

**DEVELOPING A PANDEMIC FLU PLAN FOR THURSTON COUNTY
FIRE DISTRICT #9**

Leading Community Risk Reduction

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CERTIFICATION STATEMENT

I hereby certify that this paper constitutes my own product, that where the language of others is set forth, quotation marks so indicate, and the appropriate credit is given where I have used the language, ideas, expressions, or writings of others.

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ABSTRACT

The problem was the potential impact of pandemic flu on department operations and steps that should be taken to prepare for pandemic flu had not been identified.

Descriptive research was used to identify the impact on department operations and steps that should be taken to prepare for pandemic flu by answering the following questions: a) what is pandemic flu and why are we at risk? b) what impact would pandemic flu have on department operations? c) what steps should the department take to prepare for pandemic flu?

Based on the findings, it was recommended the department conduct continuity of operations planning, implement a pandemic training program and update the department's *Member Exposure Control manual*.

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INTRODUCTION

Avian influenza (sometimes called *Bird flu*) is an infectious disease of birds caused by strains of the Type A influenza virus. Influenza viruses are very contagious among birds and are carried naturally among seemingly healthy wild birds throughout the world. However, the virus can be easily transmitted to domesticated birds such as chickens, ducks and turkeys, making them very sick and killing them. Although avian influenza does not normally infect people, confirmed cases of human avian influenza infection have occurred since 1997 with most infections resulting from direct contact with infected poultry or surfaces contaminated by the infected birds (Centers for Disease Control and Prevention [CDC], 2006).

Influenza A viruses are constantly changing and may adapt over time to spread among humans (CDC, 2006). An *epidemic* is an outbreak of disease localized to a geographical region whereas a pandemic affects many countries across the globe (Washington State Department of Health, 2005). Influenza pandemics are extremely infectious disease outbreaks and has the potential to rapidly become a worldwide event with most, if not all, populations at risk for infection or illness. With the potential to rapidly spread worldwide while overwhelming societies and causing illness and deaths among all age groups, pandemic influenza is one of the most feared infectious disease threats (U.S. Department of Health and Human Services [HHS], 2005a).

If and when influenza pandemic occurs, Thurston County Fire District #9, like other emergency response agencies within the United States, will be tasked to deal with a large number

of ill citizens while dealing with a potentially depleted work force. According to the American Ambulance Association (AAA), an estimated 40% of EMS staff and first responders will be sickened by the disease and unable to work for an extended period of time (AAA, 2006).

Thurston County Fire District #9 is committed to adequately plan for a potential pandemic flu outbreak. The problem is the actual impact of pandemic flu on department operations and the steps that should be taken to prepare for the pandemic flu have not been identified.

The purpose of this research was to identify the potential impact of pandemic flu on department operations and to recommend steps that should be taken by the department to prepare for pandemic flu.

The Descriptive Research Method was used to answer the following questions: a) what is pandemic flu and why are we at risk? b) what impact would pandemic flu have on department operations? c) what steps should the department take to prepare for pandemic flu?

BACKGROUND AND SIGNIFICANCE

According to the U.S. Department of Health and Human Services (HHS), the average annual influenza season results in approximately 36,000 deaths, 226,000 hospitalizations, and direct medical costs between \$1 billion to \$3 billion. This significant monetary impact is due to the secondary complications that result from influenza infections such as pneumonia, dehydration, as well as the aggravation of chronic lung and heart problems. HHS further reports,

“Despite the severity of influenza epidemics, it is sobering to understand the effects of seasonal influenza are moderated because most individuals have some underlying degree of immunity to recently circulating influenza viruses either from previous infections or from vaccination” (HHS, 2005, p.B6).

A pandemic is a disease outbreak in many countries at the same time. An influenza pandemic occurs when a new flu virus spreads rapidly from country-to-country around the world. The global spread of pandemic flu happens occurs because people are not immune to the new flu virus, and a virus-specific vaccine would take months to develop (Washington State Department of Health, 2005a).

Three influenza pandemics have swept the globe in the last century. The *Spanish Flu* pandemic of 1918 infected over one-third of the U.S. population, resulting in the deaths of over 500,000 Americans and more than 20 million worldwide. Pandemics also occurred in 1957 and 1968 killing tens of thousands in the U.S. and millions across the world (Homeland Security Council, 2006).

