

Pandemic Influenza Epidemiology and Planning— Are Your Organization and Family Prepared?

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1.0 Introduction

The subject of Pandemic Influenza Planning is one of great concern to governments, businesses, and individuals due to the very large and potential global impact of such a widespread disease outbreak. The H5N1 influenza virus that causes avian influenza disease is the primary virus of concern in current pandemic planning. As such, it is important to understand the means of transmission, symptoms, and likely mechanism of spreading throughout the population.

State and Federal planning efforts to prepare and protect the Nation against a pandemic have produced a number of state plans. The United States Centers for Disease Control has taken a leadership role in developing plans, disseminating information, and providing training and coordination to local health officials, organizations, and hospitals.

The emergence of an avian flu pandemic (AFP), with rates of high attack and high fatalities, could have a substantial impact on individuals, on the global economy, and on financial systems throughout the world. While the current strain of avian flu outbreak among birds has occasionally affected humans with high fatality rates, it does not spread easily from birds to humans, or yet from person to person. However, health experts are concerned that the virus could mutate into a form that allows for efficient human-to-human transmission while retaining its high mortality rate.¹

Avian influenza refers to a large group of different influenza viruses that primarily affect birds. On rare occasions, these bird viruses can infect other species, including pigs and humans. The vast majority of avian influenza viruses do not infect humans. An influenza pandemic could occur when a new subtype influenza strain emerges that has not previously circulated in humans. A pandemic occurs when a new influenza virus emerges and starts spreading as rapidly by coughing and sneezing. Because the virus is new, the human immune system will have no pre-existing immunity, making it likely that people who contract pandemic influenza will experience more serious consequences than caused by a normal influenza infection.

Once a fully contagious virus emerges, its global spread is considered inevitable. Countries might, through measures such as border closures and travel restrictions, delay arrival of the virus, but cannot stop it. The pandemics of the previous century encircled the globe in 6 to 9 months, even when most international travel was by ship. Given the speed and volume of international air travel today, the virus could spread more rapidly, possibly reaching all continents in less than 3 months.²

2.0 Historical Background

In the last century, three influenza pandemics have occurred worldwide resulting in the loss of millions of lives. The 1918 Spanish influenza killed over 500,000 Americans and more than 20 million people worldwide.

The 1918 Spanish Flu³

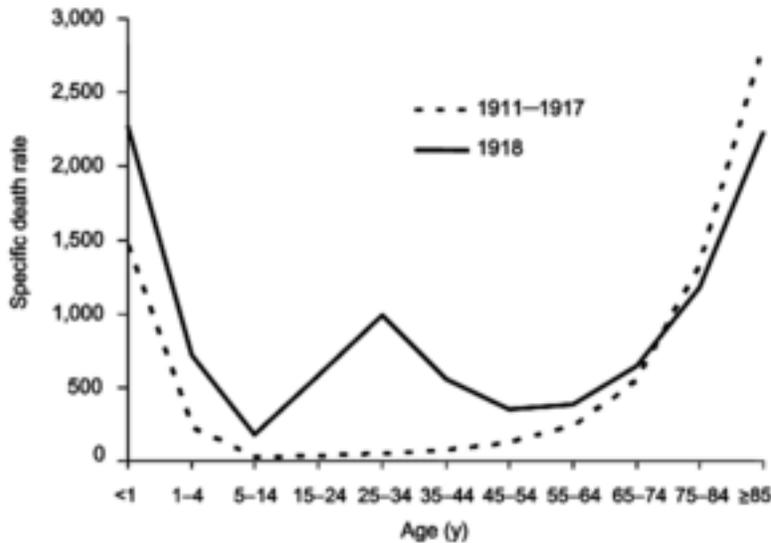
The Spanish flu of 1918-19 was the most lethal influenza pandemic of the 20th century. According to World Health Organization (WHO) estimates, it infected about one-quarter of the global population and took the lives of more than 40 million people—about 2 percent of the global population at the time, and more people than died in WWI. This renders the Spanish flu the third most deadly pandemic on record, surpassed only by the plague pandemics of the 6th and 14th centuries. One unusual feature of the Spanish flu was that it killed not only the very young and the very old, but also adults in the prime years with above-average frequency. Despite its name, the first outbreak of Spanish flu was recorded in early 1918 in army camps in the United States. The Spanish flu came in three waves, with the second wave which begun in August 1918 in France, Sierra Leone, and the United States being the most deadly. Fatality rates varied greatly between countries, ranging from an estimated 0.5 percent of the population in the United States (equivalent to about 600,000 deaths) to about 5 percent in India and 20 percent in some Pacific islands, such as Fiji or Western Samoa.

