PANDEMIIC INFLUENZA: PREVENTION AND MAINTENANCE
A Guide to a Global Strategy

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December 7, 2007
Public Policy in Global Health
and Medical Practice

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PUBP 757

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Abstract

The outbreak of pandemic influenza represents one of the greatest biological threats to humanity. Due to the ease with which influenza passes from human to human combined with the severity of symptoms and likelihood of death, proper prevention and containment requires a global unified strategy. As the world becomes more interconnected through trade and travel, the threat of outbreak continues to escalate.

By examining the official strategies prepared by the World Health Organization, the United States and China can better understand the current level of cooperation, preparedness, and protocol toward a pandemic flu prevention strategy. This paper is not an exhaustive study incorporating all nations, non-governmental organizations, and international agencies participating pandemic prevention, but it does provide a snapshot analysis of three key entities involved in pandemic flu preparedness.

Introduction and Background

Influenza is a respiratory infection caused by a variety of viruses. Symptoms are usually quite sudden, beginning one or two days after infection. An infected person can present a variety of signs and symptoms, including full body aches, coughing, sneezing, fever, fatigue, nasal congestion, nausea, and vomiting. Early onset is often confused with the common cold, but symptoms will become more severe and life threatening if left untreated. The Center for Disease Control estimates that 5 to 20 percent of the U.S. population contracts a flu virus each year during the "flu season" that extends from November to March. Scientists have identified three types of influenza viruses, classified as A, B, and C. Type A viruses are mostly found in non-human animals (ducks, chickens, pigs, etc.) and usually do not affect humans. Type B viruses typically circulate among humans. Type C viruses have been found in all types of animals, causing mild respiratory infections but do not escalate to epidemic proportions.

Type A influenza represents the most deadly strains and is believed to be responsible for the global outbreaks that occurred in 1918, 1957, and 1968. Only Type A is subcategorized into strains of the virus. Scientific labeling includes the locale where the strain was first found, a lab ID number, the year of discovery, and the HA and NA sequences it possesses. With proper medical and personal care, most people recover from the illness under normal conditions. The CDC estimates that 200,000 Americans are hospitalized and 36,000 die each year from the flu and its complications.[1]

It is the ease with which influenza is transmitted that creates such concern. Humans can transmit the virus simply by coughing or sneezing around one another. The virus can survive outside the body, pass through the air, and enter another body through the nose and mouth. The

[1] National Institute of Allergy and Infectious Diseases, "Flu (Influenza)," *National Institutes of Health*, November 28, 2006, http://www3.niaid.nih.gov/healthscience/healthtopics/Flu/understandingFlu/DefinitionsOverview.htm, Accessed December 1, 2007.

flu can also be contracted by touching the surface on which an infected person has come in contact. Due to the length of time the virus can exist outside the body, the ease of transmission, and the period of time a person is contagious, influenza represents a serious health hazard for everyone. These concerns are only exacerbated by the event of an epidemic or pandemic.

As defined by *MedicineNet.com*, a pandemic is an epidemic that becomes very widespread and affects a whole region, continent, or the world. An epidemic affects more than the expected number of cases of disease occurring in a community or region during a given period of time.[2] Once influenza reaches these proportions it becomes much more difficult to contain and irradiate. A pandemic exists when the virus shifts strains and becomes associated with a rapid international spread consisting of high incidence of infection.[3] The flu cannot be cured, only treated. If doctors know the strain, they can vaccinate as a method of prevention to boost the immune system against contraction. Antiviral medicines are designed to lessen the severity of the flu by inhibiting the activity of proteins within the virus and preventing it from further replicating in the body. Studies show that these drugs reduce the duration of flu symptoms by one day and help prevent more serious flu-related complications such as pneumonia.[4] Vaccinations serve as the primary method for resisting contraction of influenza. It is recommended that people obtain a yearly vaccination because scientists provide different vaccines depending on what strain appears most prevalent that year. Vaccines consist of dead strains of both Type A and B viruses that are occurring more prevalently. The immune system attacks the vaccine as if it were a living virus and creates a memory (similar to a blueprint) for

[2] "Definition of Pandemic," *MedicineNet.com*, 2007, http://www.medterms.com/script/main/art.asp?articlekey=4751, , Accessed November 27,/2007.
[3] Morgan-Capner, P., "The PHLS response to a pandemic of influenza: An action plan," *European Journal of Epidemiology*, 10, 497-502, 1994.
[4] National Institute of Allergy and Infectious Diseases, 2006.

fighting the virus if contracted later. Until 2003, the flu vaccine was only available as an injection; now it comes in a nasal spray form.[5]

History of Influenza

The World Health Organization describes pandemic influenza as the greatest international threat in existence. The world continues to shrink as countries' economies, security, infrastructure, and communications become more interdependent with other nations. Humans are more mobile, connected, and interactive than at any other point in history.

