



# Section 19. Disease Outbreak/ Pandemic Influenza

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## Why Disease Outbreak/Pandemic Influenza Is a Threat

An influenza pandemic is a global outbreak of disease that occurs when a new influenza A virus appears or “emerges” in the human population, causes serious illness, and then spreads easily from person to person worldwide. Pandemics are different from seasonal outbreaks or “epidemics” of influenza. Seasonal outbreaks are caused by subtypes of influenza viruses that are already in existence among people, whereas pandemic outbreaks are caused by new subtypes or by subtypes that have never circulated among people or that have not circulated among people for a long time. Past influenza pandemics have led to high levels of illness, death, social disruption and economic loss.

There are many different subtypes of Influenza or “flu” viruses. The subtypes differ based upon certain proteins on the surface of the virus (the hemagglutinin or “HA” protein and the neuraminidase or the “NA” protein). Pandemic viruses appear (or “emerge”) as a result of a process called “antigenic shift,” which causes an abrupt or sudden, major change in influenza A viruses. These changes are caused by new combinations of the HA and/or NA proteins on the surface of the virus. This change results in a new influenza A virus subtype. The appearance of a new influenza A virus subtype is the first step toward a pandemic, but the new virus subtype also must spread easily from person to person to cause a pandemic. Once a new pandemic influenza virus emerges and spreads, it normally becomes established among people and moves around or “circulates” for many years as seasonal epidemics of influenza. The U.S. Centers for Disease Control and Prevention and the World Health Organization have large surveillance programs to monitor and





“detect” influenza activity around the world, including the emergence of possible pandemic strains of influenza virus.

Influenza pandemics have occurred every 10 to 60 years with three occurring in the twentieth century (1918, 1957-58, and 1967-1968). Influenza pandemics occur when there is a notable genetic change in the circulating strain of influenza. Because of this genetic shift, a large portion of the human population is entirely vulnerable to infection from the new pandemic strain.

## Phases of Pandemic Influenza

The World Health Organization (WHO) has developed a global influenza preparedness plan, which defines the stages of a pandemic, outlines WHO’s role and makes recommendations for national measures before and during a pandemic. The phases are:

### INTERPANDEMIC PERIOD

**Phase 1.** No new influenza virus subtypes have been detected in humans. An influenza virus subtype that has caused human infection may be present in animals. If present in animals, the risk of human infection or disease is considered to be low.

**Phase 2.** No new influenza virus subtypes have been detected in humans. However, a circulating animal influenza virus subtype poses a substantial risk of human disease.

### PANDEMIC ALERT PERIOD

**Phase 3.** Human infection(s) with a new subtype, but no human-to-human spread, or at most rare instances of spread to a close contact.

**Phase 4.** Small cluster(s) with limited human-to-human transmission but spread is highly localized, suggesting that the virus is not well adapted to humans.

**Phase 5.** Larger cluster(s) but human-to-human spread still localized, suggesting that the virus is becoming increasingly better adapted to humans, but may not yet be fully transmissible (substantial pandemic risk).

### PANDEMIC PERIOD

**Phase 6.** Pandemic: increased and sustained transmission in general population.

Notes: The distinction between **phase 1** and **phase 2** is based on the risk of human infection or disease resulting from circulating strains in animals. The distinction is based on various factors and their relative importance according to current scientific knowledge. Factors may include



pathogenicity in animals and humans, occurrence in domesticated animals and livestock or only in wildlife, whether the virus is enzootic or epizootic, geographically localized or widespread, and/or other scientific parameters.

The distinction between **phase 3**, **phase 4** and **phase 5** is based on an assessment of the risk of a pandemic. Various factors and their relative importance according to current scientific knowledge may be considered. Factors may include rate of transmission, geographical location and spread, severity of illness, presence of genes from human strains (if derived from an animal strain), and/or other scientific parameters.

