Table 4.3.10-4 Estimated jurisdictional losses due to lightning strikes.

COUNTY	NUMBER OF IMPACTED BUILDINGS	DOLLAR VALUE OF EXPOSURE, BUILDING AND CONTENTS (THOUSANDS $)
Allegheny	666,754	$170,090,579
Beaver	14,265	$4,735,685
Berks	214,878	$56,231,792
Bucks	319,283	$107,502,439
Butler	10,453	$3,740,680
Carbon	6,450	$1,640,614
Chester	256,870	$88,796,727
Delaware	268,456	$84,115,326
Lackawanna	3,379	$700,643
Lancaster	18,105	$4,944,082
Lebanon	5,582	$1,592,987
Lehigh	215,706	$59,301,465
Monroe	113,484	$28,932,611
Montgomery	439,397	$149,314,686
Northampton	178,622	$49,582,595
Philadelphia	18,123	$5,453,004
Pike	12,180	$2,775,393
Schuylkill	7,666	$1,820,286
Washington	1,556	$302,176
Wayne	3,379	$700,643
Westmoreland	19,217	$4,948,641
TOTAL	***2,793,805***	***$827,223,054***

Losses due to lightning can be lessened by installing surge protection on critical electronic lighting or information technology systems. Lightning protection devices and methods such as lightning rods and grounding can be installed on a community's communications infrastructure and other critical facilities to reduce losses.

4.3.10.9. State Facility Loss Estimation

The total replacement cost of all state critical facilities located in areas vulnerable to lightning strike is $10,692,310,083. Note that losses due to lightning strikes will differ based on the magnitude of the event and the lightning protection measures on a given facility.

4.3.11. Pandemic and Infectious Disease

4.3.11.1. Location and Extent

Pandemic is defined as a disease affecting or attacking the population of an extensive region, including several countries, and/or continent(s). It is further described as extensively epidemic. Generally, pandemic diseases cause sudden, pervasive illness in all age groups on a global scale. Infectious diseases are also highly virulent, but are not spread person-to-person.

Pandemic and infectious disease events cover a wide geographical area and can affect large populations, potentially including the entire population of the Commonwealth. The exact size and extent of an infected population is dependent upon 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 denser areas where there are large concentrations of people. The transmission rate of infectious disease will depend on the mode of transmission of a given illness. Pandemic events can also occur after other natural disasters, particularly floods, when there is the potential for bacteria to grow and contaminate water.

Historically, the Commonwealth is primarily concerned with two diseases with pandemic and infectious potential: West Nile Virus and influenza. West Nile Virus is a vector-borne disease that can cause headache, high fever, neck stiffness, disorientation, tremors, convulsions, muscle weakness, paralysis, and, in its most serious form, death. The virus spreads via mosquito bite and is aided by warm temperatures and wet climates conducive to mosquito breeding. West Nile Virus has been detected in all 67 counties at least once in the past 10 years. The virus is highly temporal with most cases occurring between April and October (PADEP-WNCP, 2009).

Pandemic influenza planning began in response to the H5N1 (avian) flu outbreak in Asia, Africa, Europe, the Pacific, and the Near East in the late 1990s and early 2000s. H5N1 did not reach pandemic proportions in the United States, but the Commonwealth began actively planning for an occurrence of an influenza pandemic. As stated in the Pennsylvania Department of Health (DOH) Influenza Pandemic Response Plan, “an influenza pandemic is inevitable and will probably give little warning” (PA DOH, 2005). Influenza, also known as “the flu”, is a contagious disease that is caused by the influenza virus and most commonly attacks the respiratory tract in humans. The estimated morbidity and mortality during and influenza pandemic within 12-16 weeks nationwide and in Pennsylvania are shown Table 4.3.11-1.

