



5.9 Pandemic

2023 SHMP UPDATE CHANGES

- ❖ The 2023 State Hazard Mitigation Plan (SHMP) risk assessment was expanded to include this hazard. The hazard profile has been created to describe the hazard, location, extent, previous occurrences, and probability of future occurrence (including how future conditions may impact the hazard). Figures from federal and state agencies are incorporated.

5.9.1 Hazard Profile

Pandemics are large-scale disease outbreaks, defined by the way in which a disease spreads rather than the number of fatalities associated with it. A pandemic outbreak has several recognizable characteristics, including rapid, large-scale (potentially global) spread causing (1) overloaded healthcare systems; (2) inadequate medical supplies; (3) medical supply shortages; and (4) a disrupted economy and society (Centers for Disease Control and Prevention [CDC] 2015). Pandemics typically result from infectious diseases. An infectious disease, as defined by the World Health Organization (WHO), is caused by pathogenic organisms (e.g., bacteria, viruses, fungus, or parasites) that spread from one person to another, whether through direct or indirect contact. Zoonotic disease is a type of infectious disease that occurs when animals transmit a disease to humans (WHO 2015). Although any infectious disease can reach pandemic levels, the 2019 Coronavirus (COVID-19) is the most recent pandemic the United States faced and continues to face.

HAZARD DESCRIPTION

The COVID-19 pandemic alerted the entire world to how rapidly a disease outbreak or epidemic can become a large-scale pandemic. This chapter discusses diseases and conditions of concern in West Virginia, with a focus on COVID-19, pandemic influenza, and vector-borne diseases.

Diseases that are usually present in a community have an established baseline or endemic level. This expected level may continue to occur indefinitely. An outbreak refers to when the amount of a disease in a community rises above the endemic level in a limited geographic area. An epidemic refers to an unexpected rise in the amount of disease over a wider area. The greatest spread of a disease, or a pandemic, can affect large numbers of people in several countries, continents, or the entire globe (CDC n.d.).

A new virus strain or subtype that easily transmits between humans can cause a pandemic. Bacteria that become resistant to antibiotic treatment may also be behind a rapid spread. Sometimes pandemics occur when new diseases develop the ability to spread rapidly, such as COVID-19. Humans may have little or no immunity against a new virus. Often, a new virus that previously was unable to spread between animals and people mutates so that it can. It then may start to spread easily, and a pandemic may result.

Seasonal flu epidemics generally occur because of a viral subtype that is already circulating among people. Novel subtypes, such as COVID-19, generally cause pandemics. These subtypes will not previously have circulated among humans. A pandemic can lead to social disruption, economic loss, and general hardship on a wide scale (Felman 2020).



Coronavirus Disease

COVID-19 is an infectious disease caused by the SARS-CoV-2 virus. The virus can spread in small liquid particles from the mouth or nose of infected persons when they cough, sneeze, speak, sing, or breathe. Most people infected with the virus experience mild to moderate respiratory illness and recover without requiring special treatment. However, some become seriously ill and require medical attention. Older people and those with underlying medical conditions, such as cardiovascular disease, diabetes, chronic respiratory disease, or cancer, are more likely to develop serious illness. Anyone at any age can get sick with COVID-19 and become seriously ill or die (World Health Organization 2022).

Influenza

Seasonal Flu

Seasonal flu is a viral infection that occurs every year, attacking the respiratory system (nose, throat, and lungs) in humans. In the United States, the influenza season typically extends from October through May, peaking in January or February, with yearly epidemics of varying severity. Although mild cases may be similar to a viral “cold,” influenza is typically much more severe. Influenza usually comes on suddenly and may include fever, headache, tiredness, weakness, dry cough, sore throat, runny or stuffy nose, and body aches. Persons 65 and older, those with chronic illnesses, people who are obese, residents of nursing homes, pregnant women, and young children are at the highest risk for serious complications, including death (Mayo Clinic 2022).

Pandemic Flu

Pandemic flu happens when a new type of flu virus spreads around the world, passing easily from person to person. Because the virus is new and people have not had it before, it can cause large numbers of people to become sick or die. A pandemic flu would likely affect businesses, travel, and some basic services for a period of time (CDC 2020).

Avian Influenza

Avian influenza, commonly referred to as “bird flu,” primarily spreads from birds to birds and rarely to humans, but it remains a pandemic threat. An avian flu virus may mutate or change so that it can be passed from birds to humans, potentially causing a pandemic in humans (CDC 2022). Some strains of avian influenza could arise from continents where people have very close contact with infected birds, such as poultry farmers or visitors to live poultry markets (Mayo Clinic 2020).

