



## 5.4.4 Epidemic

This section provides profile information including description, location, extent, previous occurrences and losses, probability of future occurrences, and climate change impacts, as well as the vulnerability assessment for the epidemic hazard in Genesee County.

### 5.4.4.1 Hazard Profile

#### Description

An outbreak or an epidemic exists when there are more cases of a particular disease than expected in a given area, or among a specific group of people, over a particular period of time. An aggregation of cases in a given area over a particular period, regardless of the number of cases, is called a cluster. In an outbreak or epidemic, it is presumed that the cases are related to one another or that they have a common cause (Center for Disease Control and Prevention [CDC] 2004). There are other diseases that impact Genesee County, including foodborne illness, vaccine-preventable disease, and vector-borne diseases (tick-borne and mosquito-borne). However, for the disease outbreak profile, the County identified influenza and the Ebola virus as the diseases that may lead to an epidemic.

#### Influenza

The risk of a global influenza pandemic has increased over the last several years. This disease is capable of claiming thousands of lives and adversely affecting critical infrastructure and key resources. An influenza pandemic has the ability to reduce the health, safety, and welfare of the essential services workforce; immobilize core infrastructure; and induce fiscal instability.

Pandemic influenza is different from seasonal influenza (or "the flu") because outbreaks of seasonal flu are caused by viruses that are already among people. Pandemic influenza is caused by an influenza virus that is new to people and is likely to affect many more people than seasonal influenza. In addition, seasonal flu occurs every year, usually during the winter season, while the timing of an influenza pandemic is difficult to predict. Pandemic influenza is likely to affect more people than the seasonal flu, including young adults. A severe pandemic could change daily life for a time, including limitations on travel and public gatherings (Barry-Eaton District Health Department 2013).

At the national level, the CDC's Influenza Division has a long history of supporting the World Health Organization (WHO) and its global network of National Influenza Centers (NIC). With limited resources, most international assistance provided in the early years was through hands-on laboratory training of in-country staff, the annual provision of WHO reagent kits (produced and distributed by CDC), and technical consultations for vaccine strain selections. The Influenza Division also conducts epidemiologic research including vaccine studies and serologic assays and provided international outbreak investigation assistance (CDC 2010).

#### Ebola Virus

Ebola, previously known as Ebola hemorrhagic fever, is a rare and deadly disease caused by infection with one of the Ebola virus strains. According to the CDC, the 2014 Ebola epidemic was the largest in history affecting multiple countries in West Africa. Two imported cases (including one death) and two locally-acquired cases in healthcare workers have been reported in the United States. CDC and partners are taking precautions to prevent the further spread of Ebola in the United States (CDC 2014).