Table 4.3.11-1 Estimated morbidity and mortality during an influenza pandemic within 12-16 weeks

	UNITED STATES	PENNSYLVANIA
Require Outpatient Care	50 Million	1.6 Million
Hospitalizations	2 Million	37,800
Deaths	500,000	9,100

The 2009 H1N1 virus, colloquially known as *swine flu*, was a primary concern during the development of the 2010 SSAHMP. However, the threat of that flu strain has passed since it is no longer novel. This virus was first detected in people in the United States in April 2009. On June 11, 2009, the world health organization signaled that a pandemic of 2009 H1N1 flu was underway (CDC, 2009).

4.3.11.2. Range of Magnitude

The magnitude of a pandemic or infectious disease threat in the Commonwealth will range significantly depending on the aggressiveness of the virus in question and the ease of

transmission. In the case of West Nile Virus, slightly less than 80% of cases are clinically asymptomatic. Approximately 20% of cases result in mild infection, called West Nile Fever, lasting two to seven days. However, one in 150 cases result in severe neurological disease or death. Since the appearance of West Nile Virus in Pennsylvania in 2000, the worst year was 2003 when 237 Pennsylvanians were infected with the virus and 9 people died. The virus is typically more serious in older adults.

Pandemic influenza is more easily transmitted from person-to-person than West Nile, but advances in medical technologies have greatly reduced the number of deaths caused by influenza over time. In terms of lives lost, the impact various pandemic influenza outbreaks have had globally over the last century has declined. The severity of illness from the 2009 H1N1 influenza flu virus varied as expected with any influenza pandemic. The gravest cases occurring mainly among those considered at high risk: children, the elderly, pregnant women, and chronic disease patients with reduced immune system capacity. Most people infected with H1N1 in 2009 recovered without needing medical treatment, and this flu strain is now included in flu shots. However, the virus also resulted in many deaths, including 78 in Pennsylvania by the time the pandemic ended. According to the CDC, about 70% of those who hospitalized with the 2009 H1N1 flu virus in the United States belonged to a high risk group (CDC, 2009).

The magnitude of a pandemic may be exacerbated by the fact that an influenza pandemic will cause outbreaks across the United States, limiting the ability to transfer assistance from one jurisdiction to another. Additionally, effective preventative and therapeutic measures, including vaccines and other medications, will likely be in short supply or will not be available.

The 1918 Spanish flu pandemic remains the worst case pandemic event on record both in Pennsylvania and worldwide. While mortality figures were probably under-reported, in the first month of the pandemic alone, 8,000 Pennsylvanians died from the flu or its complications (US DHHS, 2010). As the densest city in the Commonwealth, Philadelphia was particularly hurt from this event.

4.3.11.3. Past Occurrence

West Nile Virus arrived in the United States in 1999 and was first detected in Pennsylvania in 2000 when mosquito pools, dead birds and/ or horses in 19 counties tested positive for the virus. Since then, the number of positive counties, human cases, and West Nile deaths has fluctuated with the temperature and precipitation each year. Table 4.3.11-2 illustrates the virus's overall geography, human infection, and mortality for the past ten years.

Table 4.3.11-2 Previous West Nile Virus occurrences in Pennsylvania 2000-2012 (PA DEP).			
YEAR	**NUMBER OF COUNTIES WITH VIRUS DETECTED**	**POSITIVE HUMAN CASES**	**HUMAN DEATHS**
2000	19	0	0
2001	16	3	0
2002	63	62	9
2003	67	237	9
2004	46	15	2
2005	33	25	2
2006	48	9	2
2007	25	9	0
2008	35	14	1
2009	33	0	0
2010	37	8	0
2011	59	6	0
2012	2	0	0

While West Nile Virus occurrences are fairly recent, the United States Department of Health and Human Services estimates that influenza pandemics have occurred for at least 300 years at unpredictable intervals. There have been several pandemic influenza outbreaks over the past 100 years. A list of events worldwide is shown in Table 4.3.11-3.

Table 4.3.11-3 List of previous significant outbreaks of influenza over the past century (Global Security, 2009; WHO, 2009).

