanitation issues. ● Storms and High Winds- Heavy rain and coastal storms are common in this area in certain months (October-April). Without the necessary equipment, power outages may pose extreme risks, especially in hospitals. High winds may also lead to power and utility outages. 	<ul style="list-style-type: none"> ● Dense housing/overcrowding of NYC- The large population allows for the quick spread of bacterial and viral infections from household to household making biological or chemical threats more hazardous. An increase in population is expected and could lead to more risks and hazards. ● Population <ul style="list-style-type: none"> ○ Homeless populations- A large homeless population throughout the city creates a hazard for portions of the population as they lack access to adequate shelter, sanitation, and protective equipment that can prevent infection. ○ Other at-risk populations: New York City also has a large elderly population, as well as children, people with disabilities, and low-income populations ● Public transportation- Most of the NYC population travel the city using forms of public transportation from trains, buses, or ride-share apps in which they are exposed to many different bacteria, virus, and pathogens. The use of public transportation would contribute to the spread of viral infections. 	<ul style="list-style-type: none"> ● Anti-vaccination movement- The Anti-vaccination movement has been growing in the past decade as misinformed citizens are weary of receiving vaccines due to side effects or mistrust of the contents. ● Social Media and Vaccine Misinformation- Information and misinformation are spreading quicker than ever due to social media. Vaccine and medical misinformation, including false links between vaccines and adverse health outcomes, have been a threat to medical interventions and emergency responses. ● Religious restrictions on vaccination- Some religions prohibit followers of the faith from receiving vaccinations due to materials in the vaccine or scriptures. ● Biological/Chemical Warfare- New York City has been the target of terrorist attacks in the past. With its large, dense, transient population, it would be a prime target for

	<ul style="list-style-type: none">• Utility failure- Old and undermaintained buildings allow for the possibility of utility failure which can lead to sanitation issues and infection/exposure.	bioterrorism attacks.
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Annex II

Training Seminar Title: Preventing and Preparing for a Measles Outbreak	
Objectives of your Training Seminar (What mitigation strategy are you advocating?)	Individual prevention and protection from measles infection.
Estimate Length of Training	1-hour
Target Audience and max size of the audience.	Community members, especially families with young children, people with disabilities, or underserved members. Max 50 people/class
Who would be a good candidate (e.g., structural engineer, health dept. official, first responder?) as Facilitator of this session? Why?	Health department official NYC's Department of Health may have a better understanding of which communities to target based on lower vaccination rates. The DOH developed a Communicable Disease Preparedness program during the Ebola outbreak that could be applied here. The DOH also focuses on emergency preparedness through the Office of Health Emergency Preparedness (OHEP).
What do you want community members to do as a result of their attending this session?	<ul style="list-style-type: none"> ● Get fully vaccinated ● Get their children fully vaccinated ● Sign up for alerts from the NYCDOEM
<p>Strategies to increase community uptake of your mitigation (We have lots of useful links for checklists on the Course Home page under the Important Links page.)</p> <p>List the ones you think might be useful (in the appropriate language) or provide a title or two of a list or handout that you think would be good to give out to attendees.</p>	<ul style="list-style-type: none"> ● Map of 160 free emergency supply distribution/vaccination centers in NYC ● Show pictures of measles infection ● Measles Vaccination Pamphlets

Table for Emergency Operations Plan Annex III, Short-term Strategies for NYC

Necessities	Possible Resources	Distribution Strategies
Water	<ul style="list-style-type: none"> ● FEMA ● American Red Cross ● NYC Office of Emergency Management ● NYC Fire Department 	<ul style="list-style-type: none"> -Mobile and door to door distribution units -Distribution through non-profit organizations and community groups
Food	<ul style="list-style-type: none"> ● FEMA ● American Red Cross ● NYC Office of Emergency Management ● NYC Fire Department 	<ul style="list-style-type: none"> -Mobile and door to door distribution units -Distribution through non-profit organizations and community groups and meal delivery programs
Housing	<ul style="list-style-type: none"> ● Hospitals, outpatient clinics ● Public Facilities <ul style="list-style-type: none"> ○ Schools, Emergency Shelters, Armory ● Hotels 	<ul style="list-style-type: none"> -Evacuation and transport to emergency shelters/temporary housing facilities. -Conversion of public facilities and use of hotels/motels for emergency housing -Government partnerships
Medical Supplies/PPE	<ul style="list-style-type: none"> ● National Stockpile ● Local pharmacies ● FEMA ● NYC Stockpile 	<p>New York City has pre-identified over 160 emergency supply distribution centers ready to open and distribute supplies in a citywide emergency.</p>
Vaccines	<ul style="list-style-type: none"> ● National Stockpile ● Local pharmacies ● FEMA ● NYC Stockpile 	<p>New York City has pre-identified over 160 emergency supply distribution centers ready to open and distribute supplies in a citywide emergency</p>