Information on the economic impact of the Spanish flu is limited, partly because the epidemic broke out during WWI when most governments restricted the flow of information, but also because national income accounting was in its infancy at the time. According to data available for the United States, both industrial production and the business activity index dipped at the height of the epidemic in October 1918. However, according to a recent study by the Canadian Department of Finance these declines point to an annual output loss of only 0.4 percent. Other indicators point to temporary and modest reductions in passenger rail transport and retail sales. Federal reports note that “While these estimates suggest a surprisingly modest economic impact, it appears unlikely that a similar outbreak today would have comparably limited effects.” The Spanish flu struck when the U.S. economy was supporting World War I, and there was likely considerable social pressure on workers to stay at work. The lack of a formal financial, health insurance, and social safety net may have threatened workers with high financial costs in case of absenteeism from the workplace. One study dating from the 1960s for another country, India, finds that agricultural output declined by over 3 percent⁴. This impact may reflect the heavy toll of the pandemic on the agricultural workforce, of which some 8 percent are estimated to have succumbed to illness. Experts believe that these estimates are subject to large margins of error.

Scientists believe that viruses from birds played a role in each of those outbreaks. Recent spreads of avian influence show causes for concern. The new avian influenza subtype H5N1 is spreading through bird populations across Asia, Africa and Europe and has infected more than 300 people as of June 2008. More troubling has been the high case fatality rate of 60%. There is little preexisting natural immunity to H5N1 virus infection in the human population. If H5N1 viruses gain the ability for efficient and sustained transmission among humans, an influenza pandemic could result, with potentially high rates of illness and death worldwide.

Even with modern medicines and vaccines it is estimated that a widespread outbreak would cause mass illness and death. Public transportation systems, schools public events, and the functions of businesses and organizations may be dramatically affected such that normal operations may not be able to occur. Disruptions in distribution of food, services, fuel, and other items and services may occur, affecting national and world economies.

3.0 Epidemiology



Specific death rate versus age in the 1911-1917 and 1918 outbreaks. Note peaks at both very young, very old, and age 25 subpeak.

Influenza, commonly known as flu, is an infectious disease of birds and mammals caused by an RNA virus of the family *Orthomyxoviridae* (the influenza viruses). In humans, common symptoms of influenza infection are fever, sore throat, muscle pains, severe headache, coughing, and weakness and fatigue. In more serious cases, influenza causes pneumonia, which can be fatal, particularly in young children and the elderly. Sometimes confused with the common cold, influenza is a much more severe disease and is caused by a different type of virus. Although nausea and vomiting can be produced, especially in children, these symptoms are more characteristic of the unrelated gastroenteritis, which is sometimes called "stomach flu" or "24-hour flu."

Typically, influenza is transmitted from infected mammals through the air by coughs or sneezes, creating aerosols containing the virus, and from infected birds through their droppings. Influenza can also be transmitted by saliva, nasal secretions, feces and blood. Infections occur through contact with these bodily fluids or with contaminated surfaces. Flu viruses can remain infectious for about one week at human body temperature, over 30 days at 0 °C (32 °F), and indefinitely at very low temperatures (such as lakes in northeast Siberia). Most influenza strains can be inactivated easily by disinfectants and detergents.

4.0 Current Planning and Worst Case Scenarios

The World Health Organization spokesman on influenza, reported to a recent news conference in Geneva that the WHO's official estimate of the number of people who could die was between two million and 7.4 million.⁵

Several studies of the widespread economic impact, or macroeconomic impact, of an influenza pandemic have been released, providing estimates that span a wide range and thereby highlight the considerable uncertainty involved. In December, 2006, the Congressional Budget Office estimated that a severe influenza pandemic (similar to the one that began in 1918) might cause a decline in U.S. gross domestic product (GDP) of about 4-1/4 percent and that a milder pandemic (similar to those that occurred in 1957 and 1968) might reduce GDP by about 1 percent, relative to what would have happened otherwise. One recent study, notable in that it analyzes economic data from past pandemics, suggests that the impact of a 1918-style pandemic would be milder than what CBO and others have estimated.⁶

In light of 2008 and 2009 economic downturns, this financial impact would be considerable in an already extremely stressed world financial situation.