Tens of millions of people worldwide died from influenza in the 20th century alone. Within that timeframe, there were three pandemic outbreaks of influenza (1918, 1957, and 1968). The deadliest pandemic occurred in 1918, known as the Spanish Flu and Black Death. The virus began in North America in March and spread to France by April. Conservative estimates place the death toll at 500,000 in the United States, at 20 to 40 million globally[6], but more current estimates place the death toll at 50 to 100 million.[7] Chart 1 provides the name, date, number of deaths, and strain involved in the flu pandemics of the 20th century.[8]

[5] National Institute of Allergy and Infectious Diseases, 2006.
[6] Ghendon, Youri, "Introduction to Pandemic Influenza through History," *European Journal of Epidemiology*, 10, 451-453, 1994.
[7] Knobler S, Mack A, Mahmoud A, Lemon S: *The Threat of Pandemic Influenza: Are We Ready? Workshop Summary*, Washington, D.C.: The National Academies Press, 60–61, 2005.
[8] Potter, CW, "A history of Influenza," *Journal of Applied Microbiology*, 4, 572-579, October, 2001.

Chart 1: Known flu pandemics

Name of pandemic	Date	Deaths	Strain involved
Asiatic (Russian) Flu	1889–1890	1 million	possibly H2N2
Spanish Flu	1918–1920	40 million	H1N1
Asian Flu	1957–1958	1 to 1.5 million	H2N2
Hong Kong Flu	1968–1969	0.75 to 1 million	H3N2

Influenza is a common event, occurring in most countries almost every year. However, its occurrence, severity, and longevity are unpredictable. Scientists who have studied its history can provide a model for the types of locations and conditions where influenza may appear. Epidemics tend to occur during the winter months, particularly in regions that experience long-term cold. The cold temperatures tend to lower the human immune system, making it more susceptible to illness. Within those regions, influenza is more likely to spread in major cities where human beings tend to populate in mass. Influenza viruses tend to linger longer in localities with higher humidity and may cause infections throughout the year.[9] New strains of influenza usually originate in Eastern Asia or Indonesia and spread west to Europe.[10]

It is important to differentiate between seasonal (common) flu, avian flu, and pandemic flu. A seasonal flu is a respiratory illness that is transmitted from person to person. Most people

[9] Potter, 2001
[10] Morgan-Capner, 1994.

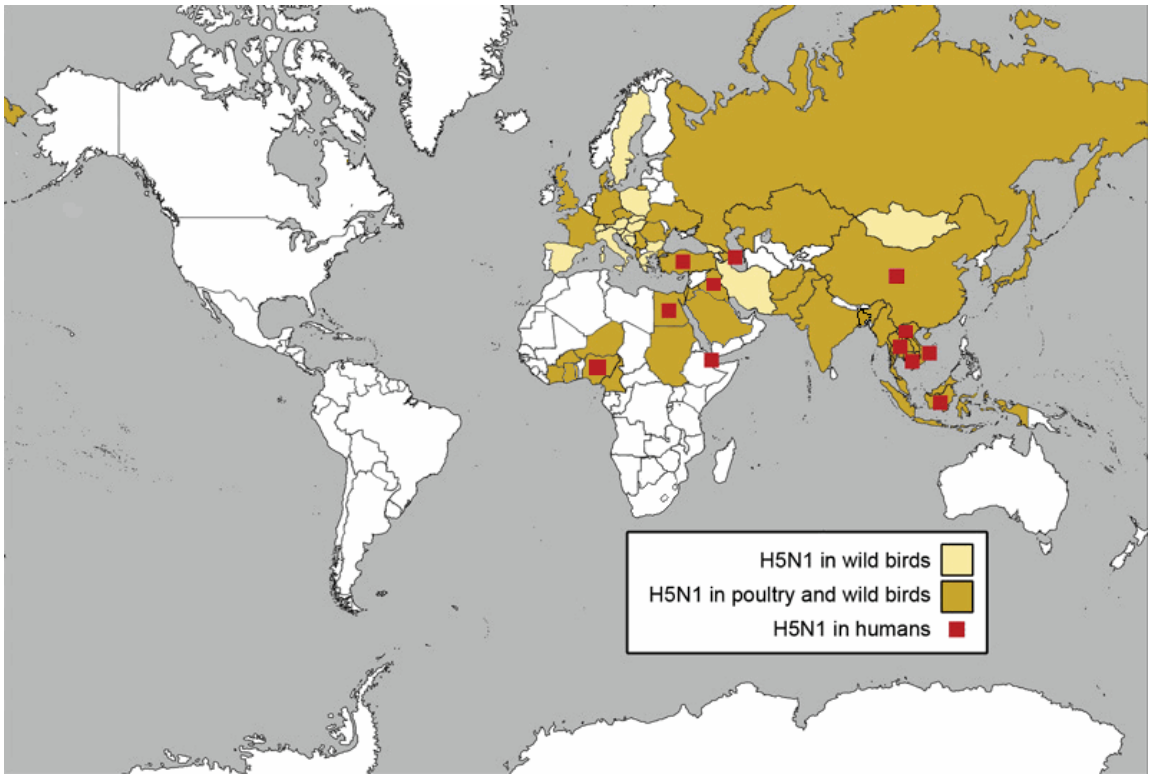
have some immunity, and vaccines are available. Avian flu refers to influenza viruses that occur naturally in wild birds. Low pathogenic strains commonly occur in birds and rarely represent a threat to humans. Highly pathogenic strains, like H5N1, are fatal to birds, including domestic fowl, and can infect humans. There is virtually no natural human immunity to these strains and vaccines are extremely limited. Pandemic flu refers to a virulent human flu with an outbreak that has reached global proportions. Due to very limited natural human immunity, the disease can spread easily from person to person.[11]