So far, avian influenza viruses have not mutated and demonstrated easy transmission from person to person. If avian influenza viruses were to mutate into a highly virulent form and become easily transmissible from person to person, the public health community would be very concerned about the potential for a pandemic (CDC 2022). Such a pandemic could disrupt all aspects of society and severely affect the economy. No cases of bird flu in people have been reported yet in West Virginia, but the virus has been found in flocks of poultry in each bordering state (Snyder 2022), and the H5N2 variant resulted in the depopulation of 25,000 turkeys in April 2007.



Swine Influenza

Swine flu typically spreads among pigs, but it can be passed to humans, especially to those who work closely with infected swine. While these types of infections usually cause mild illness, they are concerning because they can cause severe illness, especially in people at higher risk of serious flu complications, and because of their potential to cause a flu pandemic (WV News 2022).

Vector-Borne Diseases

Mosquito-Borne Viruses

Mosquito-borne diseases include diseases caused by viruses (also called arboviruses) and parasites that are transmitted through the bite of an infected mosquito. The most commonly reported mosquito-borne illness in West Virginia is La Crosse encephalitis, followed by West Nile virus; however, travel-associated mosquito-borne diseases (such as dengue fever and malaria) are also reported in West Virginia residents each year. Mosquito-borne diseases are most common during the summer and fall months when mosquitoes are active. Prevention of mosquito-borne illness includes removing containers that collect water near homes (where mosquitoes lay eggs) and the regular use of mosquito repellants (West Virginia Department of Health & Human Resources 2022).

Tick-Borne Diseases

Lyme disease is the most common tick-borne disease in West Virginia. It is transmitted by the black-legged tick, which has been reported in 51 of the 55 West Virginia counties. If an infected person is not treated early with antibiotics, Lyme disease can progress over weeks to years to cause recurrent arthritis, pain and swelling at joints, facial palsy, and neurological complications (West Virginia Department of Health & Human Resources 2022).

Anaplasmosis, ehrlichiosis, and Rocky Mountain spotted fever have also been reported in West Virginia, with about 1–10 cases of each per year.

Tick-borne infection can cause a variety of symptoms, including fever, headache, chills, myalgia, and rash. Most infections occur from late spring through early fall when ticks (and people and pets) are most active (West Virginia Department of Health and Human Resources 2022).

LOCATION

In general, epidemics, pandemics, and vector-borne diseases can occur without regard for location. Location-based factors such as population density, travel, and the length of time spent in a location all contribute to the spread of infectious diseases (Hazarie, et al. 2021). For example, influenza and COVID-19 are more likely spread by persons in close contact. Indoor areas where people are in close contact with each other appear to be significant vectors for diseases that are spread through respiratory droplets (World Health Organization 2020).

EXTENT

The CDC has defined levels of disease as follows (CDC n.d.):

- *Sporadic* refers to a disease that occurs infrequently and irregularly.
- *Endemic* refers to the amount of a particular disease that is usually present in a community. This level is not necessarily the desired level, but rather is the observed level.
- *Hyperendemic* refers to persistent, high levels of disease occurrence.



- *Epidemic* refers to an increase, often sudden, in the number of cases of a disease above what is normally expected in that population in that area.
- *Outbreak* carries the same definition of epidemic but is often used for a more limited geographic area.
- *Cluster* refers to an aggregation of cases grouped in place and time that are suspected to be greater than the number expected, even though the expected number may not be known.
- *Pandemic* refers to an epidemic that has spread over several countries or continents, usually affecting a large number of people.

Widespread sickness and loss of life can result from epidemics, pandemics, and vector-borne diseases. As of January 2, 2023, the COVID-19 pandemic infected nearly 745 million people and caused nearly 6.8 million deaths worldwide in less than 3 years (WHO 2023).

Warning Time

Pandemics are inevitable and arrive with very little warning. Warning time for a pandemic will depend on the origin of the virus, virus incubation time (the duration required before an individual begins to develop symptoms of an illness), and the amount of time needed to identify the virus.

PREVIOUS OCCURRENCES AND LOSSES

Federal Emergency Management Agency (FEMA) Disaster Declarations

Between 1953 and 2022, there was one pandemic FEMA disaster declaration for West Virginia for COVID-19.

U.S. Department of Agriculture (USDA) Disaster Declarations

The Secretary of Agriculture from the USDA is authorized to designate counties as disaster areas to make emergency loans to producers suffering losses in those counties and in counties that are contiguous to a designated county. There have been no USDA disaster declarations for pandemics.