As part of its pandemic response plan, the Department of Health and Human Services is targeting planning for sufficient capacity to exist by 2011 to produce influenza vaccine for the entire U.S. population within six months of an outbreak.⁷

Current national response to a pandemic influenza relies primarily on state and local Governments, the private sector, and the federal government for overall coordination, crisis management, and expertise. For 2006, the Congress appropriated \$680 million to improve response, including funding for state and local planning, state purchases of antiviral drugs for stockpiles, and purchases of medical supplies.⁸

Antiviral Drugs and Other Medicines to Treat the Sick are budgeted by the Department of Health and Human Services in a budget of \$731 million appropriated (2006) on currently available antiviral drugs and research to develop new antiviral agents. The funds are allocated for both federal and state initiatives. Specifically, the federal government will spend \$361 million to purchase approximately 20 million doses of Tamiflu and Relenza for the Strategic National Stockpile. Those doses are expected to be delivered by the first quarter of 2007. States will be given \$170 million in matching funds to use toward the purchase of 31 million doses of antiviral drugs for their stockpiles.⁹

The projected pandemic surge in hospitalized people would result in a need for supplies and medical equipment. Hospitals will need more protective equipment such as surgical masks, gloves, and gowns, and they would need to have the capacity for increased decontamination and waste management. As occurred during the SARS outbreak in Canada, hospitals would especially need N95 particulate respirators to protect medical staff against infection.

The widely adopted just-in-time practices for procurement of medical supplies may help to control costs in normal circumstances but in the event of emergency will leave too small an inventory margin to accommodate the increased demand for supplies that would inevitably

accompany an influenza pandemic. Federal government reports that certain other essential equipment would also be needed, such as ventilators, which would be of particular importance because sick patients with inflamed and fluid-filled lungs would need assistance with breathing.

The Congressional Budget Offices assessment noted that the United States has approximately 100,000 ventilators, with three-quarters of them in use on any given day. According to the Department of Health and Human Services, a severe influenza pandemic like the one in 1918 would require 750,000 ventilators to provide treatment to all who need such ventilators.¹⁰

The effectiveness of some antiviral drugs is in question. When effective, an antiviral drug reduces the severity, duration, and likelihood of death associated with a viral infection. But there are not solid data about how effective currently available antiviral drugs are against the H5N1 virus. It is commonly believed that viral resistance to the older and less expensive class of antiviral drugs called adamantanes would limit their usefulness during a pandemic.¹¹

The Federal Government's implementation plan delegates more than 300 critical actions to various federal agencies. However, the critical tasks still focus primarily on assisting states to prepare for a pandemic. In the event of a pandemic, states would rely in part on Health and Human Services for public health and medical response, the Department of Homeland Security for domestic incident management and federal coordination, and several other agencies for various types of support.¹² In a severe pandemic, the economic impact is likely to be significant, though predictions are subject to a high degree of uncertainty. The severity of a pandemic will depend on its attack and fatality rates, duration, and the preparedness and actions of households and organizations, as well as the capacity and preparedness of health care systems.

Disruptions of services and supplies could come directly from high absenteeism, as people may be asked to stay at home, or may choose to do so to care for sick relatives or because of fear of being exposed themselves.¹³

High rates of illness and worker absenteeism are expected, and these will contribute to social and economic disruption. Past pandemics have spread globally in two and sometimes three waves. Not all parts of the world or of a single country are expected to be severely affected at the same time. 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, water, transportation, and communications.¹⁴

An Avian Influenza Pandemic may rapidly affect multiple regions and countries. Moreover, the World Health organization warns that, in the case of a severe pandemic, relatively large geographical areas may have to be quarantined. The AIP may also result in major disruptions to transportation, electricity production, and telecommunications, and may severely stretch even basic services, including police, fire, and emergency medical care.¹⁵

In severe socioeconomic disruption in quarantined areas, severe law enforcement measures may be taken to maintain order.

5.0 The Role of the Safety Professional in the Organization

The safety professional may find that in their organization there is no one assigned to the task of pandemic preparation. Many organizations have emergency response and/or business resumption tasks assigned and staffed. In this case, working with these organizational units is advised to endure that pandemic influenza preparation is one of their planning scenarios.

In the cases of other organizations, especially smaller entities, the pandemic planning function may not be assigned. In this case, the safety professional can take a proactive role in advising senior management of the major issues, and recommended a response level that the organizational leadership is comfortable with. A key role of the safety professional may be in raising an alert in civic and organizational circles to ensure that appropriate planning and coordination with health professionals, government, businesses and the public have occurred.