[11] "General Information," *PandemicFlu.gov*, 2007, http://www.pandemicflu.gov/general/index.html#, Accessed November 27, 2007.

Purpose

It is impossible to pinpoint the location and predict with certainty the next outbreak of influenza. However, calculated planning and preparation can play an important role in response and containment.[12] Pandemic flu presents a unique challenge to all countries. No one nation can afford to fight it alone. It requires a concerted and cooperative effort from all countries to properly prevent the infection of influenza and contain it when it does occur. To compound matters, no one nation can ignore outbreaks that may occur in another. Due to the level of interaction that human beings now engage in, an outbreak can quickly spread throughout a continent and on to others, as witnessed by the recent outbreak of avian flu, detailed in Figure 1.

Figure 1: Nations with Confirmed Cases; H5N1 Avian Influenza[13]



[12] Ghendon, 1994.
[13] *See* http://www.pandemicflu.gov/index.html, 12/6/2007, Accessed November 27, 2007.

The purpose of this paper is to review the pandemic flu strategies of key countries and international organizations. It is necessary to determine the amount of preparation these countries and organizations have participated in to prevent and prepare for the next attack of pandemic flu.

Methodology

Although I did not use the website as a reference, I began my search by identifying key words "influenza," "pandemic influenza," "emergency preparedness," "United States," "China," and "World Health Organization" on *Wikipedia.* This search provided a basic understanding of influenza and pandemic influenza, as well as a listing of government agencies and international institutions that are involved in pandemic flu prevention and preparedness. *Wikipedia* should not be used as reference, but I find that it serves as an effective starting point for expanding vocabulary and beginning knowledge to research a topic through professional media.

To prepare a comprehensive guide, I researched the various health agency websites for the governments of the United States and China as well as the World Health Organization (WHO). These websites provide the most recent actions, programs, and laws that these entities have engaged in to prepare for pandemic influenza. The WHO provides a history of influenza worldwide, as well as statistical information regarding occurrence, diagnosis, treatment, and prevention. The government health websites from the United States and China provide statistical information specific to the respective countries. Because this paper is reviews current public health policies, I compared high profile countries involved in influenza prevention, using the WHO as a unifying entity.

To provide commentary on the current state of influenza preparedness, I used the George Mason University Libraries Database. I searched the key terms that I defined with *Wikipedia* on websites including *JSTOR, Lexis-Nexis Academic, Expanded Academic ASAP, InfoTrac, ProQuest, Blackwell Synergy, PubMed,* and the *Congressional Research Service*. These websites provide expert research and commentary on the status of country-based and international pandemic preparedness.

Results

World Health Organization

Created as an internal agency within the United Nations, the World Trade Organization was designed to serve the international community. Its Constitution embraces the credence that all human beings have a right to physical, mental, and social well-being. They deserve access to the highest attainable standard of health, and health is a fundamental principle of peace and security. The healthy development of children is as essential as education and security. In addition, governments have a responsibility to ensure that their citizens are provided with adequate healthcare.[14] The WHO is meant to serve as an unbiased organization providing research, coordination, and leadership to perpetuate identification, prevention, and maintenance of all threats to public health. Since its inception, the WHO has targeted the spread of infectious disease as the greatest threat to public health. In 1948, the WHO accepted the responsibility for the International Classification of Disease (ICD).[15] The ICD is an extensive database that identifies and categorizes all diseases, creating an international standard available for public access. The WHO has published four revisions to the ICD, the most recent publication approved in 1994.

