

# An Economic-Impact Analysis of the Avian Flu in Southern Nevada

## 2007

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## **ABSTRACT**

Pandemics, though rare occurrences, result in sickness, large loss of life, and impose heavy economic costs. Using a reasonable avian flu outbreak scenario lasting three months, we show that Southern Nevada could see a sharp drop in tourism that would result in the loss of more than 39 thousand jobs and \$2.3 billion in Gross Revenue Product (GRP). This impact is about twice the adverse impact of September 11, 2001, in which travel and tourism activities in the area came to a full stop. These findings underscore the need for planning to address the area's critical public-health infrastructures.

## INTRODUCTION

Three times during the past century a pandemic imposed a significant impact on the economy of the U.S. and, to a varying degree, on its regions. In 1918, the Spanish flu pandemic infected between 20 and 40 percent of the population worldwide, and resulted in mortalities of approximately 50 million. For the United States, the Spanish flu caused approximately 675,000 deaths. Almost 40 years later, in 1957, the Asian influenza hit the U.S. and, although limited vaccines were available, resulted in an estimated 69,800 deaths by early 1958. Subsequently, the Hong Kong flu, considered a relatively mild pandemic, caused approximately 33,800 U.S. deaths between September 1968 and March 1969 (PandemicFlu.gov 2006). Although influenza pandemics are rare, they do recur and, with the advent of the H5N1 influenza virus, the threat of a new pandemic presents serious economic and public-health concerns for the world (WHO 2005).

The highly pathogenic virus, H5N1, was first isolated from a farmed goose in 1996 in the Guangdong Province of China. In 1997, the first known human infections were reported in Hong Kong (WHO 2006). Since December 2003, more than 200 human cases of the H5N1 influenza have been confirmed, with earlier outbreaks in Cambodia, China, Indonesia, Thailand, and Vietnam. Moreover, in 2006, human cases of H5N1 spread to Azerbaijan, Djibouti, Egypt, Iraq and Turkey. (CDC 2006)

Although the H5N1 strain has not yet exhibited sustained human-to-human

transmission, world health experts are tracking it closely, in part, because of its high mortality rate—greater than 50 percent of confirmed cases have resulted in death. Further, the Center for Disease Control and Prevention (CDC) has expressed concern that avian influenza viruses, such as the H5N1 strain, “have the potential to change and gain the ability to spread easily between people” (CDC 2006, p.1). Given these characteristics, should the H5N1 virus evolve for easy human-to-human transmission, an ensuing pandemic of intensity similar to the 1918 pandemic is considered likely to occur. What, then, is the vulnerability of the Las Vegas economy to such a health-related adversity?

From a global perspective, the International Monetary Fund (IMF) predicts that an avian flu pandemic “could have a substantial impact on individuals, on the global economy, and on financial systems throughout the world” (IMF 2006, p. 3). Nationally, researchers have conducted studies which predict U.S. severe-pandemic impacts ranging from 207,000 deaths with economic losses of \$166.5 billion (Meltzer, Cox and Fukuda 1999) to 2 million deaths and a 4.4 percent (around \$477 billion) decrease in Gross Domestic Product (Congressional Budget Office 2006). Many researchers, including those at the Congressional Budget Office (CBO), use the response of affected economies to the Severe Acute Respiratory Syndrome (SARS) as a benchmark for estimating effects of more serious contagious outbreaks.

The SARS outbreaks in Hong Kong and Toronto revealed the vulnerability of regional economies to declines in tourist-based activities from health-related events. In the case of the SARS outbreaks, the economic impacts were great, but of short duration. Still, the tourism sectors of these economies were significantly and adversely affected and more so than other

sectors. Moreover, fear of the unknown, in terms of the probability of life-threatening effects, set off panic effects, such as avoidance of travel or public gatherings, which imposed noteworthy economic costs. In short, the evidence suggests that the tourist-dominated Las Vegas economy, even with a relatively short-run pandemic, would experience marked drops in tourist visitations and associated financial flows if a pandemic avian flu event occurred.

With more than 130,000 hotel rooms, a health-related incident, such as an H5N1 pandemic, would cut the flow of monies into Southern Nevada. The magnitude and duration of such incidents are currently unknown. Still, the SARS experiences of Hong Kong and Toronto point to the benefit of knowing the likely economic magnitudes so as to best marshal responses.