Previous Events

According to West Virginia law, outbreaks are immediately reportable to the local health departments (West Virginia Department of Health & Human Resources 2022). Table 5.9-1 lists reported outbreak and pandemic events from 2018 to 2022.

Table 5.9-1. Reported Outbreak and Pandemic Events in West Virginia 2018-2022

Date	FEMA Declaration Number	Impact
COVID-19 (Statewide)		
January 2020-November 2022	DR-4482	613,165 cases 7,597 deaths
Seasonal Flu (Statewide)		
2022	N/A	2,964 cases
2021	N/A	374 cases
2020	N/A	3,056 cases
2019	N/A	2,586 cases
2018	N/A	2,568 cases
Swine Flu		
2022	N/A	3 cases (Jackson County)



Date	FEMA Declaration Number	Impact
La Crosse Encephalitis		
2022	N/A	1 case (Fayette County)
2020	N/A	7 cases (Fayette, Logan, Nicholas, Raleigh, Wyoming Counties)
2019	N/A	3 cases (Greenbrier, Logan, Wyoming Counties)
2018	N/A	6 cases (Fayette, Kanawha, Mercer, Raleigh Counties)
West Nile Virus		
2018-2022	N/A	2 cases (Hardy, Wyoming Counties)
Lyme Disease		
2021 (through 09/23/2021)	N/A	755 confirmed and probable cases (Statewide <i>except</i> Grant, Jefferson, Lincoln, Logan, McDowell, Mingo Counties)
2020	N/A	1,065 confirmed and probable cases (Statewide <i>except</i> Logan, Morgan, Wyoming Counties)
2019	N/A	898 confirmed and probable cases (Statewide <i>except</i> Cabell, McDowell, Mingo Counties)
2018	N/A	671 confirmed and probable cases (49 of 55 counties)

Sources: West Virginia Department of Health & Human Resources 2022; CDC 2022; CDC 2020a; CDC 2020b

PROBABILITY OF FUTURE HAZARD EVENTS

Overall Probability

Based on the historical pandemic and vector-borne disease events in West Virginia, the state has a high probability of future events. According to FEMA and the West Virginia Department of Health & Human Resources, West Virginia experienced at least five pandemic or vector-borne disease events every year between 2018 and 2022 (see Table 5.9-1). It is reasonable to expect multiple such events every year in the future, as indicated in Table 5.9-2.

Table 5.9-2. Probability of Future Pandemic Events in West Virginia

Hazard Type	Number of Occurrences between 2018 and 2022	Percent Chance of Occurrence in Any Given Year
Pandemic or Vector-Borne Diseases	5	100%

Projected Future Conditions

Changes in temperature and precipitation can influence seasonality, distribution, and prevalence of vector-borne diseases, which are influenced significantly by high and low temperature extremes and precipitation patterns (Rocklöv and Dubrow 2020). Changing hazard conditions may also create conditions favorable for invasive mosquitoes in West Virginia.



High temperatures are among the factors associated with vector-borne disease outbreaks. Warmer temperatures associated with changing conditions can accelerate mosquito development, biting rates, and the incubation of the disease within a mosquito (U.S. EPA 2022).

Vector-borne disease transmission can be influenced by many factors other than climate, which makes it difficult to predict how future hazard conditions will influence future outbreaks of vector-borne diseases. These factors include how viruses adapt and change, the availability of hosts, changing ecosystems and land use, human behavior such as time spent indoors, and vector control programs (CDC 2020).

5.9.2 Vulnerability Assessment

STATE ASSETS

No structures are anticipated to be directly impacted by a pandemic or infectious disease. However, structures could be damaged if maintenance personnel are unavailable due to illness.

CRITICAL FACILITIES AND COMMUNITY LIFELINES

No critical facilities are anticipated to be directly impacted by a pandemic or infectious disease. However, critical facilities could be damaged if maintenance personnel are unavailable due to illness. This is especially true of critical facilities and businesses with processes (e.g., chemical reactions) that occur continuously.

POPULATION

In West Virginia, the entire population is exposed and vulnerable to pandemics. Populations in closer proximity are at higher risk of passing a disease from one person to another. As the population of West Virginia is predominantly rural and less-densely populated than urban centers, there is a lower risk of pandemic compared to urbanized states.