Pandemic influenza may occur in waves lasting up to 12 weeks over an extended time period. Unlike a bioterrorism event, outside resources will likely be unavailable, as the influenza will impact many regions simultaneously (Thurston County, 2006). The following table shows the potential impact (35% attack rate) as calculated using the Center for Disease Control (CDC) FluAid Program (Thurston County, 2006). Thurston County Fire District 9 potential impact is based upon an estimated population of 11,360 (Thurston Regional Planning Council [TRPC], 2004). It should be noted that population estimates do not take into account the approximately 3000 resident students of the Evergreen State College protected by the fire district.

Table 1

Estimated maximum morbidity and mortality during an influenza pandemic

	United States	Washington	Thurston County	Fire District 9
Infected	200 million		76,475	3059
Outpatient Visits	42 million	1,050,000	58,203	2328
Hospitalized	734,000	22,685	1,118	44
Deaths	207,000	5,091	333	13

Note. Adapted from *Pandemic influenza response plan* (p.4), Thurston County Public Health and Social Health Services Department, 2006, Olympia:WA.

Thurston County Fire District #9 is a 70-member combination department providing fire and EMS services to a suburban/rural population of approximately 12,000 people. In addition to Basic Life Support (BLS) responses, the department also provides BLS transport services to district residences and provides backup transport services for four neighboring agencies covering approximately 250 square miles and a population of nearly 50,000. The department utilizes a small career staff to supervise an on-duty contingent of volunteer and student firefighters. The department serves as the coordinating agency for the South Puget Sound Community College Fire and Emergency Services Technology (FEST) program. An integral part of the program is the fire related experience requirement in which students are assigned to 24-hour shifts in district fire stations. A small career force provides the needed supervisory element and volunteer firefighters augment the on-duty staffing in the evenings and weekends and respond from home for major emergencies. Due to the heavy reliance upon the FEST program for on-duty staffing, a pandemic flu outbreak would likely result in an immediate 75% reduction in department staffing due to the likelihood that the FEST program would be suspended due to the high level of risk to the student responders.

The Fire District utilizes an infectious disease control plan that meets the requirements of the National Fire Protection Association (NFPA) Standard 1581, *Fire Department Infection*

Control Program, 2000 edition. However, an in depth review of the plan has not been conducted to ensure that it incorporates the protective measures needed to protect responders during a pandemic flu outbreak.

This research project relates to several units in the Leading Community Risk Reduction Course. In order to assess the risk associated with pandemic influenza, it is necessary to understand the elements of risk reduction; the hazards associated with pandemic flu; and vulnerability of the community to the affects as described in Unit 1: Getting Ready, and Unit 2: Assessing Community Risk. Likewise, the need for agency planning is supported by the recognition that pandemic influenza, as a low-frequency/high-risk event, often results in response agency complacency and lack of preparedness (U.S. Department of Homeland Security, 2005). Information in Unit 3: Building Support, is useful in this Research project highlighting the need to engage stakeholders in a community based pandemic flu response plan. In addition, it is recognized that conducting pandemic flu planning, and the subsequent public education component is important for building future organizational equity within our community – regardless of whether pandemic flu becomes a reality. In addition, this applied research paper directly relates to the following United States Fire Administration (FEMA, 2003) Operational Objective:

4. To promote within communities a comprehensive, multi-hazard risk-reduction plan led by the fire service organization.

LITERATURE REVIEW

A review of relevant literature highlighted the risks and potentiality of pandemic flu and provided valuable guidance into the various planning components needed for an effective pandemic flu plan.

What is Pandemic Flu and why are we at risk?

A multitude of sources highlighted the ever-changing nature of Influenza A viruses and the increasing likelihood that the Avian Influenza virus (H5N1) will likely someday lead to a worldwide pandemic. Klaus Stoh, coordinator of the World Health Organizations global influenza program stated it poignantly,

“The fear...the virus will become transmissible from human to human...is real, it’s scientifically substantiated, and we have enough historical data to tell us that the pandemic that would come out of this mutation would lead to a global health emergency, with millions of deaths, a global spread in less than three months and people in the developing countries being hardest hit” (Kimery, 2006, p.12).