The WHO involvement with infectious disease does not end at identification. The organization revised its *Global Influenza Preparedness Plan* in 2005 to address rising concerns of outbreak and to respond to recent biological events of the H5N1 virus in Asian poultry flocks, the H7N3 virus in Canadian poultry, and the sever acute respiratory syndrome (SARS) in 2003.

[14] *Constitution of the World Health Organization*, 45th Edition, Supplement, World Health Organization, October, 2006, http://www.who.int/governance/eb/who_constitution_en.pdf, Accessed November 25, 2007.
[15] "International Classification of Diseases (ICD)," *World Health Organization*, 2007, http://www.who.int/classifications/icd/en/, Accessed November 26, 2007.

The new plan modifies the 1999 WHO plan by doing the following:

- Placing additional emphasis on the risk posed to humans by contact with infected animals;
- Developing enhanced surveillance and nonpharmaceutical public intervention as well as increasing the global vaccine stockpile;
- Stimulating more interaction between the WHO and individual nations regarding pandemic preparedness and prevention; and
- Assuring the adherence to and the execution of the International Health Regulations by all governmental and non-governmental organizations.[16]

To achieve these goals, the WHO created a six-phase pandemic preparation and response plan designed to respond to pandemic flu at key points: the interpandemic period, the pandemic alert period, and the pandemic period. The interpandemic period refers to the period of time when all countries and organizations are actively engaged in surveying, monitoring, and recording the public health climate for signs of manifesting viral outbreaks. The pandemic alert period is reached when the possibility of an outbreak is detected and a rapid, coordinated global and national response may be necessary to contain and delay the spread. The pandemic period signifies the official outbreak of a flu pandemic. All countries and organizations must transition from prevention to management and containment in order to minimize the impact of the pandemic.[17] Figure 2 provides a definition of each phase and the goals associated with an effective and efficient response.

[16] Department of Communicable Disease, *WHO global influenza preparedness plan: The role of WHO and recommendations for national measures before and during pandemics*, The World Health Organization, 2005.
[17] *WHO global influenza preparedness plan, 2005.*

Figure 2: Phases of the WHO Pandemic Response

NEW PHASES	OVERARCHING PUBLIC HEALTH GOALS
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[a] of human infection or disease is considered to be low.	Strengthen influenza pandemic preparedness at the global, regional, national and subnational levels.
Phase 2. No new influenza virus subtypes have been detected in humans. However, a circulating animal influenza virus subtype poses a substantial risk[a] of human disease.	Minimize the risk of transmission to humans; detect and report such transmission rapidly if it occurs.
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.[b]	Ensure rapid characterization of the new virus subtype and early detection, notification and response to additional cases.
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.[b]	Contain the new virus within limited foci or delay spread to gain time to implement preparedness measures, including vaccine development.
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).	Maximize efforts to contain or delay spread, to possibly avert a pandemic, and to gain time to implement pandemic response measures.
Pandemic period	
Phase 6. Pandemic: increased and sustained transmission in general population.[b]	Minimize the impact of the pandemic.

The WHO firmly believes that an entity for developing effective and efficient international preparedness and response cannot be national. Any one country's government is too volatile, controversial, and political to embody the authority necessary to establish global policy. Secondly, no country, including the United States, has the time or resources to dedicate to sustainable and evolving international prevention policy. National plans are still vitally important as long as those countries are willing to include internationally recognized quality standards for surveillance and response.[18]

[18] *The world health report 2007: A safer future: Global public health security in the 21st century*, The World Health Organization, 2007.

United States

The United States has been very active in developing both unilateral and multilateral responses to the increased concern for pandemic influenza. Due to the dominance of the private sector over most of the critical infrastructure within the country (85 percent control) the U.S. Government faces a challenge unlike any other single-nation obstacle regarding influenza preparedness and response. Coupled with the challenges of shifting most of the influenza-preparedness responsibilities from the Department of Health and Humans Services to the Department of Homeland Security (DHS), the U.S. Government must regulate, encourage, and even inspire the private sector to participate in research, preparedness, and response as a part of the public good.

The Government Accountability Office (GAO) conducted an extensive report interviewing officials within the federal executive agencies and non-governmental organizations as well as private businesses who participate in flu preparation. The GAO indentified the following five key challenges:

1. Keeping private and public agencies focused on the necessity of continued research, surveillance, and preparation for flu outbreaks;

2. Clarifying between state and federal authority and responsibility regarding border closures and vaccine distribution;

3. Sustaining a clear and concise strategy from the confusion created by the multitude of public and private agencies involved;

4. Developing sustainable strategies through the interagency process that establish protocol for seeing America's critical infrastructure through the crisis;

5. Investing in research, training, and infrastructure which currently lacks full attention.[19]

[19] "Influenza Pandemic: Opportunities Exist to Address Critical Infrastructure Protection Challenges That Require Federal and Private Sector Coordination," *United States Government Accountability Office*, October 31, 2007.