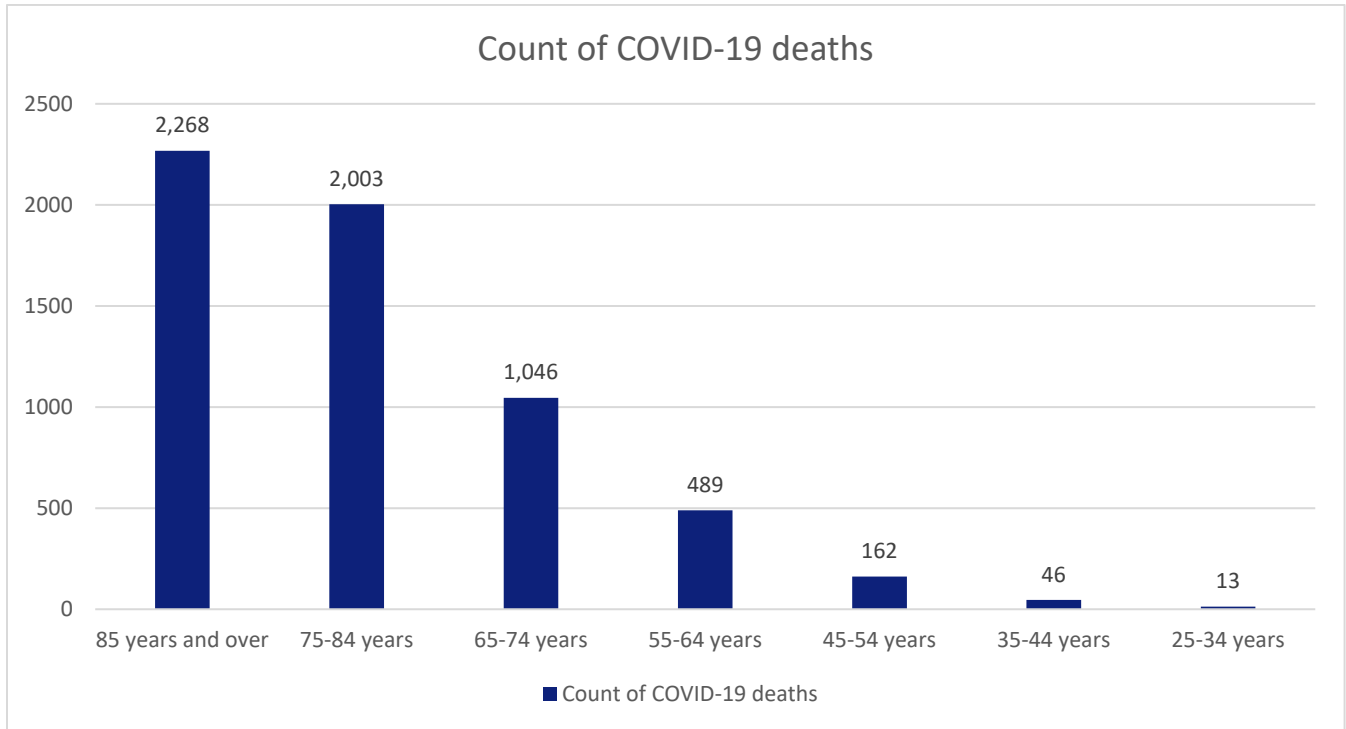
Impacts on Socially Vulnerable Populations

The socially vulnerable are at the greatest risk due to pandemics and other disasters (Karaye IM 2020), partly due to disparities in income, education, transportation, housing, jobs, environment, psychosocial stresses, and healthcare. Lower household incomes result in diminished health care.

Depending on the characteristics of the disease or virus, certain population groups can be at higher risk of infection than others. For example, as shown in Figure 5.9-1, the vast majority of deaths (77.9 percent) from COVID in the State comprised people who were at least 65 years of age. Figure 5.9-2 shows that more individuals who are categorized as Moderately Vulnerable or Highly Vulnerable (according to the CDC's Social Vulnerability Index [SVI]) died from COVID-19 than other groups.

