

Bird Flu Economics

by William F. Ford*

Studies by economists around the world indicate that a severe and widespread bird flu outbreak striking the U.S. could involve serious illness. It could affect up to 40 percent of the population and cause as many as 2 million fatalities. Such a disaster also could cost 4 to 11 percent of a given year's GDP.

Public health historians have identified many influenza-related pandemics dating back to at least the fifth century A.D., including three such events in the past 90 years. The most severe 20th-century pandemic was the Spanish flu of 1918-19, which generated more than 50 million fatalities worldwide and upwards of 500,000 deaths in the U.S. Only the Black Death in Europe, which ravaged that continent from 1348-1351, had a more devastating impact. During this period, bubonic plague killed about one-third of Europe's population.

In 1957, nearly 40 years after the Spanish flu, the Asian flu killed about 2 million people worldwide and caused roughly 75,000 U.S. fatalities. A little more than a decade later, in 1968, the Hong Kong flu caused about one million global fatalities and roughly 36,000 deaths in our country. All three of these 20th-century flu pandemics are believed to have originated in East Asia and to have involved avian flu virus strains.

Currently, public health authorities around the world are deeply concerned about a possible bird flu pandemic emanating from the deadly H5N1 avian flu virus. Recent outbreaks have forced the culling and destruction of tens of millions of live chickens and ducks throughout Southeast Asia, including the destruction of every live chicken in Hong Kong in June 2008.

The good news is that through year

end 2007, only 327 humans have been verified as being infected by the H5N1 virus. The really bad news is that 199 of them died from it, a remarkable 61 percent mortality rate. Almost all of those who died or were infected are believed to have had close contact with infected avian flocks.

Fortunately, the H5N1 virus has not yet mutated genetically into a flu strain that easily spreads from human to human. If and when such a virus appears, people will have no historic resistance to it. A specifically targeted vaccine can't be developed until the new bird flu strain actually appears in humans and is detected and analyzed by medical scientists.

Planning for a Pandemic

In anticipation of such a catastrophe, world and U.S. health authorities are committing billions of dollars to planning for such a pandemic. Public health experts believe there is a 3 to 4 percent chance each year that such a global flu pandemic may occur.

In America, preparations include stockpiling medications and other supplies that would be needed to treat millions of severely ill people. Hundreds of thousands of medical personnel and auxiliary civilian volunteers are being trained to set up a nationwide network of medical triage facilities. These facilities may be needed to treat up to 40 percent of our population if a very severe bird flu pandemic strikes this country.

In January 2007, the Centers for Disease Control developed a *Pandemic*

Severity Index (PSI) that public health officials on the state and local levels can use to plan public health responses. That, in turn, has set the stage for an analysis of the expected economic consequences of a human-to-human bird flu outbreak.

The *PSI* will be used to prescribe an increasingly comprehensive and costly series of public health responses as a pandemic appears, widens and deepens around the world. Table 1 provides a list of the basic characteristics of a possible flu outbreak, along an intensity scale ranging from one to five. Category 1 represents an event roughly equivalent to a seasonal flu outbreak, while Category 5 represents the most severe circumstances and is equivalent to the Spanish flu pandemic in severity.

The Cost of Urbanization

Public health officials are in near-unanimous agreement that a human-to-human bird flu virus would quickly spread around the world because of the extent to which modern humans rapidly move within and among nations. In addition, today's level of urbanization and the close contact among travelers, workers, and visitors to public places further heightens the probability of extensive person-to-person transmission.

A key determinant of an outbreak's intensity is the assumed case-fatality ratio—ranging from less than 0.1 percent of the illnesses resulting in deaths for a Category 1 event to more than 2 percent for Category 5. The index also tracks the expected illness rate, measured as a percent of the population. This ranges in all categories from 20 to 40 percent.

Finally, the *PSI* tracks deaths caused by the flu per 100,000 residents. These range from less than 30 fatalities for a Category 1 outbreak to more than 600 fatalities for a Category 5 pandemic. The potential deaths in the U.S., ranging from under 90,000 to 1.8 million or more, are then scaled in relation to the three prior 20th century flu pandemics.