To meet these challenges, the GAO suggests that DHS serve as lead agency in all matters related to America's pandemic prevention and preparedness. The DHS created the Critical Infrastructure Advisory Council, which consists of representatives from state and local governments, as well as from the private sector, to oversee preparations within the 17 identified critical infrastructure sectors involved in and affected by a influenza pandemic. These sectors include food and agriculture, banking and finance, chemical, commercial facilities, commercial nuclear reactors, materials and water, dams, defense, drinking water and water treatment systems, emergency services, energy, government facilities, information technology, national monuments and icons, postal and shipping, public health and healthcare, telecommunications, and transportation. To date, the councils organized by the DHS have predominately focused on information-sharing and the development of sector-specific plans for a pandemic. The one-year summary provided by DHS states that these councils must transition quickly to policy recommendation and implementation in order to properly serve the American public as they were designed.[20]

In 2005, the DHS drafted the *National Strategy for Pandemic Influenza* to provide public and private protocols. A year after its inception, DHS indentified the *International Partnership on Avian and Pandemic Influenza* as a key entity in mobilizing the United States and the international community to confront the threat of influenza pandemics. Through this organization, the United States supports and consolidates efforts to improve laboratory diagnosis internally with private companies and government agencies. Other efforts to ensure earlier detection and quicker responses to potential outbreaks include early warning networks, ground surveillance capacity, and more advanced research centers. The U.S. Government has invested in the expansion of vaccine manufacturing capacity, new developments in cell-based vaccines,

[20] Homeland Security Council, *National Strategy for Pandemic Influenza: Implementation Plan One Year Summary*, Department of Homeland Security, July, 2007.

antigen-sparing technologies to stretch U.S. vaccine supplies, and the establishment and maintenance of pre-pandemic vaccine stockpiles.[21] The United States is focused on establishing surveillance capability worldwide in order to respond within days of expected outbreaks.

The same year DHS drafted the *National Strategy for Pandemic Influenza*, President Bush announced the International Partnership on Avian and Pandemic Infleunza. The partnership was designed to unite nations and international organizations in order to improve global readiness. Similar to the domestic councils created by DHS, the International Partnership has focused on establishing a core set of principles meant to enhance preparedness, prevention, response, and containment activities. Through the Department of Health and Human Services, the United Stateas. has provided more than $5.5 million to technical assistance and grants dedicated to preparedness and prevention to affected countries in Southeast Asia and the WHO. This funding came after the President signed an emergency appropriations bill passed by Congress for $25 million to prevent and contain the avian influenza developing in China and Indonesia.[22] The International Partnership still remains in the discussion and development stages. It needs to transition into the policy implementation phase but lacks the authority to establish any type of effective, sustainable international protocol or regulations.

In order to strengthen and expediate federal and state activities directed toward pandemic flu preparedness, Congress passed the Pandemic and All Hazards Preparedness Act in 2006 to create an official approach to public health preparedness. This law provides funding, regulations, and penalties in various areas involved in pandemic preparedness:

- Provides grants for federal public health programs to repay public health professionals who provide services for public health emergencies;

[21] Homeland Security Council, 2007.
[22] Office of the Spokesman, "U.S. Launches International Partnership on Avian and Pandemic Influenza," *U.S. Department of State*, 2005, http://www.state.gov/r/pa/prs/ps/2005/53865.htm, Accessed December 1, 2007.

- Establishes penalties for states that fail to meet performance benchmarks for emergency preparedness created by the Department of Health and Human Services;
- Provides funding directly to area hospitals who have agreed to participate in emergency preparedness programs;
- Requires HHS to establish a database for sharing information on infectious disease outbreaks and other public health emergencies;
- Allows for the creation of a vaccine tracking program regarding the distribution of federally purchased flu vaccines; and
- Authorizes the creation of Centers fro Public Health Preparedness at accredited schools of public health to ensure training programs and provide other educational resources.[23]

PAHPA was created to improve detection and response time for an array of public health emergencies including bioterrorism, infectious diseases, and natural disasters. This legislation authorizes HHS as the lead agency regarding all public health emergencies covered by the National Response Plan. Designed to streamline federal public health responses, PAHPA holds each state accountable for its own preparedness, establishes a national surveillance structure, promotes volunteerism, and encourages the development of medical preparedness and prevention within the private sector.[24]