The International Monetary Fund Pandemic Group advises that an Avian Influenza Pandemic could result in significant absenteeism over a period lasting several weeks, which may arise from the illness itself, from official or autonomous attempts to limit its spread, from the need to care for the ill, because of forced closing of schools, and even from widespread panic. Projections are difficult, and absenteeism may vary widely across the cycle of the pandemic. Absenteeism could become so widespread that staffing for the even the most critical operations may become inadequate.¹⁶

To prepare for this, it is recommended that each organization identify key resources and necessary response actions for their organizations. Organizations may then selectively phase in parts of their response plan as the pandemic progresses.

The following phases are adapted from the International Monetary Fund documents to be used in preparing organizations:

- Phase 1: No human-to-human outbreak reported. Costs of preparations included in the regular budget but may include some stockpiling of critical supplies and establishing task forces in key areas for detailed planning, coordination, and testing.
- Phase 2: Human-to-human transmission is identified. More costly measures implemented. Activities in that region isolated, activities shifted to other locations where possible, and staff removed from the area.
- Phase 3: Isolated outbreaks in the parent company's country. Preparations accelerated, most costly measures implemented, staff dispersal initiated.
- Phase 4: Outbreak affects key production areas or crucial facilities. The full range of the institution's plans is implemented.
- Phase 5: Recovery period, including reintegration of staff and resumption of production, continued monitoring for further outbreaks, assessment of "lessons learned" from the outbreak.

6.0 Family and Community Preparedness

What should organizations and individuals do to be prepared for the event of an avian influenza pandemic? What are resources they may use in their efforts? Basically this is a scaled down

version of what one will do for an organization. Education of family and community is important, as well as coordinating with family members, or community partners as to roles, and resources available, as well as expectations of resource limitations. A good home preparedness or community preparedness checklist should be used, as are available on the American Red Cross websites. These should include additional specific items necessary for pandemic preparation, such as N-95 respirators and disinfectants.

7.0 Checklists

IMF Checklist for a Pandemic Response Plan

- Identify core activities or basic minimum services.
- Identify the activities the organization will cease providing or scale down at each phase of the response plan, recognizing that demand for certain services will change in a pandemic.
- Identify key employees and supplies needed to provide critical services. Scenario analysis can be useful to obtain a range of possible effects and actions. Institutions should recognize that identification of critical staff will depend on the length of the disruption and on the timing of the absenteeism.
- Create redundant or double teams for all critical staff functions. Some institutions are planning to split their critical staff into two sections to operate from different locations and are training ancillary workforce, including contractors, employees with other job titles, and retirees.
- Develop staffing plans & identify work that must be done in the office and work that can be done from home.
- Establishing remote and redundant facilities for activities that must be done from centralized locations¹⁷
- If the facilities are in a populated area, steps should be taken to protect the site from a spreading flu pandemic.
- If staff is moved to remote facilities, determine if they commute from home. Identify when staff would be dispersed and whether families move with them.
- Institutions should undertake regular tests of the equipment and procedures for remote facilities that are not staffed or operational in normal times.
- Determine and inventory how to ensure adequate communication with staff, including cell phones and landline telephone numbers, and personal e-mail addresses. Identify platforms and backup system for communicating with staff, vendors, suppliers, and customers for timely updates and emergency contact systems (i.e., hotlines and dedicated websites).
- Inform staff about the organizations plan, how the plan would be triggered and where to monitor the institution's ongoing preparation.

Pandemic Influenza Education Checklist:

- Establish education programs for staff.¹⁸
- Include reminders on the importance of hand washing and health habits such as cough hygiene, diet, and exercise.
- Set reminders to staff at high risk of the need for special care.
- Provide advice on the difference between flu and a cold, and between avian flu and other flu's.
- A strong insistence that staff who feel ill should not report to work (together with liberal leave policies and non-punitive sick leave.)