Using a range of scenarios based on the best-available information and fashioned for the Las Vegas environs, we identify a set of possible adverse health pandemic events. We then trace the likely impacts of the pandemic events on the Southern Nevada economy, recognizing that the metropolitan-area definition is Clark County, Nevada. This full-fledged accounting, that is, tracing the direct, indirect, and induced effects, yields a range of outcomes.

Of course, the magnitude of the predicted outcomes is dependent upon assumptions made within the scenarios regarding the length of the pandemic, its severity, and whether the demand side of the local economy or the supply side experiences the greatest impact. On the demand side, we choose a moderate term of three months for the initial shock of an avian flu outbreak and the subsequent containment of the pandemic. The shock to demand for Clark County is modeled higher than for other areas since tourism dominates the local economy.

We use alternative expenditure effects which reflect the nature of local activity, with greater impacts for discretionary-spending items, such as air transportation, accommodation, arts and entertainment and food services. On the other hand, other industry sectors such as construction or mining are assumed to experience smaller effects (CBO 2006).

Alternately, we study the predicted effect of an avian flu pandemic on the supply side, particularly the local labor force, using a moderate fatality rate and an average of two weeks away from work for surviving employees. This later formulation proved to have a smaller effect on employment, such that adverse demand-side effects created job losses in excess of what would be needed to cover the loss of jobs from the supply side. Moreover, we did not add the demand- and supply-side impacts because to do so would create a double-counting problem.

Using the Regional Economic Model's Inc. (REMI) Policy Insight 8.0 analysis system model for Clark County, Nevada, we forecast the impacts of both final-demand shocks and labor-supply shocks due to a projected H5N1 pandemic in 2007. First, we examine the impact of a decrease in exogenous or outside demand for the Las Vegas metropolitan area. The model predicts an employment decrease of over 39 thousand and reduction in real disposable personal income of almost \$1.0 billion (nominal) in 2007 due to declines in tourism and its associated spending. Contributing to these decreases are the indirect effects of fewer tourists requiring fewer restaurant meals, cab rides, entertainment, and so forth. In addition, local employers would require fewer labor hours, leading to decreased household incomes and a depression of induced spending on household items.

In contrast, a decrease on the supply side due to illness in the labor force yields a



smaller economic contraction, as would be expected in a demand-driven economy such as Southern Nevada. In 2007, the model predicts a decrease of 28 thousand employees in the short term (three months) resulting from a pandemic outbreak. Estimated mortalities under this scenario are approximately five thousand employees and real disposable personal income is predicted to fall by \$868 million. For both demand and labor-supply responses to outbreak scenarios, the Clark County economy recovers gradually with increasingly smaller effects over a four-year period.

To be sure, the true impact of a pandemic outbreak may be significantly larger than we calculated in our scenarios. Such rare events could depend on less-likely factors that could greatly affect the amount of time the contagion spreads before containment, the mortality rate of the pandemic, and the degree of consumer fear. With our scenario assuming a relatively short window for containment of an influenza pandemic, our estimates may be understated. Indeed, there may be repeated waves of outbreaks in different regions, which lengthen the time prospective visitors hear about and react to the pandemic. Moreover, both supply-side and demand shocks could occur simultaneously and hit critical areas, such as health-care providers that cause further shutdowns, worsening the impact with a reduction of health-care employees available to meet the increased demand for treatment (Menon, Taylor and Ridley 2005). Hence, the results of the analysis and the attendant consequences of a longer-term pandemic of the avian influenza call for foresightful analysis and contingency planning for Southern Nevada.

## BACKGROUND

*If an influenza pandemic struck today, borders would close, the global economy would shut down, international vaccine supplies and health-care systems would be overwhelmed, and panic would reign.*

*Michael T. Osterholm*

Since ancient times, such as the Peloponnesian War of 430 BC where typhoid fever destroyed 25 percent of the population, humankind has succumbed in large numbers to pandemic outbreaks.<sup>1</sup> During the 1900s, the world experienced three such outbreaks: the Spanish flu in 1918, the Asian flu in 1957-1958, and the Hong Kong flu in 1968-1969. Currently, global officials and policymakers are closely monitoring the developments of the H5N1 avian flu virus, which has spread from birds to humans across Asia into the Middle East and Eastern Europe. While the H5N1 virus has not clearly demonstrated the ability for human-to-human transmission, should it mutate to allow this capability, it is projected to bring about the next lethal and severe pandemic.