DATE	PANDEMIC NAME/SUBTYPE	WORLDWIDE DEATHS (APPROXIMATE)
1918-1920	Spanish Flu / H1N1	50 million
1957-1958	Asian Flu / H2N2	1.5-2 million
1968-1969	Hong Kong Flu / H3N2	1 million
2009 - 2010	Swine Flu / A/H1N1	12,000

Deaths occurred in the United States as a result of the Spanish Flu, Asian flu, and Hong Kong Flu outbreaks. The Spanish Flu claimed 500,000 lives in the United States, and there were 350,000 cases in Pennsylvania – 150,000 were in Philadelphia alone. Most deaths resulting from the Asian flu occurred between September, 1957 and March, 1958; there were about 70,000 deaths in the United States and approximately 15% of the population of Pennsylvania was affected. The first cases of the Hong Kong Flu in the U.S. were detected in September of 1968 with deaths peaking between December, 1968 and January, 1969 (Global Security, 2009). More recently, 10,940 cases of 2009 H1N1 were confirmed in Pennsylvania resulting in 78 deaths.

4.3.11.4. Future Occurrence

Future occurrences of West Nile Virus are unclear. Instances of the virus have been generally decreasing due to aggressive planning and eradication efforts, but some scientists suggest that as global temperatures rise and extreme weather conditions due to climate change, the range of the virus in the United States will grow (Epstein, 2001).

As with West Nile Virus, the precise timing of pandemic influenza is uncertain, but occurrences are most likely when the Influenza Type A virus makes a dramatic change, or antigenic shift, that results in a new or “novel” virus to which the population has no immunity. This emergence of a novel virus is the first step toward a pandemic.

Future pandemics may also emerge from other diseases, especially invasive pathogens that Pennsylvanians do not have natural immunity to. Overall, though, the probability of future pandemic events can be considered *possible* according to the Risk Factor Methodology (see Section 4.1).

4.3.11.5. Environmental Impacts

There are no true environmental impacts of pandemics and infectious disease threats, but there will be significant economic and social costs beyond the possibility of disease-related deaths. Widespread illness may increase the likelihood of shortages of personnel to perform essential community services. In addition, high rates of illness and worker absenteeism occur within the business community, and these contribute to social and economic disruption. On a national scale, the Congressional Budget Office Estimates that a severe pandemic could cost the US economy more than $600 million, or 5% of the Gross Domestic Product (US DHHS 2005). Social and economic disruptions could be temporary but may be amplified in today’s closely interrelated and interdependent systems of trade and commerce. Social disruption may be

greatest when rates of absenteeism impair essential services, such as power, transportation, and communications.

4.3.11.6. Jurisdictional Vulnerability Assessment

In general, jurisdictions that are more densely populated are more vulnerable to disease threats when the disease is directly spread from human to human, but every jurisdiction in the Commonwealth has some vulnerability to pandemic and infectious disease threats. Table 4.3.11-4illustrates the 27 counties that identified pandemic disease or public health emergency as a significant hazard in the most recent hazard mitigation plan. As stated in Section 4.1, the decision by a county to profile a hazard is one indicator of the presence of risk from that hazard. This indicator should be viewed complementary to other analysis in this section. Together this analysis from reputable sources addresses different aspects of risk for a full risk profile.

Of the 19 counties that calculated risk factors for pandemic hazards, the average risk factor was 2.2. This average does not include Lebanon, Montour, Perry, and Philadelphia, who use an alternate Risk Factor/Ranking system. The State Risk Factor for pandemic is 2.0, while the Pennsylvania THIRA scored pandemic as a 7 out of 10. For more details on the State Risk Factor and THIRA rankings, please see Section 4.1.

Table 4.3.11-4 Counties profiling pandemic hazards with hazard ranking and risk factor (if available).