Health, Security, and Safety Issues Checklist

- Protection of the health of an institution's staff will be a key concern. Up-to-date information on the health of the staff will be critical for managers. Clearly established policies can reduce the spread of the virus, ease staff concerns, and allow time for the institution to address disruptions. Issues include both the treatment of sick staff and limiting the spread of the infection.
- Examples of actions that can be taken include early planning of health responses to an AFP, identifying steps to take at each phase of the pandemic (stockpiling of critical supplies in the early stage, intensive cleaning as the pandemic becomes established, to closing key facilities and changing business practices such as working hours as the pandemic becomes established in the country).
- Establishing mechanisms to centralize information and track sickness among staff.
- Instituting guidelines for the phased intensification of measures to reduce face-to-face contact (avoiding meetings, seating in meetings, use of videoconferencing, and modification of office layouts).
- Distribute hygienic supplies throughout the offices, including hand sanitizers, tissues, and special trash receptacles with hands-free lids.
- Establishing designated places to quarantine the sick and arrangements for their transportation to health centers, policies for rapid cleaning of workspace, and the monitoring of those who were in contact with the sick.
- Extending working hours, aimed at reducing crowding in the building, closing the business to visitors, and staggering lunch hours.
- Identifying whether any specially trained and equipped staff are needed to assist with medical emergencies.
- Employees who have already been ill with the virus and have recovered are likely to have a degree of immunity and may be available to act in a volunteer capacity or in critical staff functions.
- Travel restrictions issues should be considered, as well as plans for any staff held in quarantine abroad (e.g., means of transferring emergency cash or providing credit, revision of medical insurance policies to ensure coverage will extend to those in quarantined areas).
- Some institutions will review staff insurance policies, to ensure that coverage extends to those in quarantined areas.
- Plans are being developed by some global institutions for the wholesale evacuation of staff from infected areas. Issues to be considered in evacuation plans include collecting required documentation in advance, finance considerations, contingency plans for business and staff that remain in the infected area, and security for offices and houses in evacuated areas.¹⁹

8.0 References

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- International Monetary Fund, **The Global Economic and Financial Impact of an Avian Flu Pandemic and the Role of the IMF**, Prepared by the Avian Flu Working Group¹, (in consultation with Departments and the Joint Bank-Fund Health Services Department), February 28, 2006

9.0 Endnotes

¹ International Monetary Fund, *The Global Economic and Financial Impact of an Avian Flu Pandemic and the Role of the IMF*, Prepared by the Avian Flu Working Group1, (in consultation with Departments and the Joint Bank-Fund Health Services Department), February 28, 2006, p 11.

² International Monetary Fund, *The Global Economic and Financial Impact of an Avian Flu Pandemic and the Role of the IMF*, Prepared by the Avian Flu Working Group1, (in consultation with Departments and the Joint Bank-Fund Health Services Department), February 28, 2006, p. 12.

³ International Monetary Fund, *The Global Economic and Financial Impact of an Avian Flu Pandemic and the Role of the IMF*, Prepared by the Avian Flu Working Group1, (in consultation with Departments and the Joint Bank-Fund Health Services Department), February 28, 2006

⁴ Theodore Schultz, 1964, "Transforming Traditional Agriculture" (New Haven, Yale University Press).

⁵ BBC News, Sept. 30, 2005.

⁶ Report to Congress, Congressional Budget Office, "A Potential Influenza Pandemic:

An Update on Possible Macroeconomic Effects and Policy Issues," May 22, 2006; revised July 27, 2006.

⁷ Ibid.

⁸ Ibid

⁹ Ibid

¹⁰ Department of Health and Human Services, "Pandemic Planning Assumptions," www.pandemicflu.gov/plan/pandplan.html.

¹¹ See Department of Health and Human Services, *Pandemic Influenza Plan*, Appendix D. However, a study expected to appear in a coming issue of the *Journal of Infectious Diseases* suggests the possibility that adamantanes can be used selectively alongside Tamiflu to treat people infected with some strains of the H5N1 virus. See Nicholas Zamiska, "Bird Flu Options Expand," *Wall Street Journal Online*, May 11, 2006.

¹² See the statements of John O. Agwunobi and Jeffrey W. Runge, Acting Under Secretary for Science and Technology and Chief Medical Officer, Department of Homeland Security, *Working Through an Outbreak: Pandemic Flu Planning and Continuity of Operations*, before the House Committee on Government Reform (May 11, 2006).

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¹⁴ International Monetary Fund, *The Global Economic and Financial Impact of an Avian Flu Pandemic and the Role of the IMF*, Prepared by the Avian Flu Working Group1, (in consultation with Departments and the Joint Bank-Fund Health Services Department), February 28, 2006, Page 12.

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¹⁹ International Monetary Fund, *The Global Economic and Financial Impact of an Avian Flu Pandemic and the Role of the IMF*, Prepared by the Avian Flu Working Group1, (in consultation with Departments and the Joint Bank-Fund Health Services Department), February 28, 2006, Page 26.