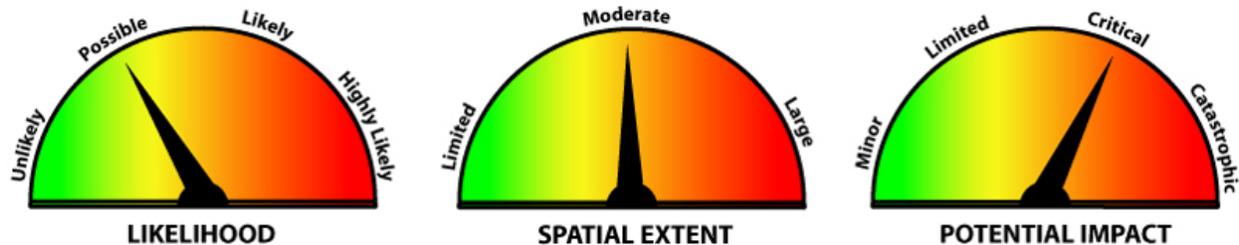
## Vaccines to Protect Against Pandemic Influenza Viruses

A vaccine probably would not be available in the early stages of a pandemic. When a new vaccine against an influenza virus is being developed, scientists around the world work together to select the virus strain that will offer the best protection against that virus, and then manufacturers use the selected strain to develop a vaccine. Once a potential pandemic strain of influenza virus is identified, it takes several months before a vaccine will be widely available. If a pandemic occurs, it is expected that the U.S. government will work with many partner groups to make recommendations to guide the early use of vaccine.

## Antiviral Medications to Prevent and Treat Pandemic Influenza

Four different influenza antiviral medications (amantadine, rimantadine, oseltamivir, and zanamivir) are approved by the U.S. Food and Drug Administration for the treatment and/or prevention of influenza. All four work against influenza A viruses. However, sometimes influenza virus strains can become resistant to one or more of these drugs, and thus the drugs may not always work. For example, the influenza A (H5N1) viruses identified in human patients in Asia in 2004 and 2005 have been resistant to amantadine and rimantadine. Monitoring of avian viruses for resistance to influenza antiviral medications is continuing.

# Hazard Profile



**Figure 19-1. Disease Outbreak/Pandemic Influenza Hazard Profile Summary for the City of Plano**

The frequency, or likelihood, of pandemic influenza in the City of Plano is “Possible,” with an event is possible in the next four to five years. The spatial extent of disease outbreak/pandemic influenza is “Moderate,” meaning that the hazard is expected to result in multiple deaths or injuries. There may be a complete shutdown of facilities for more than one week. If it occurs, however, it would, by definition, affect much of the City’s population with a potentially critical impact.

## Location of Hazardous Areas

The two most important geographic considerations for disease outbreak/pandemic influenza are that it occurs almost everywhere and that it moves extremely rapidly. For example, in 1918, well before the advent of commercial passenger aviation, pandemic influenza spread across the United States within a six- to eight-week period. There is no geographic boundary for disease outbreak/pandemic influenza.

Quarantine has not been typically used with much success to stop the spread of influenza. However, in a pandemic influenza outbreak, isolation of exposed persons may be necessary. The public health community may provide quarantine instructions to certain highly affected areas.

The City of Plano considered as a hypothetical example of an influenza pandemic. For the table-top exercise, the center of the pandemic epidemic was the Baylor Medical Center and the two other hospitals within a two-mile radius of Baylor Medical Center, since they would be at the forefront of providing care to victims. Using this hypothetical example, a typical quarantine area was established. The hypothetical buffer area involved almost 52,000 people and major economic areas. There is no federal requirement for a standard buffer distance. The objective is to keep the infected people from "rushing" the hospital, gaining access and contaminating clean areas. Signage should be utilized to direct people to an entry control point. The Plano Public Health Department and law enforcement should have a coordinated buffer protection/patrol plan.