Across the world, researchers from organizations such as the World Health Organization, the International Monetary Fund, the Congressional Budget Office, and the Centers for Disease Control and Prevention have conducted analyses to estimate the public-health and economic impacts of an avian flu pandemic. In Table 1 below, the International Federation of Pharmaceutical Manufacturers and Associations (IFPMA) has summarized the health and economic effects of pandemics in the 1900s and presented global projections for

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<sup>1</sup> The term “pandemic” originates from Greek *pan* all + *demos* people, *The American Heritage® Dictionary of the English Language*.

severe and mild outbreaks of the avian flu.

**Table 1: Health and Economic Effects of Influenza Pandemics in the 20th Century:**

	<b>Projections for the Next Pandemic</b>				
	Spanish Influenza (H1N1), 1918-1919	Asian Flu (H2N2), 1957-1958	Hong Kong Flu (H3N2), 1968-1969	Mild Avian Influenza (H5N1), <i>projection</i>	Severe Avian Influenza (H5N1), <i>projection</i>
Illness (Worldwide)	500 million; 20-40% of total world population <sup>1</sup>				
Hospitalizations	<i>Unknown</i>	<i>Unknown</i>	<i>Unknown</i>	314,000- 2.3 million <sup>2</sup>	734,000- 4.7 million <sup>2</sup>
Dead (worldwide)	40-50 million	2 million	1 million		
Illness (U.S.)	Unknown (but about 20-40% of the world population fell ill)			75 million/ 25% of the total U.S. population	90 million/ 30% of the total U.S. population
Outpatient visits	<i>Unknown</i>	<i>Unknown</i>	<i>Unknown</i>	18 million	42 million
Dead (U.S.)	500,000-675,000	70,000	36,000	100,000	2 million
Attack rate (percentage of total population who fall ill)	40% <sup>3</sup> Highest among adults age 20-50 years*	20-70% <sup>3</sup> Highest among adults >65	15% <sup>3</sup> Highest among adults >65	25%	30%
Case-fatality rate in the U.S. (percentage of ill who die)	2.5%	0.1-0.2%	0.1-0.2%	0.1%	2.5%
Virulence	High; able to kill young/ healthy in >48 hours	Low; elderly, chronically ill most susceptible	Low; elderly, chronically ill most susceptible	Low; elderly chronically ill most susceptible	High
Economic Cost (U.S.)	<i>Unknown</i>	<i>Unknown</i>	<i>Unknown</i>	\$100-200 billion <sup>4</sup>	
Economic Cost (Worldwide)	<i>Unknown</i>	<i>Unknown</i>	<i>Unknown</i>	\$800 billion <sup>5</sup>	

**Source:**

All information from the: Congressional Budget Office. "A potential influenza pandemic: Possible macroeconomic effects and policy issues," Washington, DC: The Congress of the United States, Congressional Budget Office; December 2005. unless otherwise noted.

1 National Vaccine Program Office. "Pandemics and pandemic scares in the 20th century." U.S. Department of Health and Human Services. Available online at: <http://www.hhs.gov/nvpo/pandemics/flu3.htm>. Updated 2/14/02005. Accessed 1/4/06;