COUNTY	PROFILED HAZARD	DID NOT PROFILE HAZARD	RANKING (IF AVAILABLE)	RISK FACTOR (IF AVAILABLE)
Adams		X		
Allegheny	X		Medium	2.2
Armstrong		X		
Beaver	X		Medium	2.4
Bedford	X		Low	1.5
Berks		X		
Blair		X		
Bradford	X		Not Ranked	No RF
Bucks		X		
Butler		X		
Cambria	X		Low	1.5
Cameron	X		Low	1.9
Carbon		X		
Centre	X		Medium	2.1
Chester		X		
Clarion		X		
Clearfield	X		Low	1.1
Clinton		X		

Table 4.3.11-4 Counties profiling pandemic hazards with hazard ranking and risk factor (if available).

COUNTY	PROFILED HAZARD	DID NOT PROFILE HAZARD	RANKING (IF AVAILABLE)	RISK FACTOR (IF AVAILABLE)
Columbia	X		Low	1.8
Crawford	X		Medium	2.2
Cumberland	X		High	2.6
Dauphin		X		
Delaware	X		Medium	2.3
Elk		X		
Erie		X		
Fayette	X		Medium	2.3
Forest	X		Not Ranked	No RF
Franklin		X		
Fulton		X		
Greene		X		
Huntingdon	X		Not Ranked	No RF
Indiana	X		Medium	2.3
Jefferson		X		
Juniata	X		Medium	2.2
Lackawanna		X		
Lancaster		X		
Lawrence	X		Medium	2.2
Lebanon*	X		Not Ranked	6.9
Lehigh		X		
Luzerne		X		
Lycoming		X		
McKean		X		
Mercer	X		Medium	2.2
Mifflin	X		Not Ranked	No RF
Monroe	X		Low	1.8
Montgomery		X		
Montour*	X		Not Ranked	5.3
Northampton		X	Medium	2.2
Northumberland		X	High	2.5
Perry*	X		Not Ranked	8.4
Philadelphia**		X		

Table 4.3.11-4 Counties profiling pandemic hazards with hazard ranking and risk factor (if available).

COUNTY	PROFILED HAZARD	DID NOT PROFILE HAZARD	RANKING (IF AVAILABLE)	RISK FACTOR (IF AVAILABLE)
Pike	X		Medium	2.0
Potter		X		
Schuylkill		X		
Snyder		X		
Somerset		X		
Sullivan		X		
Susquehanna		X		
Tioga		X		
Union		X		
Venango	X		Low	1.4
Warren	X		Medium	2.3
Washington		X		
Wayne		X		
Westmoreland		X		
Wyoming		X		
York	X		Medium	2.4

* Lebanon, Montour, and Perry use an alternate weighted ranking where Risk Factor = Frequency x [(0.25 x Critical facilities) + (0.40 x Social) + (0.25 x Economic) + (0.10 x Environmental)]. While this risk factor was used to comparatively rank hazards, the number does not correspond to a high-medium-low rating.

**Philadelphia uses an A, B, C rating system where A is high, B is medium, and C is low.

4.3.11.7. State Facility Vulnerability Assessment

State facilities are no more or less vulnerable to pandemic and infectious disease than the general population. There are some occupation-specific risks that may make some employees more vulnerable, though. For example, those working in direct patient care situations are more likely to be exposed to a pandemic disease; similarly, state employees working outdoors for extended periods of time in the warm months may be more vulnerable to West Nile Virus.

4.3.11.8. Jurisdictional Loss Estimation

Jurisdictional losses in a pandemic or infectious disease outbreak stem from lost wages and productivity, not losses to buildings or land. Losses are difficult to estimate because the exact rates of absenteeism and cost of treating a widespread disease will depend on the virus or bacterium in question, the availability of vaccination or treatment, and the severity of symptoms. For historical context, though, the Asian and Hong Kong Flu pandemics killed over 1.5 million people worldwide and caused an estimated $32 billion loss due to lost productivity and medical