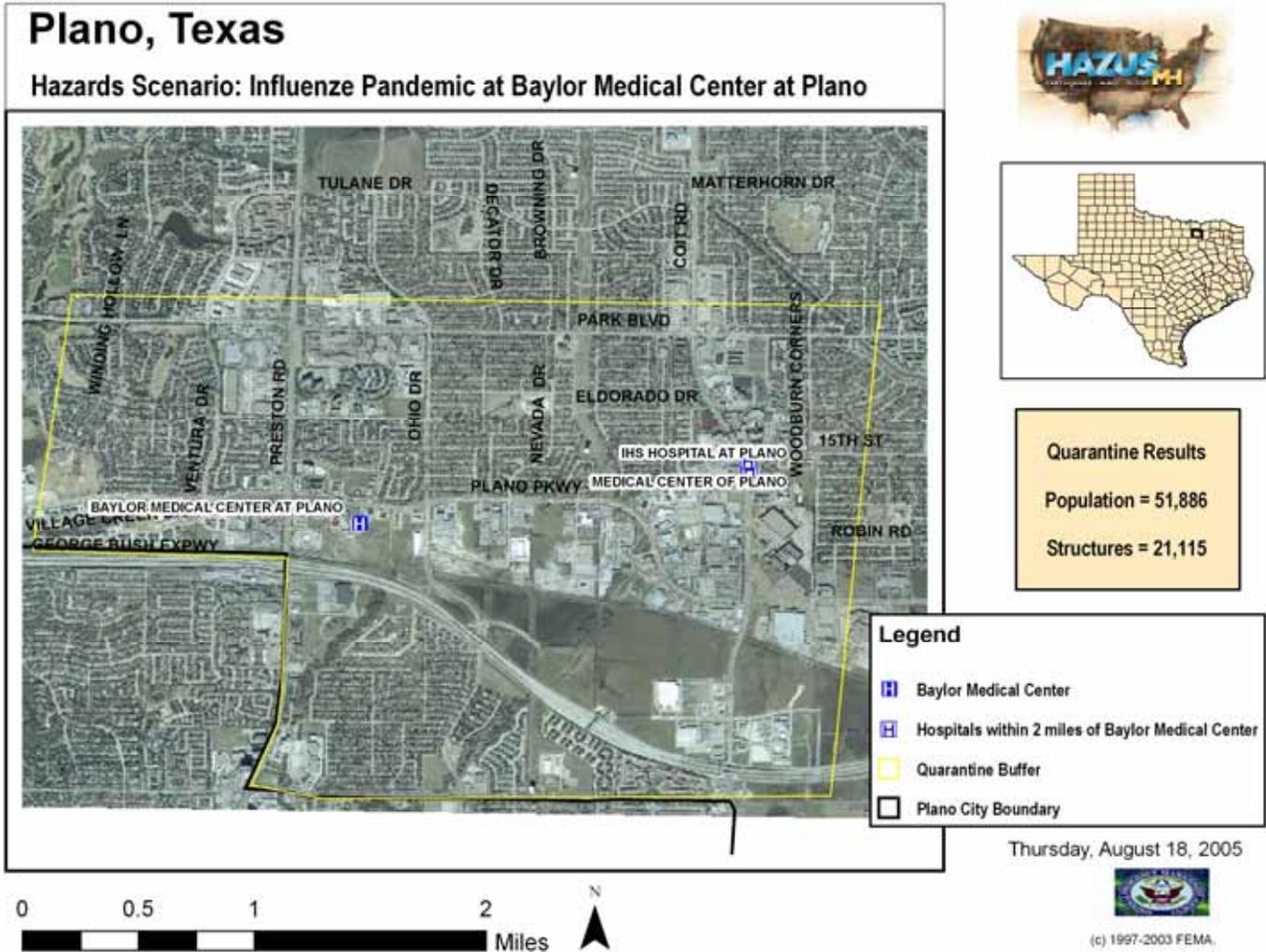


Figure 19-2. Hypothetical Hazards Scenario, Influenza Pandemic at Baylor Medical Center, Plano



# History of Disease Outbreak/Pandemic Influenza

During the 20th century, the emergence of new influenza A virus subtypes caused three pandemics, all of which spread around the world within 1 year of being detected.