2 Trust for America's Health. "A killer flu?" Washington, DC: Trust for American's Health; June 2005;

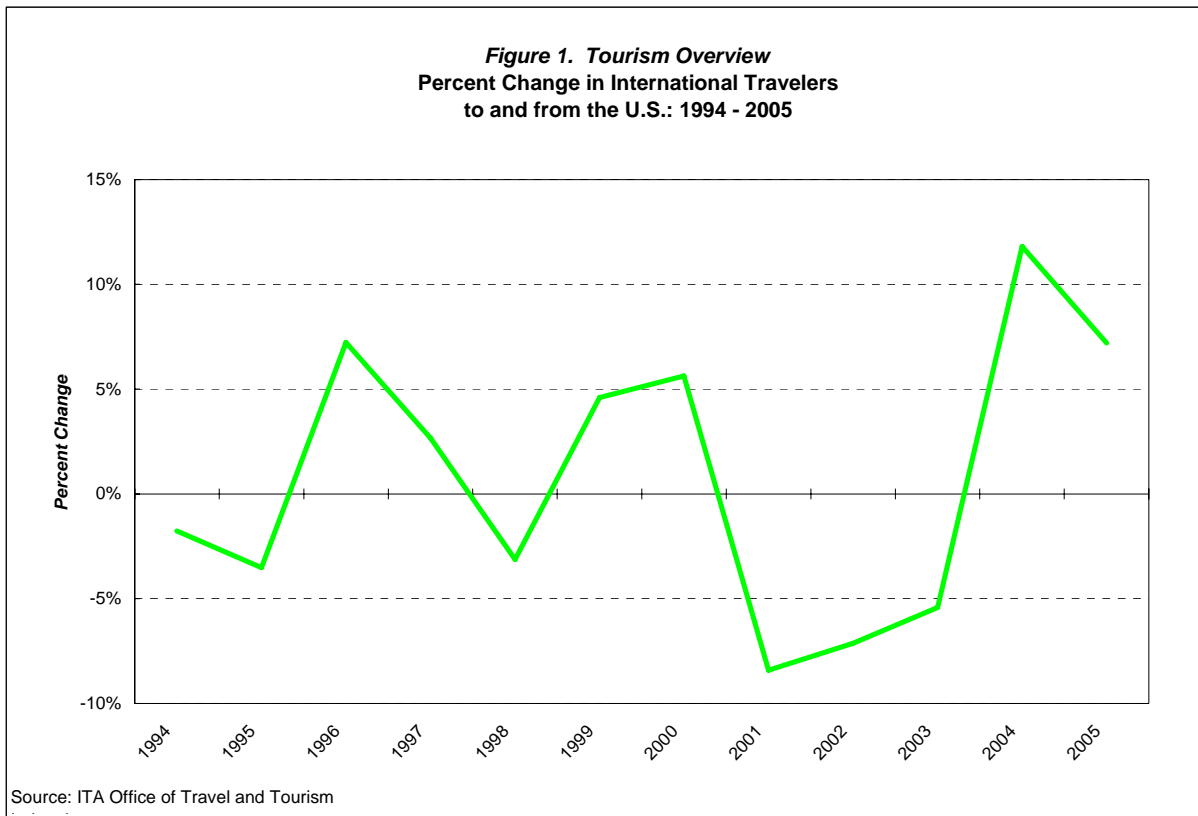
3 "Influenza Pandemic Preparedness - Information Kit for Health Care Workers" by Centre for Health Protection, Hong Kong and "Avian influenza: assessing the pandemic threat" by World Health Organization;

4 Brahmabhatt M. "Avian influenza: Economic and social impacts." World Bank Report. Released 9/23/2005;

5 Centers for Disease Control and Prevention. "Public health prepares." Pandemic Influenza Update. Jan 5, 2005.

Researchers have also analyzed the global economic impact of even relatively limited influenza epidemics such as the Severe Acute Respiratory Syndrome (SARS) outbreak in 2003, in order to make robust estimates of the impact of an avian flu pandemic in modern times. According to Jane Lloyd, SARS killed approximately 800 people worldwide and resulted in a global economic cost estimated at \$30 billion (Lloyd 2005). Research on SARS has highlighted, as well, how global tourism exacerbates the economic impact of infectious diseases due to the increasing importance of spending on tourism to Gross Domestic Product (GDP) in many countries.

Indeed, the U.S. has experienced a sharp rise in tourism since the 9/11 terrorist attack in 2001, and the SARS outbreak in 2003, as exhibited in Figure 1 below. This discretionary spending is highly volatile as travelers tend to act quickly to avoid perceived health threats, even in the case of SARS, where the outbreak was relatively small and quickly contained (Rossi and Walker 2005). Ironically, it is also the ease of travel and expansion of global tourism which allows infectious diseases to quickly spread out across nations, increasing the likelihood of pandemic outbreaks.



### **Avian Influenza and Southern Nevada**

In view of the public and economic response to the SARS outbreak, an avian influenza pandemic could lead, in general, to significantly greater shocks to the global economy and, specifically, to sharp short- or long-term contractions in the economy of Southern Nevada (Clark County). As noted by Michael Osterholm, “A number of recent events and factors have heightened concern that a specific near-term pandemic may be imminent. . . The reality of a coming pandemic, however, cannot be avoided. Only its impact can be lessened” (2006, p. 1). Osterholm’s concerns are shared by many in public health, including the WHO and the CDC.