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Table 2 shows the increasingly costly and comprehensive public health interventions that are recommended as the measured severity of the outbreak increases.

Such interventions would occur in the homes of ill families, in schools, and in most workplaces and public gathering places. The increasingly dramatic interventions are driven by the need to increase social distance between ill and healthy individuals everywhere—at home, in schools, at work, in eating places, and entertainment venues. As a bird flu outbreak begins and intensifies, both the outbreak and response would become increasingly costly in terms of lost employment, income, and consumption, as well as asset valuation reductions and other economic factors.

As such a pandemic intensifies, it is expected to affect the economy on both macro- and microeconomic levels through a variety of channels.

Modeling for a Disaster

At the macroeconomic level, economists have recently developed a series of models to estimate the overall effects of a bird flu outbreak on both global and national levels of Gross Domestic Product and their components.

At the microeconomic level, economists have also studied the pandemic's possible effects on various industries, financial sector impacts and, based on historical experience, likely differences in the regional impacts within nations and among the affected countries.

At the international level, Australia's Lowy Institute for International Policy (www.lowyinstitute.org) published an excellent study in 2006 by Warwick

McKibben and Alexandra Sidorenko that provides some rough estimates of the likely macroeconomic effects of a global pandemic.

The study separates a flu outbreak into four categories—mild, moderate, severe, and ultra—and gauges the projected worldwide economic impacts of each. The Lowy models suggest that even a mild scenario could cost the world 1.4 million lives and close to 0.8% of global GDP (approximately \$330 billion) in lost economic output. The ultra scenario—a Spanish flu-like event—could cause an estimated 142 million deaths worldwide and a global GDP loss of \$4.4 trillion. Given our share of the world's GDP, about a fourth of the output loss would occur in the U.S.

McKibben's and Sidorenko's ultra scenario also would involve flu-driven illnesses affecting well over a billion people worldwide and create sharp reductions in global trade and travel.

The Lowy study also summarizes the best available estimates of regional differences in the historic impacts of the Spanish and Asian flu pandemics. The Spanish flu pandemic, generated an estimated U.S. GDP loss of 11.3 percent in 1918-19, and GDP losses of 16.9 percent and 14.7 percent in Great Britain and Canada, respectively.

American Scenarios

Beginning in 2005, Congress, the Centers for Disease Control, and the Homeland Security Council have studied the projected effects of a bird flu outbreak on the U.S. economy and health industry. At the behest of former Senate Majority leader Dr. William Frist

(R-Tenn.), the non-partisan Congressional Budget Office has conducted and updated a comprehensive impact study, "A Potential Influenza Pandemic: Possible Macroeconomic Effects and Policy Issues." (Congressional Budget Office, July 27, 2006).

Budget Office economists and their public health consultants also studied the likely impacts of a global bird flu pandemic on the U.S. economy and health systems. They came up with two scenarios, mild and severe.

The mild scenario, similar to the Hong Kong and Asian flu pandemics, would sicken about 75 million Americans (one-fourth of the 2006 U.S. population) and kill about 100,000. The surprising good news, they said, is that such an event "reduces real GDP by a modest amount, about one percent... but would probably not cause a recession..."

The Worst Case

Unfortunately, under their severe scenario, "90 million people become severely ill and 2 million people die... real GDP would be about 4 ¼ percent lower [than normal]."

This study also models the likely supply and demand effects of a severe flu outbreak. Most of the supply-side effects, roughly half of the projected real GDP loss, would flow from the labor-input losses occasioned by illnesses and fatalities among the nation's workers.

Demand-side impacts would also be widespread and most heavily felt by "the entertainment, arts, recreation, lodging and restaurant industries."

In both the mild and severe scenarios, the U.S. medical and pharmaceutical industries would experience huge surges in demand, severely overtaxing their facilities and personnel, especially if a Spanish flu-like event should unfold.