China

The People's Republic of China continues to play a key role in the global pandemic flu prevention and containment. China serves as the point of origin for a number of recent outbreaks of H5N1 avian influenza that has killed millions of domestic fowl in Southeast Asia. If this strain acquires the ability to transmit between humans it could in the exposure, contraction, and deaths

[23] *Summary pf Pandemic and All Hazards Preparedness Act (S.3678),* http://www.naccho.org/advocacy/documents/SummaryofBTbill.pdf, 2006, Accessed December 5, 2007.
[24] Hodge, James G., Gostin, Lawrence O., and Vernick, Jon S., "The Pandemic and All-Hazards Preparedness Act: Improviing Publich Health Emergency Response," *Journal of the American Medical Association*, Vol. 297, No. 15, April 18, 2007.

of millions of humans worldwide. Some estimates predict that human contraction of H5N1 could yield 180 to 369 million deaths.[25] Figure 3 represents a timeline of the documented human infection of avian influenza viruses in Southeast Asia from 1997 through 2005.

Figure 3.[26]

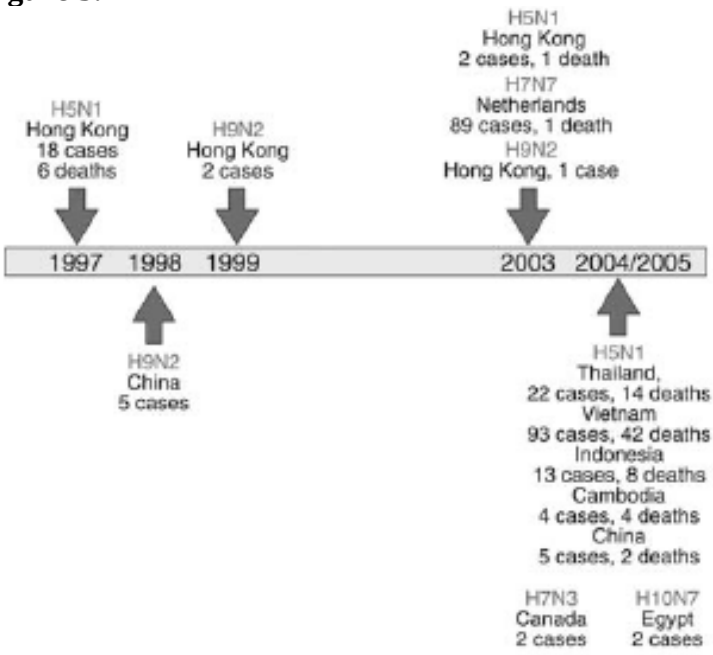


Figure 2. Timeline of documented human infection with avian influenza viruses, 1997–present (*2*). Sporadic cases of mild human disease associated with avian influenza viruses were reported before 1997.

The Ministry of Health (MOH) is responsible for organizing and coordinating a unified Chinese response to any pandemic crisis. In 2005, the MOH launched a contingency plan to enhance national preparedness and prevention and outbreak. Included in the plan are coordination instructions between the national government and localities detailing protocol for proper prevention techniques and response to outbreaks. Similar to the color alert system that the

[25] Osterholm, Michael, "Preparing for the Next Pandemic," *Foreign Affairs*, July/August, 2005, http://www.foreignaffairs.org/20050701faessay84402-p10/michael-t-osterholm/preparing-for-the-next-pandemic.html, Accessed December 2, 2007.
[26] Fauci, Anthony, Pandemic Influenza Threat and Preparedness," *Emerging Infectious Diseases*, Vol. 12, No. 1, January, 2006, http://origin.cdc.gov/ncidod/EID/vol12no01/pdfs/05-0983.pdf, Accessed December 2, 2007.

United States developed for terrorism, the MOH establishes a four-level system (red, orange, yellow, and blue) to indicate the seriousness of a pandemic outbreak. Level "red" indicates a consistent and rapid spread of a virus or serves in response to a WHO announcement of an outbreak.[27]

The Chinese government agreed to partner with the United States in April 2006 to create the U.S.-China Initiative on Avian Influenza. This partnership is designed to develop exercises and protocols to facilitate quick recognition and response to potential flu outbreaks. The United States hopes to encourage the Chinese government to accept a regional leadership role in the prevention, surveillance, and containment of future flu outbreaks in Eastern Asia.[28] In addition to this partnership, China has developed other relationships with G-8 members, the WHO, and non-governmental organizations for assistance in combating the increased thereat of H5N1 and other flu viruses present within its borders.