Nevada, among 49 states, has posted pandemic influenza plans in accordance with the

U.S. Department of Health and Human Services guidelines. However, as Holmberg et al. warn, only 25 percent of the state plans include “real-time syndromic surveillance” of patients at clinics or emergency rooms to detect influenza-type symptoms, which could flag the onset of a pandemic.

In addition, because of its large volume of tourists (with over 39 million visitors in 2006), Southern Nevada is particularly vulnerable to the introduction of infectious diseases from outside populations. Clearly, Southern Nevada, the fifth-ranked U.S. destination for tourism, faces a heightened public-health risk from an influenza pandemic (Center for Business and Economic Research 2006).

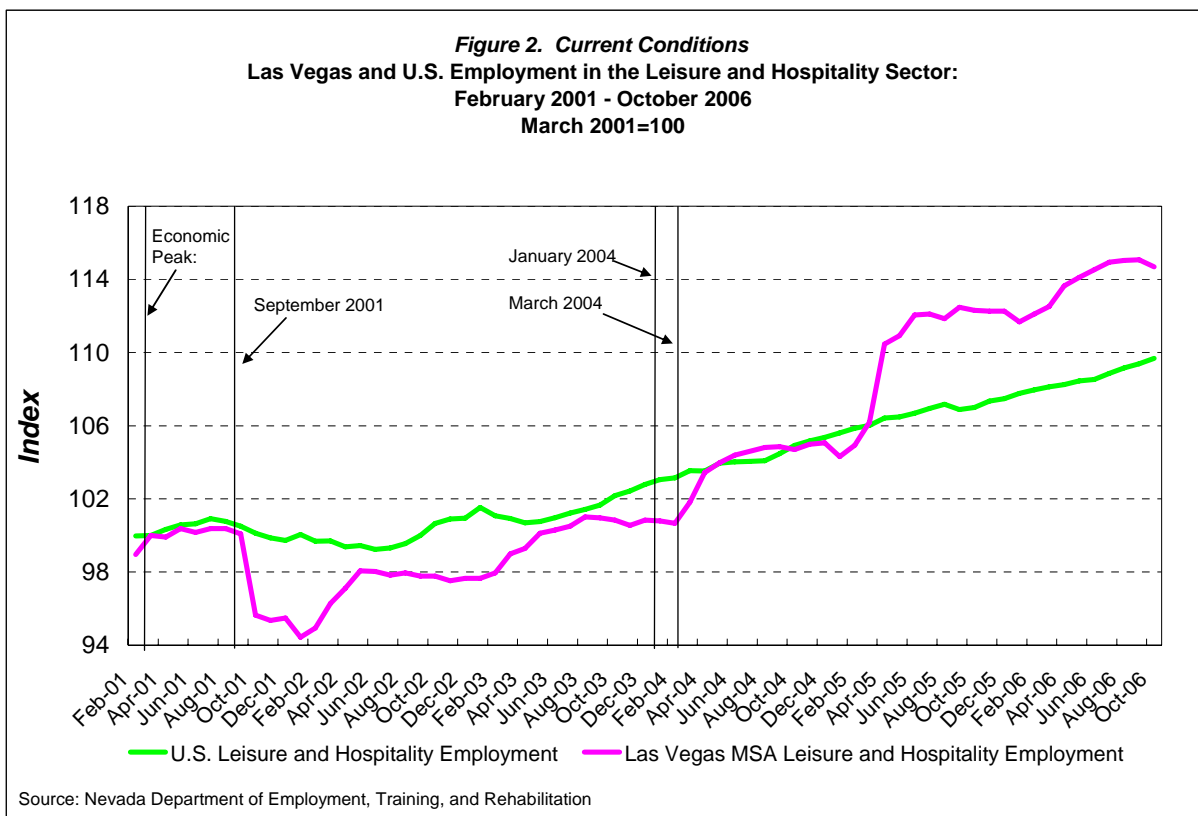


Figure 2 illustrates the sensitivity of Las Vegas employment in tourism industries to

events which result in downturns in national and international travel, such as the September 11, 2001, terrorist event. Although there was a general recessionary trend in the economy in 2001, the 9/11 events in New York, Pennsylvania, and Washington DC had a greater impact on leisure and hospitality employment in Las Vegas than on U.S. employment in general, indicating a higher local elasticity (or responsiveness) of industry demand. Additionally, the tourism industry in Southern Nevada experienced a longer recovery cycle than the rest of the country. These characteristics of the Las Vegas leisure and hospitality industry, the greater economic adversity to events associated with reduced tourism, and the likelihood of longer recovery periods for business contractions for Las Vegas than other regional economies, would make a bad situation worse for a pandemic.