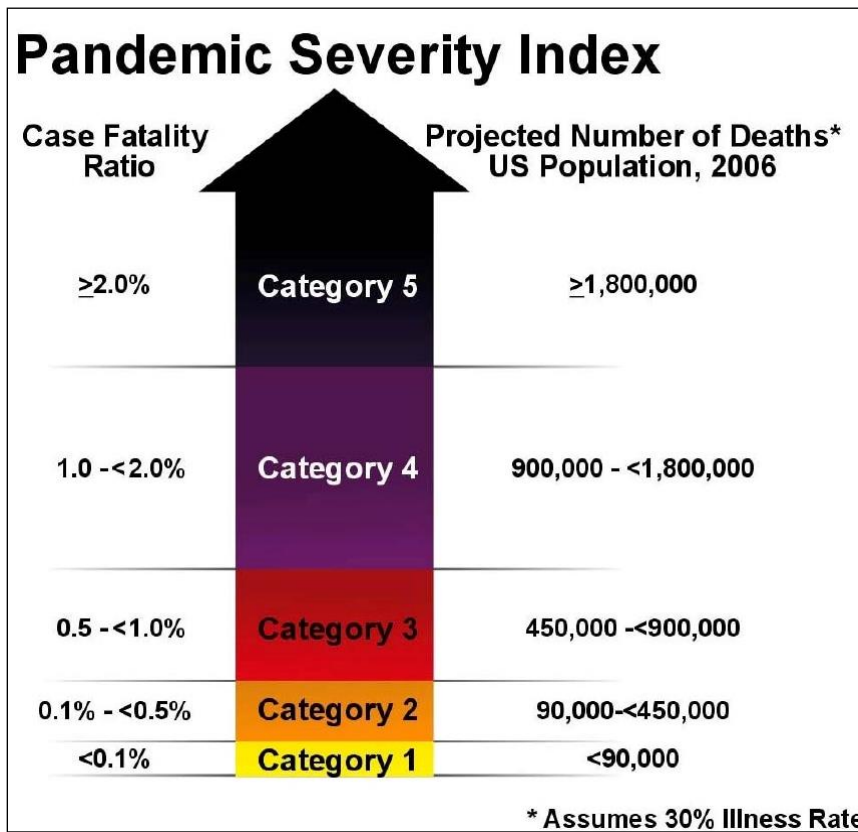


**Extent**

The exact size and extent of an infected population depends on how easily the illness is spread, the mode of transmission, and the amount of contact between infected and uninfected individuals. The transmission rates of pandemic illnesses are often higher in more densely populated areas. The transmission rate of infectious diseases will depend on the mode of transmission of a given illness. The Ebola virus is spread to others through direct contact; it is not spread through the air like influenza.

The CDC and Prevention Community Strategy for Pandemic Influenza Mitigation guidance introduced a Pandemic Severity Index (PSI), which uses the case fatality ratio as the critical driver for categorizing the severity of a pandemic. The index is designed to estimate the severity of a pandemic on a population to allow better forecasting of the impact of a pandemic, and to enable recommendations on the use of mitigation interventions that are matched to the severity of influenza pandemic. Pandemics are assigned to one of five discrete categories of increasing severity (Category 1 to Category 5) (CDC 2016). Figure 5.4.4-1 illustrates the five categories of the PSI.

Figure 5.4.4-1. Pandemic Severity Index



Source: CDC 2016

WHO and CDC identify pandemics according to a number of pandemic classification levels. Additionally, New York State Department of Health (NYSDOH) and State Emergency Operations Center (EOC) have their own activation levels in response to a pandemic event. Multiple waves of pandemic can be anticipated throughout the life cycle of an event. Refer to <https://www.health.ny.gov/diseases/communicable/influenza/pandemic/> for information regarding the various levels in New York State.



**Location**

Genesee County’s geographic location and demographic characteristics make it vulnerable to importation and spread of infectious diseases. The County has experienced the effects of a pandemic or diseases outbreak, including influenza. There are some densely populated municipalities in the County, which can lead to the spread of influenza and mumps more quickly than less densely populated communities.

**Previous Occurrences and Losses**

Between 1900 and 2017, New York State was included in one disease outbreak-related emergency (EM) declaration, classified as a virus threat due to West Nile Virus impacting the State (EM-3155, May – November 2000). Generally, epidemic disasters cover a wide region of the State; therefore, they may have impacted many counties. However, not all counties were included in the disaster declarations. Genesee County was included in this declaration (Federal Emergency Management Agency [FEMA] 2017). Table 5.4.4-1 provides details on epidemic episodes that occurred in Genesee County between 1900 and 2017.

**Table 5.4.4-1. Epidemic Affecting Genesee County, 1900 to 2017**

Date(s) of Event	Municipality	Damage (\$)	Description
2009	Entire County	Not Reported	Multiple cases of swine flu (H1N1) were confirmed in New York State. New York State Governor Paterson declared a state of emergency. Numerous schools in the state were closed due to the large amount of students and staff infected with the flu.
May-November 2000	Entire County	Not Reported	West Nile Virus threat; resulted in a FEMA declaration (EM-3155). Genesee County was included in this declaration.
Dec. 1957	Entire County	Not Reported	Asian Flu struck the county, filling hospitals and setting off a rush to obtain the flu vaccine.
May 1949	Batavia	Not Reported	14 cases of tuberculosis were discovered; the Veteran’s Hospital was converted into a tuberculosis institution in April 1950
Sept. 1939	Entire County	Not Reported	51 polio cases were reported in the County. Some families were quarantined and complaints were registered about not enough precautions being taken.
June 1926	Bethany	Not Reported	Two cases of smallpox were reported.
Autumn 1918	Entire County	Not Reported	The worldwide Spanish influenza outbreak struck Genesee County. Schools were closed; civic gatherings and church services canceled; and theatres, restaurants, bars, ice cream parlors, and billiard halls were shut down. By mid-October, about 250 cases were reported in Le Roy alone. In Batavia, a total of 397 cases were reported to the Health Officer. By January 1919, the disease had abated, but it continued to occur in increasingly less lethal waves into the early 1920s.
Feb. 1913	Bergen	Not Reported	Measles outbreak caused the high school in Bergen to be shut down for several days.
Oct. 1911	Batavia	Not Reported	First case of diphtheria discovered in Genesee County; outbreak swept through Batavia. Batavia Opera House and local schools closed to avoid the spread of disease.
1901	Pembroke	Not Reported	East Pembroke School closed due to an outbreak of Scarlet Fever.