Under the severe scenario, however, if the near-term impact on real GDP were to reduce output by 4 to 5 percent, as a fraction of U.S. 2007 GDP of roughly \$14 trillion, the one-time loss would amount to \$640 to 700 billion.

Table 1: Public Health Preparations for a Bird Flu Pandemic

<i>Characteristics</i>	<i>Pandemic Severity Index</i>				
	<i>Category 1</i>	<i>Category 2</i>	<i>Category 3</i>	<i>Category 4</i>	<i>Category 5</i>
Case fatality ratio (percentage)	<0.1	0.1 – <0.5	0.5 – <1.0	1.0 – <2.0	≥2.0
Excess death rate (per 100,000)	<30	30 – <150	150 – <300	300 – <600	≥600
Illness rate (percentage of the population)	20 – 40	20 – 40	20 – 40	20 – 40	20 – 40
Potential number of deaths (based on 2006 U.S. population)	<90,000	90,000 – <450,000	450,000 – <900,000	900,000 – <1.8 million	≥1.8 million
20th century U.S. experience	Seasonal influenza (illness rate 5–20%)	1957, 1968 pandemic	None	None	1918 pandemic

The Budget Office further estimates that 750,000 worker fatalities would take out roughly six months worth of normal annual growth of the U.S. labor force. Some industries such as farming, where social distancing is naturally most favorable, would be least hurt. Crowded factory-like and similar close-contact work venues would be most hurt.

On a regional basis, densely populated areas near major U.S. ports of entry would likely be more heavily affected than rural farm areas, where contacts with flu-infected immigrants and visitors would be expected to occur less often.

Based on past experiences, the study also found that a flu pandemic would spread geographically in waves, and the entire event would probably pass in a year or less. Among the many side effects of the pandemic would be its impact on real wages, which would be expected to rise most rapidly among the segments of the labor force in the regions most heavily hit with fatalities. The outbreak is also expected to impact future generations. Based on post-Spanish-flu studies, children born to surviving mothers who were pregnant during the event would likely experience a higher incidence of illnesses such as schizophrenia and diabetes, for reasons not yet understood.

Major public policy questions related to the likely impacts, especially under a severe flu outbreak, may require more attention than they have received to date. Some concern purely economic issues, others reside in the arena of public health

policy.

If 120 million Americans (40 percent of the U.S. 2007 population in the Lowry Institute's ultra scenario) fell ill with the avian flu, all of the nation's health facilities, supplies, and available medical personnel would be overwhelmed. Public officials or medical personnel then would have to make hard triage-driven decisions regarding priorities for allocating scarce treatment capabilities among various groups including the young, the disabled, and the elderly. Experts in the public health arena are studying those issues and, hopefully, will come up with

appropriate solutions.

In terms of fiscal policy planning, the potentially wide-ranging impact of an intense pandemic is offset by the low probability and unpredictable timing of such an occurrence. Added public spending before Hurricanes Katrina and Ike, for example, might have been justified if the events had been more predictable, both in terms of its timing and magnitude. Federal, state, and local governments in the landfall areas surely would have committed far more resources to preparing for it. Absent such foreknowledge, public health economists

Table 2: Public Health Preparations for a Bird Flu Pandemic

Interventions by setting	Pandemic Severity Index		
	1	2 and 3	4 and 5
Home <i>Voluntary isolation</i> of ill at home (adults and children); combine with use of antiviral treatment as available and indicated.	Recommend	Recommend	Recommend
<i>Voluntary quarantine</i> of household members in homes with ill persons (adults and children); consider combining with antiviral prophylaxis if effective, feasible, and quantities sufficient.	Generally not recommended	Consider	Recommend
School <i>Child social distancing</i> Dismissal of students from schools and school-based activities, and closure of child care programs.	Generally not recommended	Consider: ≤ 4 weeks	Recommend: ≤ 12 weeks
Reduce out-of-school contacts and community mixing.	Generally not recommended	Consider: ≤ 4 weeks	Recommend: ≤ 12 weeks
Workplace/Community <i>Adult social distancing</i> Decrease number of social contacts (e.g. encourage teleconferences, alternatives to face-to-face meetings)	Generally not recommended	Consider	Recommend
Increase distance between persons (e.g., reduce density in public transit, workplace).	Generally not recommended	Consider	Recommend
Modify, postpone, or cancel selected public gatherings to promote social distance (e.g. stadium events, theater performances).	Generally not recommended	Consider	Recommend
Modify workplace schedules and practices (e.g., telework, staggered shifts).	Generally not recommended	Consider	Recommend