Notwithstanding the public-health risk, Southern Nevada confronts a serious economic challenge should an influenza pandemic ensue. In the Southern Nevada economy, over 30 percent of its more than 900 thousand workforce is employed in the leisure and hospitality and taxi and limousine service industries. With global tourism's high degree of responsiveness to perceived health threats and with regional economic characteristics, an influenza outbreak would sharply contract a significant portion of Southern Nevada's market.

## THE ANALYSIS

In structuring the framework for the economic-impact analysis of an influenza pandemic on Southern Nevada, we forecast the initial outbreak for 2007. Influenza victims are assumed to take two weeks on average for recovery and the duration of the outbreak is estimated at three months. Two predictive models of Clark County are developed: one which estimates the effect of a decrease in exogenous demand (a decrease in tourism and its related spending), and a second model forecasting the effect of endogenous employee reductions due to illness (a temporary reduction in the workforce due to illness and permanent reduction due to mortalities).

### Methodology

The REMI Policy Insight, Version 8.0 system is used to analyze the direct, indirect, and induced effects of an influenza pandemic on Clark County, Nevada. With REMI, econometric forecasting accounts for dynamic feedbacks between economic and demographic variables. George Treyz details the numerous features available in REMI in Regional Economic Models.

The Clark County model is based upon state and regional sources, as well as inputs from the Bureau of Economic Analysis, the Bureau of Labor Statistics, the U.S. Department of Energy, and the U.S. Census Bureau. It includes historical data from 1990 to 2003 and estimated data up to 2050. Central to econometric analysis with REMI is the ability to ask



“what if” questions to evaluate proposed changes in the model. REMI provides feedback on the direct change (e.g., employment decrease or decrease in tourism), the indirect responses (e.g., fewer lunches ordered by workers or fewer retail purchases by tourists), and the induced responses (e.g., reduced income leads to reduced grocery shopping).

To model a demand shock to Clark County in 2007, we first reviewed the body of literature on the economic impact of an influenza pandemic, and then applied the effects of a three-month decrease in industry demand for tourism and related spending. Demand (revenue) for agriculture, mining, construction, manufacturing, and wholesale and retail trade is assumed to fall by 2.5 percent. Demand for transportation is assumed to respond more strongly, with a 16.75 percent drop. In contrast, demand for health care is expected to rise by 40 percent, due to an increase in flu cases. The strongest decline in demand of 20 percent is modeled for the entertainment, accommodation, and food-services sectors. All other services are modeled with a 1.25 percent decline.

For the supply-side shock, we project mortality rates of 1.8 percent for farm workers and 5 percent for non-farm workers, which are modeled as permanent decreases in the workforce. To model absence from the workforce due to illness, non-farm workers are assumed to miss 10 days from their places of occupation, whereas farm workers are assumed to miss five days.<sup>2</sup> Since the agriculture industry is relatively small in Nevada, the largest impact is expected for non-farm employees.