Source: Genesee County 2008; NYSDOH 2009

**Probability of Future Events**

Predicting the future occurrences of disease outbreaks is difficult to predict; however, based on the history of occurrences in Genesee County, it is possible to predict the likelihood of a disease outbreak impacting the





County. Additionally, increases in population and population density in the County have the potential to increase exposure and susceptibility of its residents to outbreaks.

In Section 5.3, the identified hazards of concern for Genesee County were ranked. The probability of occurrence, or likelihood of the event, is one parameter used for hazard rankings. Based on historical records and input from the Planning Committee, the probability of occurrence for disease outbreaks in the County is considered “occasional” (likely to occur within 100 years, as presented in Table 5.3-1).

**Impacts of Climate Change**

Climate change is beginning to affect both people and resources in New York State, and these impacts are projected to continue growing. Impacts related to increasing temperatures and sea level rise are already being felt in the State. ClimAID: the Integrated Assessment for Effective Climate Change in New York State (ClimAID) was undertaken to provide decision-makers with information on the State’s vulnerability to climate change and to facilitate the development of adaptation strategies informed by both local experience and scientific knowledge (New York State Energy Research and Development Authority [NYSERDA] 2011).

Each region in New York State, as defined by ClimAID, has attributes that will be affected by climate change. Genesee County is part of geographical Region 1, Western New York and the Great Lakes Plain. Some of the issues in this region, affected by climate change, include: relatively low rainfall and increased summer drought risk, high-value crops could need irrigation, and improved conditions for grapes projected (NYSERDA 2014).

Temperatures and precipitation amounts are expected to increase throughout the State, as well as within Region 1. The State’s temperature is expected to rise between 2.0 and 3.4 degrees Fahrenheit (°F) by the 2020s, between 4.1 and 6.8 °F by the 2050s, and between 5.3 and 10.1 °F by the 2080s. The lower ends of these ranges assume lower greenhouse gas emissions scenarios, and the higher ends of these ranges assume higher greenhouse gas emission scenarios. By the end of the century, the greatest warming is projected to be in the northern parts of the State. (NYSERDA 2014).

Within Region 1, temperatures are anticipated to increase between 3.7 and 7.3 °F by the 2050s, and between 4.2 and 12.0 °F by the 2080s (baseline of 47.7°F). Precipitation totals will increase between 0 and 10% by the 2050s, and between 0 and 15% by the 2080s (baseline of 37 inches). Table 5.4.4-2 lists projected seasonal precipitation changes within the Western New York and Great Lakes Plain ClimAID Region (NYSERDA 2014).

**Table 5.4.4-2. Projected Seasonal Precipitation Change in Region 1, 2050s (% change)**

Winter	Spring	Summer	Fall
5 to +15	0 to +15	-10 to +10	-5 to +10

Source: NYSEDA 2014

Annual temperatures have been rising throughout New York State since the start of the 20<sup>th</sup> century. State average temperatures have increased by approximately 0.6 °F since 1970, with winter warming exceeding 1.1 °F per decade. Extreme heat events are likely to increase throughout New York State, and short-duration warm season droughts will become more common.

With the increase in temperatures, heat waves will become more frequent and intense, as shown in Table 5.4.4-3 below. Heat waves are defined as 3 or more consecutive days with maximum temperatures at or above 90 °F. Summer droughts are projected to increase under these conditions, affecting water supply, agriculture, ecosystems, and energy projects (NYSERDA 2014).



