

APPENDIX E. The Threat of Pandemic Influenza

E

Influenza or flu viruses routinely cause epidemics of disease every winter that can cause illness in about 10–20 percent of the population in the United States. Although these routine influenza epidemics cause an average of 36,000 deaths and 200,000 hospitalizations per year in the United States, healthy adults are usually not at high risk for complications. The groups that are at risk for complications include the very young, pregnant women, older adults, and those with chronic medical conditions. Typically, flu shots are available and effective against these types of influenza outbreaks, although persuading people most at risk to get annual vaccinations remains a challenge. Flu viruses are continually circulating around the world and mutate or change over time. This is the reason that the vaccine is updated to include current viruses each year, and that people who want to be protected against the flu need to get a new flu shot each year.

Pandemics of influenza are explosive global events in which most, if not all, persons worldwide are at risk for infection and illness. In past pandemics, influenza viruses have spread worldwide within months. With increased globalization, a new pandemic could circle the globe within weeks, or perhaps even days. Pandemic viruses have historically infected one-third or more of large populations and have led to tens of millions of deaths.

Pandemics occur when there is a major change in an influenza virus, resulting in a new strain that most of the world has never been exposed to, therefore leaving most individuals susceptible to infection. Unlike the gradual changes that occur in the influenza viruses that appear each year during flu season, a pandemic influenza virus is one that represents a major, sudden shift in the virus structure that increases its ability to cause illness in a large proportion of the population. This kind of change is called an “antigenic shift.”

There are two types of influenza viruses: type A and type B. Type A viruses can be found in many types of animals, while type B viruses circulate only among humans. While a routine epidemic can involve either type of virus, antigenic shift can only occur with type A influenza viruses. One way that an antigenic shift can occur is through pigs. Pigs can be infected with both avian and human influenza viruses. If pigs are infected with viruses from different species at the same time,

it is possible for the genes of these viruses to mix and create a new virus. Humans would not have any immune protection to such a virus and could be infected in large numbers (CDC, 2004d). The rare appearance of a flu pandemic virus would likely be unaffected by currently available flu vaccines that are modified each year to match the strains of the virus that are known to be in circulation among humans around the world.

During previous influenza pandemics, large numbers of people were ill, sought medical care, were hospitalized, and died. Three major influenza pandemics occurred during the 20th century. The most deadly influenza pandemic outbreak was the 1918 Spanish flu pandemic, which caused illness in roughly 20–40 percent of the world’s population and more than 50 million deaths worldwide. Between September 1918 and April 1919, approximately 675,000 deaths from the Spanish flu occurred in the United States alone (HHS, 2004a). In 1957, the Asian flu pandemic resulted in about 70,000 deaths. The most recent influenza pandemic occurred in 1968 with the Hong Kong Flu outbreak, which resulted in nearly 34,000 deaths in the United States. Although the virus involved in the 1968 outbreak was a dangerous virus, experts believe that fewer deaths occurred in the United States than in previous outbreaks for several reasons:

- › The virus was similar to the virus that appeared in the 1957 outbreak, and some people already had immunity.
- › The peak of the outbreak occurred during December when children were out of school, so the virus was not widely transmitted among school-aged children.
- › Medical care and available treatments for complications had improved since the 1957 outbreak (HHS, 2004b).

Although no one can predict when the next pandemic will occur, public health scientists believe that the risk of an influenza pandemic is greater now than it has been in decades.

AVIAN INFLUENZA

One type of influenza A virus that is of concern to many public health officials is often called avian flu or bird flu. Both the 1957 and 1968 pandemics are thought to have had avian origins. Avian flu is caused by a group of influenza viruses that circulate among birds. Avian flu is highly contagious among

birds, particularly domesticated birds, such as chickens. It is thought that most human cases have resulted from contact with infected birds. In the past, quarantine and depopulation (or culling) and surveillance of affected flocks have contained outbreaks. Among humans, symptoms range from conjunctivitis to a flu-like illness that includes severe respiratory distress and pneumonia. As of early 2007, there has been no evidence of sustained human-to-human transmission of avian flu, although there have been a few cases of transmission between family members. However, because influenza viruses have the potential to change and gain the ability to spread easily between people, monitoring for human infection and person-to-person transmission is important.