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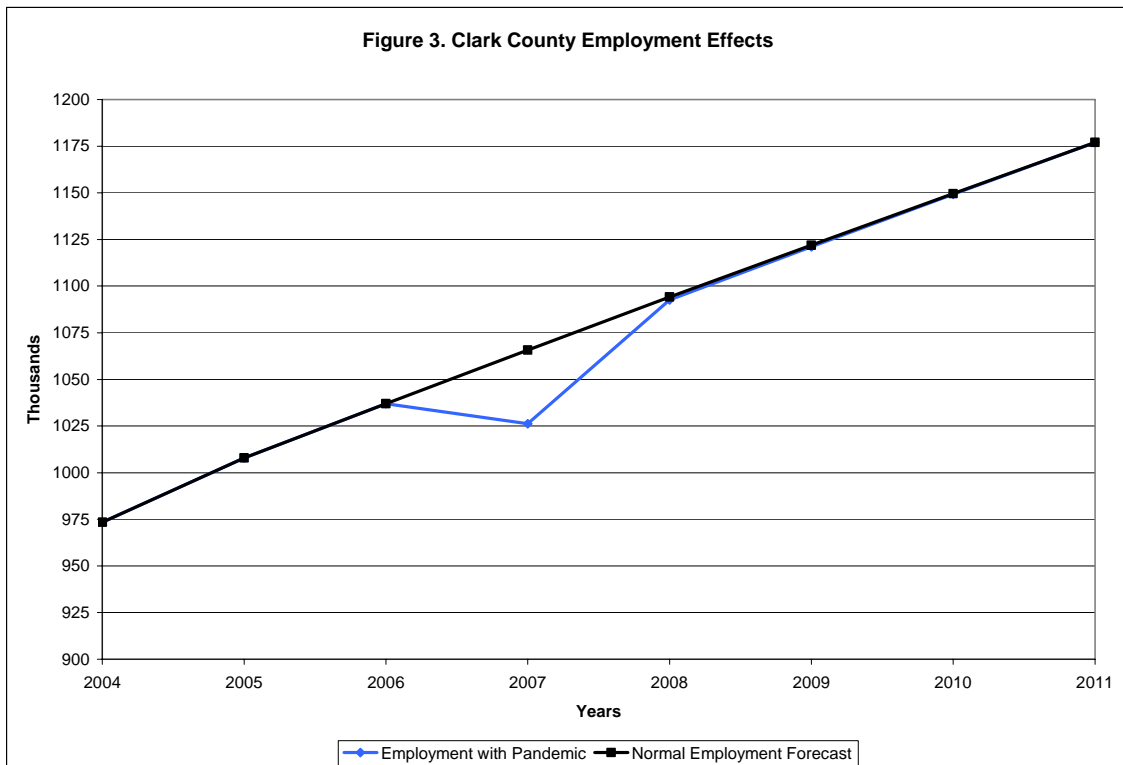
<sup>2</sup> To model the supply-side effect, we assumed an average between severe and mild pandemic fatality rates and worker absences based upon previous results from the CBO. The worker absences include absences due to illness, the need to care for sick family members, or other family obligations (CBO 2006, pp. 41-42).