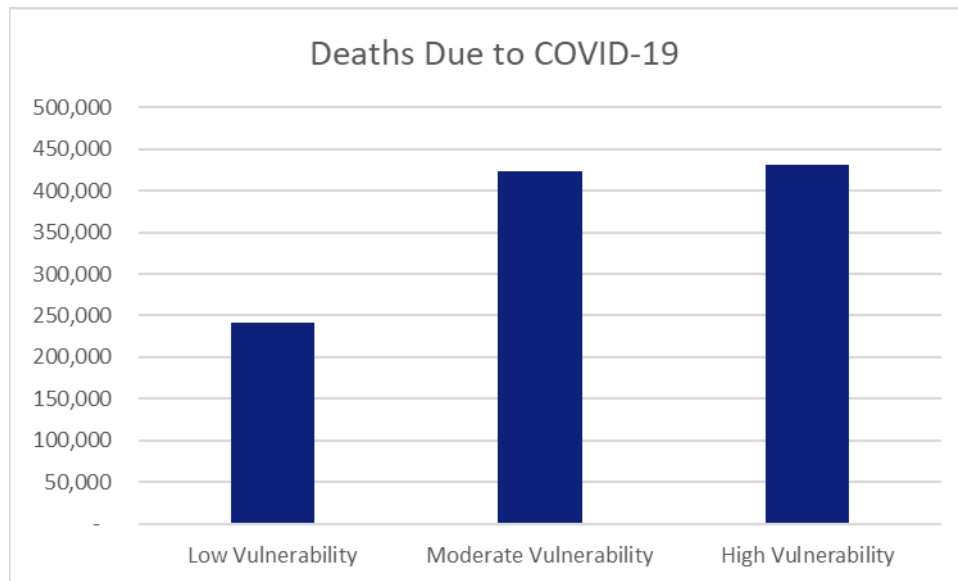


Figure 5.9-1. Count of COVID-19 Deaths by Age Group



Source: CDC 2023, as of 6/5/23

Figure 5.9-2. Count of COVID-19 Deaths by SVI Category



Source: CDC 2023, as of 6/5/23



FUTURE CHANGES THAT MAY IMPACT STATE VULNERABILITY

Understanding future changes that impact vulnerability in the state can assist in planning for future development and ensuring that appropriate mitigation, planning, and preparedness measures are in place. The State considered the following factors to examine potential conditions that may affect hazard vulnerability:

- Potential or projected development
- Projected changes in population
- Other identified conditions as relevant and appropriate, including the impacts of changing hazard conditions

Potential or Projected Development

As stated elsewhere in this SHMP, projected development in the State is currently related to redevelopment in developed areas rather than new development in areas that have not yet been developed. This could lead to concentrating people into smaller areas, increasing the risk of passing a transmissible disease among the population.

Projected Changes in Population

As population in the state continues to decrease, there is the potential that fewer people will be present to contract a disease. Additionally, as the population in the state ages (19.9% of the population is currently 65 years of age or older, and that number is expected to increase), more residents may face challenges health challenges related to pandemics and other diseases.

Other Factors of Change

Although future conditions may lead to scenarios that result in more diseases becoming a threat to the people of West Virginia, the projected decrease in population within the State means there will be fewer people exposed to the hazard.

5.9.3 Consequence Analysis

IMPACTS TO THE PUBLIC

Widespread sickness and loss of life can result from pandemics and vector-borne diseases. Disease outbreaks reaching pandemic proportions can cause social impacts on a global scale (Shang, Li and Zhang 2021). For example, civil disorder, protests, depression, and anxiety are a few of the social impacts of the COVID-19 pandemic.

IMPACTS TO RESPONDERS

Burnout and workforce shortages among first responders and public health and healthcare workers may be seen. Pandemics and infectious diseases can also affect first responders in many ways, including the need for more personal protection equipment to keep them safe and able to perform job duties. There is also an added layer of complexity to triaging patient care and a higher patient volume during pandemics.



IMPACTS TO CONTINUITY OF OPERATIONS

Health hazard events are not likely to result in any losses associated with damage or impairment to state assets. All losses from this hazard would be associated with impacts on operations and the economy.

IMPACTS TO PROPERTY, FACILITIES, AND INFRASTRUCTURE

The most significant impact on critical facilities is the increase in hospitalization and emergency room visits resulting from a health hazard event. This would create a greater demand on these critical facilities, their staff, and resources.

IMPACTS TO THE ENVIRONMENT

Epidemics, pandemics, and vector-borne diseases can be directly or indirectly tied to environmental impacts. Demand for single-use plastics to mitigate the spread of disease and increased waste generated by hospitals has negative environmental impacts. Powerful disinfectants can contaminate up in water supplies. Microplastics from degrading personal protective equipment (e.g., masks, gloves) can contribute to high concentrations found in fish, water, sediments, soils, and the air (Hartman 2021).

IMPACTS TO THE ECONOMIC CONDITION OF THE STATE

Potential statewide economic impacts include unemployment, price increases, and supply chain interruptions (Center on Budget and Policy Priorities 2022). Significant economic disruption can occur due to death, loss of work time, food insecurity, and costs of treating or preventing the spread of the virus or disease. In addition, given the importance of the poultry industry in the State, an avian influenza outbreak would have significant economic impacts.

IMPACTS TO PUBLIC CONFIDENCE IN STATE GOVERNANCE

The State's management of response and recovery efforts will influence public trust. Timely and accurate distribution of public information and notification during these events will also positively impact public trust.