Notes: Generally Not Recommended = Unless there is a compelling rationale for specific populations or jurisdictions, measures are generally not recommended for entire populations as the consequences may outweigh the benefits. Consider = Important to consider these alternatives as part of a prudent planning strategy, considering characteristics of the pandemic, such as age-specific illness rate, geographic distribution, and the magnitude of adverse consequences. These factors may vary globally, nationally, and locally. Recommended = Generally recommended as an important component of the planning strategy.

clearly need to undertake more serious efforts to model the future probabilities, likely severity, and economic costs of a possible bird flu outbreak.

An appropriate model would then answer this basic question: Given the probability and likely economic costs of a bird flu pandemic during one of the next 30 years—the average frequency of such events—how much spending on preparatory measures would be justified today? The literature reveals no informed discussion or analysis of this important economic policy issue.

The possibility of a pandemic also has implications for monetary planning and the financial markets. If the Congressional Budget Office study is correct, a flu pandemic would, even in the severe scenario, generate a year-long recession not much different than the average post-World War II recession. Some one-time price inflation also would be expected as a result of temporary labor shortages, but these might be offset, at least in part, by reduced demand for many consumer services and discretionary purchases. Thus, there is no readily apparent reason to assume that dramatic changes in interest rates or the money supply are likely to be needed.

More Stress for Financial Markets

However, the monetary authorities might well be faced with some sig-

nificant liquidity and/or solvency challenges in the financial markets. Health insurers, for example, certainly would be overwhelmed with claims far beyond anything in their recent experience and/or their normal contingency plans. A wave of health insurer bankruptcies would certainly be possible, calling for some sort of policy response to prevent financial market disruptions.

Life insurers also would face heavy drains on their reserves as a result of hundreds of thousands of abnormal and premature policy claims. However, early deaths among their elderly annuity holders might offset part of that impact on their earnings and/or reserves.

Finally, hundreds of thousands of art and entertainment companies, restaurants, and lodging and recreation providers—per the Budget Office study—would suffer sharp drops in their revenues for extended periods. How that would affect the national incidence of bankruptcies and asset values of their stocks and facilities also has not been explored.

Although billions of dollars have already been spent globally and in the U.S. preparing for a bird flu outbreak, public health experts believe that the world and most individual countries are not adequately prepared to cope with such an event—especially a severe one.

The current literature also has yielded

some disturbing contradictions. Australia's McKibben and Sidorenko, for example, estimated that the 1918-19 Spanish flu pandemic may have cost the U.S. more than 11 percent of GDP. This estimate is more than twice the 4½ percent loss the U.S. Congressional Budget Office estimated in its severe scenario of a bird flu outbreak.

A Question of Mortality

In addition, both of these studies assume roughly a 2 percent fatality rate in building their worst-case models, whereas the *actual* worldwide H5N1 fatality rate, through 2007, has been more than 60 percent. Clearly, much more work needs to be done in modeling and preparing for a possible severe bird flu outbreak to get a better understanding of what might happen and the appropriate level of preventive measures that can be justified economically.

Finally, very few individual families, businesses, local governmental bodies, and non-profit institutions in this country have given much thought to preparing for a possible flu pandemic event. Readers of this report who are interested in learning more about how to prepare themselves for a bird flu pandemic, or learn possible economic effects, can get started on the Internet by visiting www.pandemicflu.gov, www.fema.gov, www.cdc.gov, or www.ready.gov.