The Chinese MOH published a draft of national influenza epidemic plan in 2005 to respond to increased concerns of a potential flu outbreak originating from its country. The plan, contrary to the strategies of the United States and most European countries, which target heavily populated cities as priority for surveillance and prevention, focuses on rural areas. China has a history of outbreaks originating in extremely rural areas where citizens are much more likely to interact with livestock, especially poultry—this is why the Chinese strategy also emphasizes more animal to human contact than its U.S. and European counterparts. While the MOH did rely on the WHO's IHR for guidance, the Chinese strategy does suggest implementation of a plan that varies from the WHO recommendations. The strategy emphasizes domestic problems and

[27] Beijing Press, "China Sets Flu Pandemic Contingency Plan," *Terra Daily*, September 25, 2005, http://www.terradaily.com/reports/China_Sets_Flu_Pandemic_Contingency_Plan.html, Accessed November 24, 2007.
[28] "National Strategy for Pandemic Influenza Implementation Plan: Summary of Progress," *Pandemicflu.gov*, December, 2006, http://www.pandemicflu.gov/plan/federal/actionitemsummaries.pdf, Accessed December 4, 2007.

focuses heavily on combating H5N1, while failing to consider imported epidemics. Analysis of the Chinese flu pandemic plan has been rated as "high" by reviewing institutions and agencies.[29]

[29] Coker, Richard, and Mounier-Jack, Sandra, "Pandemic influenza preparedness in the Asia-Pacific region," *The Lancet*, September, 2006, 368, 9538.

Discussion

The passage of PAHPA in the United States creates a power struggle between the HHS and the DHS over authority and responsibility. The law unified pandemic preparedness and response under the newly named Assistant Secretary for Preparedness and Response, which includes the National Disaster Medical System previously under DHS. However, the *National Strategy for Pandemic Influenza* clearly indicates that the DHS is responsible for securing and preparing the nation's critical infrastructure for pandemics. This discrepancy in agency responsibility can hinder training and capability. Assigning a lead agency to oversee all pandemic preparations may only perpetuate competition and confusion. The President should differentiate responsibilities. HHS could oversee all scientific practices associated with influenza; research, surveillance, and vaccination while DHS oversees the protection of the country's infrastructure, ensuring domestic preparedness and prevention, responsible for the distribution of vaccines, and overseeing any necessary containment procedures. It is essential that the U.S. Government establish interagency protocol and guidelines. Otherwise, these two agencies may not communicate with one another extensively enough to maintain an effective pandemic strategy. Even though the U.S Government has established several laws, guidelines, and protocols regarding preparation for and response to influenza, the American public remains at the mercy of the willingness and charity of the public sector to assume responsibility to provide for the public good during the critical period of a pandemic.

China has a high track record for pandemic influenza. The first detected infections of the last three viruses that created pandemic flu discussions all originated in China.[30] The communist nation currently lacks the transparency to effectively serve as a global partner in the fight against pandemic influenza. The MOH produces few documents on internal activities concerning the

[30] Beijing Press, 2005.

country's domestic influenza surveillance abilities, diagnostic techniques, as well as prevention and containment strategies. China continues to internalize these public health concerns, refusing access by other countries and limiting access by international organizations.[31] In addition, China's plan appears very egocentric, focusing predominately on domestic preparedness, prevention, and containment. It does not provide protocol for how China should interact regionally or globally with other nations. China's short-sightedness creates significant vulnerabilities to its citizens, exposing the country to the possibility of infection through travel and importation. China cannot embrace isolationist doctrine in hopes of weathering the storm of the next flu pandemic, particularly since current potential outbreaks often originate internally, not externally.

China has developed a comprehensive strategy for utilizing its key agencies and mobilizing personnel to efficiently and effectively respond to domestic outbreaks. The Chinese strategy does suffer from some of the same pitfalls as its European counterparts. The plan remains vague regarding operational responsibility between the national and local governments. Similar to challenges in the U.S. plan, China's plan does not address the procedures for securing, stockpiling, and distributing vaccines.

Some experts believe that the only proper way to prevent the outbreak of influenza is vaccination. However, vaccines can only help the body establish immunities from established viruses whose proteins have been sequenced. Current vaccines cannot protect against new, unidentified strains. There is also the possibility that existing strains have developed resistances to human immune responses. Even if scientists could accurately predict the vaccines needed for particular strains of influenza, current stockpiles are severely lacking to meet the number needed

[31] Coker, et al., 2006.

to protect a significant percentage of the population from infection. The world must accept the daunting task of preparing for the unpredictable.[32]

A global unified prevention and containment strategy should incorporate the following actions:

- Early warning detection facilities regionally located throughout the world all connected to country health systems with the capability of surveying, detecting and alerting area governments and the WHO of a possible outbreak;
- A public database containing all known strains of Type A and B viral influenza;
- Endow the WHO with the authority to implement and regulate the IHR for pandemic preparedness;
- Increase global stockpile of vaccines which includes a global commitment by more affluent nations to meet the needs of its own citizens and aide poorer countries reach their vaccine availability needs; and
- A coalition of designated first responders located regionally throughout the world capable of being mobilized quickly in response to an outbreak.