A growing number of people have been infected with avian flu since 1997. The first documented human case was identified in 1997 in Hong Kong. Both humans and chickens were infected. Eighteen people were known to be infected, and six died. To prevent further spread of the disease, public health authorities killed more than a million chickens. A second outbreak occurred in Hong Kong in 1999; two children were infected, and both recovered. Three outbreaks occurred during 2003. Two separate cases occurred in Hong Kong and a third outbreak occurred among poultry workers and their families in the Netherlands. Eighty-four people were infected, and one died.

Between 2004 and early 2007, more than 200 cases of avian influenza were reported in a number of countries in Asia, the Near East, Africa, and Europe. All of these cases have involved the strain called H5N1. Most of these cases are believed to have been caused by exposure to infected poultry. More than half of the people reported to be infected with H5N1 have died (HHS, 2007).

So far, the spread of H5N1 virus from person to person has been limited and has not continued beyond one person. Nonetheless, because all influenza viruses have the ability to change, scientists are concerned that H5N1 virus one day could be able to infect humans and spread easily from one person to another (HHS, 2007). An additional reason for the current heightened concern about influenza viruses is that avian influenza has become endemic in many species of birds

throughout Asia. Therefore, the threat of an avian flu pandemic is not diminishing. Scientists will need to continue to monitor avian flu epidemics carefully to make sure that they remain contained and that the virus has not transformed into a virus that can be easily transmitted from person to person.

The threat to the United States specifically is considered uncertain at this time. Although poultry imports from Asia are limited (mostly feathers or processed or cooked products, which are considered to be low risk), it is possible that, in the future, an individual infected with a new avian influenza virus that is able to spread from person to person could travel to the United States (Center for Emerging Issues, 2004).

PREPARING FOR A PANDEMIC

Prepandemic planning is essential to minimize the effects should an influenza pandemic occur. Although some of the planning activities for terrorism and other public health emergencies are relevant to an influenza pandemic (e.g., strengthening surveillance systems), planning is also underway that is more specific to influenza. HHS' current Pandemic Influenza Plan (<http://www.pandemicflu.gov>) provides guidance to national, state, and local policymakers and health departments for public health preparation and response in the event of a pandemic influenza outbreak. Pandemicflu.gov is also the primary Web site portal to a variety of resources for governments at all levels, individuals and families, businesses, health care providers, and community organizations.

At the federal level, health officials are also conducting a number of other activities in preparation for the next pandemic, including international surveillance activities, vaccine development and research, and antiviral drug stockpiling and research. Among other activities, resources are being allocated to expand vaccine production as needed and add influenza antiviral drugs to the Strategic National Stockpile (SNS). Research is also being conducted on new influenza vaccines, more effective antiviral drugs, and ways to rapidly sequence the genes of influenza viruses.

If a pandemic were to occur, the federal response activities would depend, to an extent, on the stage of the pandemic. For example, the activities would be different if scientists discover

a new influenza strain in one person in another country than if a number of people in the United States were ill with a new strain of influenza. The kinds of activities in which the federal government might be involved include:

- › National and international surveillance to identify people who have the virus and where outbreaks are occurring
- › Rapid development, licensure, and production of new vaccines
- › Implementing programs to distribute and administer vaccine
- › Determining how antiviral drugs could be used to combat the current flu strain and target drug supplies
- › Implementing control measures to decrease the spread of the disease (e.g., infection control in hospitals, screening travelers from affected areas)
- › Communicating with the public, health care providers, community leaders, and the media about the status of the pandemic and the response

States have developed their own plans to deal with the local aspects of planning for and response to a potential influenza

pandemic. Some examples of what these plans include are the state and local perspective on:

- › Surveillance activities
- › Vaccine management (distribution and administration)
- › How to acquire and use antiviral agents
- › How to implement community control measures (e.g., school closings, isolation and quarantine)
- › Emergency response (e.g., delivery of medical care, maintenance of essential community services)

Local preparedness will be an essential determinant of how communities do in the early months of a pandemic. Communities are encouraged to plan now for the crucial period when a pandemic has struck, but when there are not yet adequate supplies of vaccines or antivirals. The following tasks should be considered by communities in this process:

- › Reducing social contact to slow the spread of the virus
- › Treating those who become ill
- › Sustaining civic life in the face of greatly increased morbidity, mortality, and fear

 **SOME DIFFERENCES BETWEEN TYPICAL INFLUENZA OUTBREAKS AND PANDEMIC INFLUENZA OUTBREAKS**

TYPICAL INFLUENZA	PANDEMIC INFLUENZA
Yearly occurrence.	Rare occurrence (last one was in 1968).
Virus undergoes gradual change from previous years.	Major, sudden shift in virus structure (antigenic shift).
Previous exposure to similar viruses may provide some protection.	Little or no previous exposure in the population to similar viruses.
Healthy adults usually not at high risk for complications.	Entire population may be at risk for complications.
Vaccines may be developed in advance to combat the virus.	Vaccines cannot be developed until virus strain appears. Some antiviral medications may be effective.
Approximately 5–20 percent of Americans get the flu each year and approximately 36,000 die from the disease.	Percentages of the population that would be infected by a pandemic influenza virus and die from it are hard to predict ahead of time but would be significantly higher than a typical flu season.
Symptoms include fever, cough, runny nose, and muscle pain.	Symptoms could be more severe, including shortness of breath, acute respiratory distress, pneumonia, and organ failure.

Examples of the many issues a community should consider are: how to use volunteers, especially people who have recovered and are, therefore, immune; how to educate children if schools were closed; and how essential businesses would operate.

More detail on federal and state preparedness and response activities, as well as information on all aspects of pandemic flu and avian influenza, can be found at <http://www.pandemicflu.gov>.

BIBLIOGRAPHY

Center for Emerging Issues. (2004). Highly pathogenic avian influenza, Asia outbreak summary, January 29, 2004: Impact worksheet. http://www.aphis.usda.gov/vs/ceah/cei/taf/iw_2004_files/foreign/hpai_asia_summary_0104_files/hpai_asia_summary_0104.htm.

Centers for Disease Control and Prevention. (2004). Bird flu fact sheet. <http://www.cdc.gov/flu/avian>.

Centers for Disease Control and Prevention. (2004). Fact sheet—Influenza (flu): Basic information about avian influenza (bird flu). <http://www.bt.cdc.gov/documents/planning/planningguidance.pdf>.

Centers for Disease Control and Prevention. (2004d). The influenza (flu) viruses. <http://www.cdc.gov/flu/about/fluviruses.htm>.

Centers for Disease Control and Prevention. (2007). Avian influenza infection in humans. <http://www.cdc.gov/flu/avian/gen-info/avian-flu-humans.htm>.

U.S. Department of Health and Human Services. (2004b). National Vaccine Program Office: Pandemics and pandemic scares in the 20th century. <http://www.hhs.gov/nvpo/pandemics/flu3.htm>.

U.S. Department of Health and Human Services. (2005). HHS pandemic influenza plan. <http://www.hhs.gov/pandemicflu/plan/pdf/HHSPandemicInfluenzaPlan.pdf>.

U.S. Department of Health and Human Services. (2007). General information. <http://www.pandemicflu.gov/general/index.html>.

World Health Organization. (2004). Avian influenza A(H5N1)—Update 32: Situation (human) in Thailand. http://www.who.int/csr/don/2004_03_09/en/print.html.

World Health Organization. (2004). Avian influenza—Fact sheet. http://www.who.int/csr/don/2004_01_15/en/print.html.