- **1918-19, "Spanish flu,"** [A (H1N1)], caused the highest number of known influenza deaths: more than 500,000 people died in the United States, and up to 50 million people may have died worldwide. Many people died within the first few days after infection, and others died of complications later. Nearly half of those who died were young, healthy adults. Influenza A (H1N1) viruses still circulate today after being introduced again into the human population in the 1970s.
- **1957-58, "Asian flu,"** [A (H2N2)], caused about 70,000 deaths in the United States. First identified in China in late February 1957, the Asian flu spread to the United States by June 1957.
- **1968-69, "Hong Kong flu,"** [A (H3N2)], caused about 34,000 deaths in the United States. This virus was first detected in Hong Kong in early 1968 and spread to the United States later that year. Influenza A (H3N2) viruses still circulate today.

Both the 1957-58 and 1968-69 pandemics were caused by viruses containing a combination of genes from a human influenza virus and an avian influenza virus. The origin of the 1918-19 pandemic virus is not clear.

## People and Property at Risk

Everyone in the City of Plano would be at risk from pandemic influenza. Increasing the risk is the almost certainty that few, if any, medical personnel, medical equipment, or similar resources would be available for redistribution. In the United States, State, city, and local governments, as well as health care systems, essentially would have to cope using already existing resources. Obviously, available medical supplies, such as vaccines and drugs, would be distributed as available. But health care systems would not, for example, be able to "borrow" additional health personnel from the neighboring city or State.

When planning and preparing for the next influenza pandemic, there are two equally important timelines. Due to the rapid spread of the influenza pandemic and the time required to develop, test, produce, and distribute an effective vaccine, the disease may arrive in the United States before a "significant" number of people can be vaccinated. The implication of this is that, as part of any



pandemic influenza preparation and response plan, there must be a mechanism for allocating the vaccine among the population.

Projections of the number of people who would be sick and the number who would die in the City of Plano from a disease outbreak/pandemic influenza depend entirely upon assumptions as to the virulence of the influenza strain and the time necessary to produce an effective vaccine.

The severity of the next pandemic cannot be predicted, but modeling studies suggest that its effect in the United States could be severe. In the absence of any control measures (vaccination or drugs), it has been estimated that in the United States a “medium-level” pandemic could cause 89,000 to 207,000 deaths, between 314,000 and 734,000 hospitalizations, 18 to 42 million outpatient visits, and another 20 to 47 million people being sick. Between 15% and 35% of the U.S. population could be affected by an influenza pandemic, and the economic impact could range between \$71.3 and \$166.5 billion.

It is clear, however, that property damage would be minimal. Significant economic losses would occur due to the absence of infected workers from their jobs. Estimates of the nation-wide economic cost of a pandemic influenza range from \$87 billion to \$203 billion. Based on its population, the City of Plano’s proportionate share of such losses would be between \$70 million and \$160 million.

## Preparing for the Next Pandemic

Many scientists believe it is only a matter of time until the next influenza pandemic occurs. Recent examples of avian influenza outbreaks and infections in Hong Kong in 1997, 1998, and 2002 and the ongoing widespread outbreaks of avian influenza among poultry in Asia, show the importance of preparing for a pandemic. It has been 36 years since the last pandemic.

Influenza pandemics are different from many of the threats for which public health and the health-care system are currently planning:

- The pandemic will last much longer than most other emergency events and may include “waves” of influenza activity separated by months (in 20th century pandemics, a second wave of influenza activity occurred 3 to 12 months after the first wave).
- The numbers of health-care workers and first responders available to work can be expected to be reduced; they will be at high risk of illness through exposure in the community and in health-care settings, and some may have to miss work to care for ill family members.
- Resources in many locations could be limited because of how widespread an influenza pandemic would be.



Because of these differences and the expected size of an influenza pandemic, it is important to have completed planning and preparedness activities to be able to respond promptly and adequately. For this reason, the U.S. Department of Health and Human Services (HHS) is actively involved in supporting pandemic influenza activities in the areas of surveillance (“detection”), vaccine development and production, antiviral stockpiling, research and public health preparedness. In addition, a draft National Pandemic Influenza Preparedness Plan was issued by HHS for public comment in August 2004.

A possible outbreak of pandemic influenza has the potential for becoming a major disaster in the Nation’s history. This hazard merits mitigation consideration by the City of Plano.