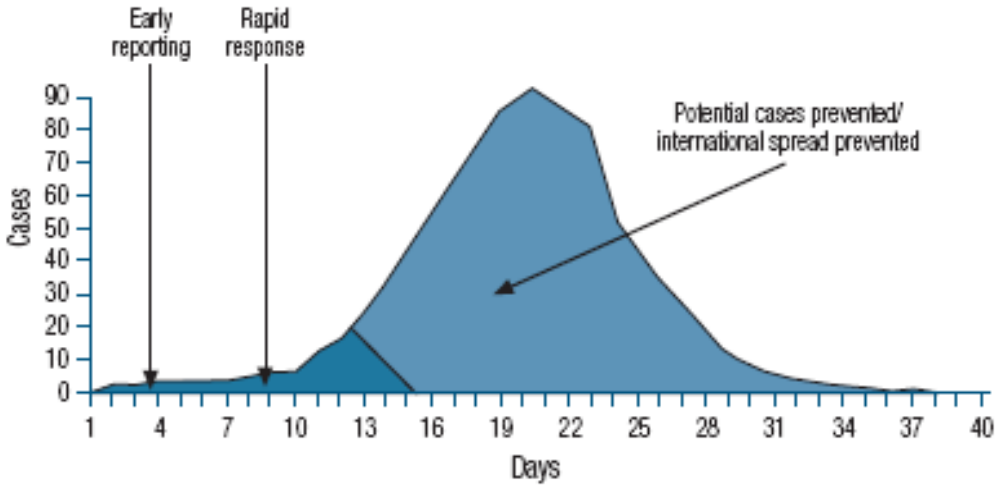
The World Trade Organization still represents a mere coordination hub for information and guidelines, given no authority by other countries to mandate and regulation pandemic preparedness. This lack of power significantly hinders the organization's ability to prepare and respond to pandemics. The burden then resides on the fiscal and physical abilities of nations capable and willing enough to not only develop domestic preventative measures but also provide support and guidance to less affluent countries in order to protect borders. It is an unnecessary responsibility brought on by the arrogance and stubbornness of governments unwilling to relinquish some sovereignty and recognize a higher authority.

[32] Kilbourne, Edwin D., "Influenza Pandemics of the 20th Century," Emerging Infectious Diseases, Janurary, 2006, http://www.cdc.gov/ncidod/EID/vol12no01/05-1254.htm#cit, Accessed December 4, 2007.

Conclusion

The world cannot rely on the United States to serve as the facilitator for a global pandemic flu strategy. There are significant disparities in ability and capacity between developed, developing and third-world countries in preparing for influenza pandemics. The United States is having difficulty meeting its own goals for national readiness and cannot assume the responsibilities of preparing another country. A disturbing amount of confusion, redundancy, and potential miscommunication remains within the pandemic emergency preparedness plan of the U.S. Government. Recent laws and protocol have created conflict between HHS and DHS. These departments and the rest of the U.S. Government only embody 15 percent of America's pandemic response capability. The other 85 percent reside in the dozens of private companies and organizations. The ability for the United States to unify these historically independent and conflicting entities remains inconclusive until the next pandemic.

Figure 4 presents a graph prepared by the WHO indicating the number of potential cases of infection prevented with proper early reporting and global rapid response techniques.



The World Health Report, 2007.

It is essential to remember that all influenza pandemics are different. Old and new strains of the virus can manifest in almost any part of the world at any given time. History indicates that pandemic influenza strikes two to three times in a given century.[33] It will take a regional and global collective preparation and response to prevent spread of the next flu outbreak to avoid expert estimates of 200 to 800 thousand lives the next pandemic flu will kill. Several scientists suggest that the avian flu strain that originated in Southeast Asia is prime for the next big pandemic. Human occurrences of the virus in Indonesia, India, Europe, and Africa indicate that the avian flu is spreading. Science and invention have stimulated remarkable advances in technology, transportation, and travel. However, the very machines and methods that the world rely on for survival and prosperity also serve as excellent carriers for the spread of infectious disease. If countries and international organizations are not unified in their approach to prevention and containment, casualties could potentially exceed the catastrophic death tolls of 1918.

[33] Kilbourne, 2006.

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