Table 5.4.4-3. Extreme Event Projections for Region 1

Middle Range (25th to 75th Percentile)	2020s	2050s	2080s
Days over 90 °F (8 days)	14 to 17	22 to 34	27 to 57
# of Heat Waves (0.7 heat waves)	2 to 2	3 to 4	3 to 8
Duration of Heat Waves (4 days)	4 to 4	4 to 5	5 to 6
Days below 32 °F (133 days)	103 to 111	84 to 96	68 to 88
Days over 1” Rainfall (5 days)	5 to 5	5 to 5	5 to 6
Days over 2” Rainfall (0.6 days)	0.6 to 0.7	0.6 to 0.8	0.6 to 0.9

Source: NYSERDA 2014

Warmer temperatures and changing rainfall patterns provide an environment where mosquitos can remain active longer, greatly increasing the risk for animals and humans. Lyme disease could also expand throughout the United States as temperatures warm, allowing ticks to move into new areas of the country. The changes in climate can also allow tropical and subtropical insects to move from regions where diseases thrive into new places (Natural Resources Defense Council 2015).

An increase in temperature and humidity may also lead to a larger number of influenza outbreaks. Studies have shown that warmer winters lead to an increase in influenza cases. During warm winters, fewer people contract influenza, which causes a large number in population to remain vulnerable into the next season. This causes an early and strong occurrence of the virus (Spross 2013).

### 5.4.4.2 Vulnerability Assessment

To understand risk, a community must evaluate what assets are exposed or vulnerable in the identified hazard area. For disease outbreaks, all of Genesee County is considered exposed to the hazard. Therefore, all assets in the County, as described in the County Profile (Section 4), are exposed and potentially vulnerable. This section evaluates and estimates potential impacts of the disease epidemic hazard on the County, including:

- Overview of vulnerability
- Data and methodology used for the evaluation
- Impact on (1) life, health and safety of residents, (2) general building stock, (3) critical facilities, (4) economy, and (5) future growth and development
- Effect of climate change on vulnerability
- Further data collections that will assist understanding this hazard over time

#### Overview of Vulnerability

Disease outbreaks are a significant concern to Genesee County, mainly due to their impact on public health and natural resources. Estimated losses are difficult to quantify; however, disease outbreaks can impact the County’s population and economy. Areas with a higher population density will have a higher exposure to disease outbreaks, especially those populations living in areas prone to mosquitoes and ticks. Additionally, vulnerable populations such as the young and elderly are considered at higher risk.



---

### **Data and Methodology**

Due to a lack of quantifiable loss information, a qualitative assessment was conducted to evaluate the assets exposed to this hazard and the potential impacts associated with this hazard.

---

### **Impact on Life, Health, and Safety**

The entire population of Genesee County is vulnerable to the disease outbreak hazard. Healthcare providers and first responders have an increased risk of exposure due to their frequent contact with infected populations.

---

### **Impact on General Building Stock and Critical Facilities**

No structures are anticipated to be directly affected by disease outbreaks.

---

### **Impact on Economy**

The impact disease outbreaks have on the economy and estimated dollar losses are difficult to measure and quantify. Costs associated with the activities and programs implemented to conduct surveillance and address disease outbreaks have not been quantified in available documentation. Instead, activities and programs implemented by the County to address this hazard are described below, all of which could impact the local economy.

---

### **Effect of Climate Change on Vulnerability**

The relationship between climate change and infectious diseases is somewhat controversial. The notion that rising temperatures will increase the number of mosquitoes that can transmit diseases among humans (rather than just shift their range) has been the subject of debate over the past decade. Some believe that climate change may affect the spread of disease, while others are not convinced. However, many researchers point out that climate is not the only force at work in increasing the spread of infectious diseases into the future. Other factors, such as expanded rapid travel and evolution of resistance to medical treatments, are already changing the ways pathogens infect people, plants, and animals. Climate change accelerations may likely work synergistically with many of these factors, especially in populations increasingly subject to massive migration and malnutrition (Harmon 2010).

---

### **Impact of Future Growth and Development**

As discussed in Section 4, areas targeted for future growth and development have been identified across the County. Any areas of growth could be potentially impacted by the disease outbreak hazard because the entire planning area is exposed and vulnerable.

---

### **Change of Vulnerability**

A disease outbreak analysis was not conducted as part of the 2008 HMP risk assessment.

---

### **Additional Data and Next Steps**

For the Plan Update, any additional information regarding historic costs incurred to conduct surveillance, prevent, treat and eradicate disease outbreaks may help with quantifying losses, given a margin of uncertainty. These data will be developed to support future revisions to the plan. Mitigation efforts could include building on existing New York State, Genesee County, and local efforts.