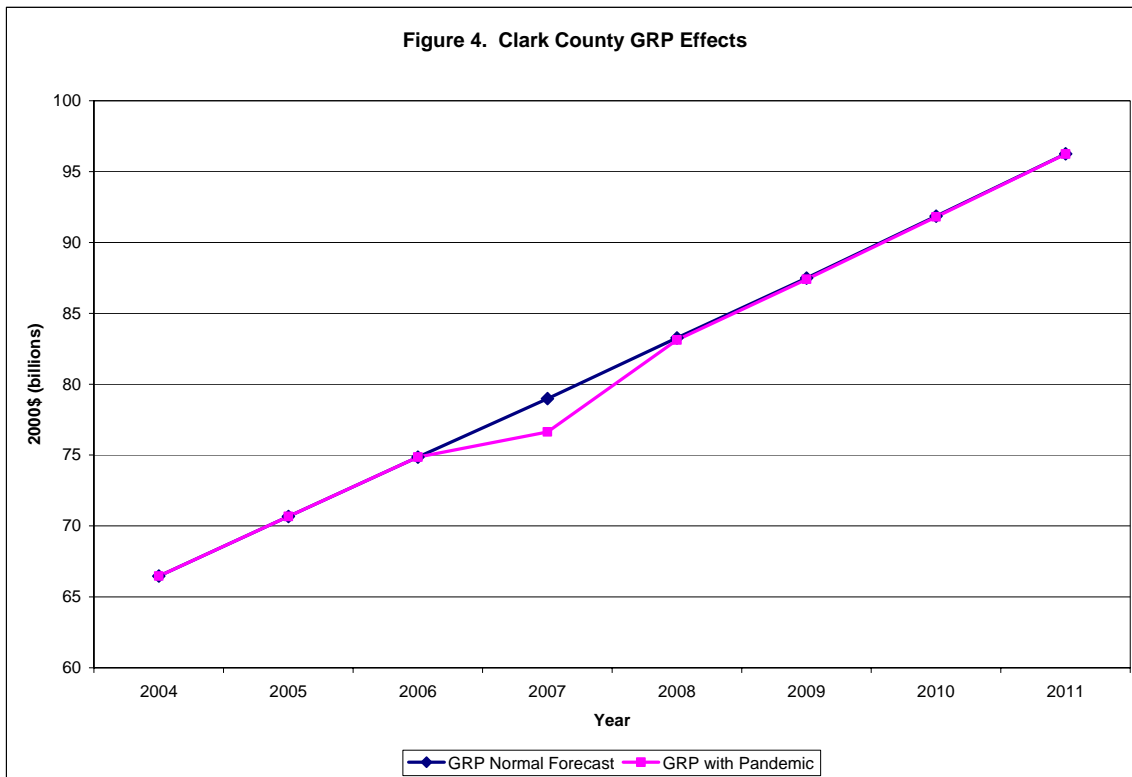
## RESULTS

The estimation results for a demand shock (decreases in tourism revenue to the region) due to a three-month influenza outbreak in Southern Nevada are presented below.

Employment numbers are presented in thousands and dollar figures reflect billions of constant 2000 dollars.

- Total employment is forecast to drop sharply by over 39 thousand in 2007. In the long run, however, Figure 3 shows almost full employment recovery by 2011.
- Gross Regional Product (GRP) for Southern Nevada is forecast to drop by \$2.3 billion in 2007. It is predicted to improve to a loss of \$123 million in 2008, and to gradually recover toward baseline forecast levels, as shown in Figure 4. A \$1.0 billion drop in Real Disposable Personal Income is also forecast for 2007.





The supply-side model results yielded significantly smaller decreases in the region’s total employment, and smaller results for GRP. These results are not presented because they are so small. Indeed, with Southern Nevada’s large tourism sector, we posit that the losses due to a demand reduction will outweigh and account for a greater employment decrease than a reduction in the labor force due to illness. Of course, this assumes a moderate death rate and a moderate loss of work days due to the influenza outbreak. REMI estimation results are presented in Table 2.

**Table 2. REMI Analysis Results**

<b>DIFFERENCES</b>					
<b>Variable</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>
Total Employment (Thousands)	-39.4	-1.50	-0.90	-0.30	-0.10
Total Gross Regional Product (Billion Fixed 2000\$)	-2.30	-0.12	-0.08	-0.04	-0.02
Real Disposable Personal Income (Billions Fixed 2000\$)	-1.00	-0.11	-0.09	-0.07	-0.05
Demand (Billions Fixed 2000\$)	-6.2	-0.39	-0.26	-0.16	-0.10
Labor Force	-9.2	-6.2	-4.7	-3.7	-2.8

## CONCLUSION

The results of a three-month outbreak of avian flu will sharply contract aggregate demand in Southern Nevada. The analysis predicts that a decrease in tourism will lead to a loss of over 39 thousand jobs and a decrease in Southern Nevada's Gross Regional Product (GRP) of over \$2.3 billion. Moreover, these impacts will linger for some time because of the magnitude of their adversity. We estimated the economic effects of a flu pandemic on the demand side (tourism) and the supply side (labor supply) for the local economy and found that the loss of tourism dollars to the region overwhelms the losses from labor supply due to illness or death. These results underscore the need for emergency planning in Clark County, not only in health care, but in programs to diminish the impact of job losses for a significant portion of the work force.

In these days of global tourism and relatively easy international travel, the rapid spread of infectious diseases is a concern for most nations. Of particular concern are avian influenzas, such as the current H5N1 strand, which can result in disaster if they were to mutate and become easily transmitted from human to human. Although there is not a certainty that the current avian flu will become the next pandemic, it has already demonstrated avian-to-human transmission. Indeed, limited cases of human-to-human transmission are suspected in Asia. Our estimates reflect only one likely scenario. As a result, the impacts could be even greater if the transmission of disease should take a more virulent track and slip past current capacities of health science or health services.

A flu pandemic creates great adversity for a tourism-oriented economy such as Southern

Nevada's. The community will face the double coincidence of bad news—a public-health crisis and an economic adversity of a precipitous decline in demand for the leisure and hospitality industries. Our analysis points to the difficulties that health professionals could face and to the importance of local businesses working in close collaboration with state and local emergency management and health officials and other health professionals to address the critical infrastructure issues of meeting the difficulties of such an occurrence.

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