To date, the spread of H5N1 virus among people has not continued beyond one person. However, because all influenza viruses can change over time, there is great concern that the virus will one day be capable of being easily transmitted from people-to-people. Because the virus is not normally transmitted amongst humans, people will have little or no immune protection from the virus (CDC, 2006b).

The Center for Disease Control identifies three types of influenza viruses: Influenza A which causes moderate illness and infects humans and other animals such as birds and pigs; Influenza B which only affects humans - usually children, and causes milder disease than type A; and Influenza C, which rarely causes human illness and has not been associated with epidemic disease. Type A influenza has subtypes which is determined by the surface antigens hemagglutinin (H) and neuraminidase (N). Hemagglutinin in humans (H1, H2 and H3) provide a role in virus attachment to cells, while types of Neuraminidase (N1 and N2) deal with virus penetration into cells. Hemagglutinin and neuraminidase routinely change and every 10 to 40

years major antigenic differences appear. Because humans do not have antibodies that provide protection from these new antigens, pandemic disease occurs (CDC, 2002).

Antigenic shift is a major change in one or both surface antigens (H and/or N) and may result in a worldwide pandemic if the virus is easily transmitted from human-to-human. To a lesser degree, *Antigenic drift* is a minor change that can result in an epidemic due to the limited antigen protection that remains from past exposure to the similar viruses. Over the past 100 years, four antigenic shifts have led to major pandemics (CDC, 2002).

Influenza viruses usually remain highly species-specific, with viruses that infect a specific species (birds, human, pigs) staying true to the species and rarely cause infection to the other species (WHO, 2006b).

The World Health Organization reports that of the many hundreds of different avian influenza A strains, only four have caused human infections: H5N1, H7N3, H7N7 and H9N2. These infections normally result in mild symptoms and very little severe illness, with one major exception, the highly pathogenic H5N1 (WHO, 2006b).

The ability of the Avian Influenza virus to spread from person-to-person is greatly influenced by the incubation period of the virus. According to the Department of Homeland Security, patients infected with influenza can remain asymptomatic for a period of 1 to 1.5 days. At two days, most infected people will develop symptoms of illness. This is of significant importance in that seemingly healthy people in early stages of influenza can be infectious to others (Homeland Security 2006a). The CDC further adds that although the incubation period associated with influenza is normally two days, it can vary from one to five days depending upon the patients previous immunologic experience with the influenza virus (CDC,2002).

Current research suggests that the H5N1 virus is becoming more pathogenic (capable of causing disease) than earlier viruses. A study found that H5N1 infected ducks now shed the virus for longer periods of time without outward signs of illness. This finding has major implications for the role ducks have in transmitting the disease to other birds and humans. (CDC, 2006b).

Thurston County Fire District 9, located in the Pacific Northwest, lies directly in the path of the Pacific Flyway – a major migratory flyway for waterfowl. There is growing concern that H5N1 could spread over a large geographical area by infecting migratory waterfowl, which could then lead to a global pandemic (USGS, 2005).

Humans infected with avian influenza have exhibited symptoms ranging from typical influenza like symptoms (fever, muscles aches, sore throat, cough) to pneumonia, eye infections, severe respiratory diseases and other life-threatening complications (CDC, 2006a). Thus far, patients infected with H5N1 have shown rapid clinical deterioration. As was demonstrated in Thailand, the time between onset of illness to the development of acute respiratory distress was approximately six days. In Turkey, severe cases resulted in respiratory failure three to five days after symptom onset (WHO, 2006a).

Vaccine

The effectiveness and availability of a vaccination is of great concern as there is currently no virus specific vaccination available for emergency workers.

According to the Homeland Security Council, at the onset of a pandemic, there will only be a limited supply of matched vaccine available and it will take an additional 4 to 6 months to develop a virus-specific vaccine. Finally, the supply of antiviral drugs will remain limited throughout a pandemic. “Until sufficient stockpiles of antiviral drugs have been established,

these medications may be available for treatment of only some symptomatic individuals” (Homeland Security, 2006, p.170). Because available influenza vaccines are produced by growing influenza viruses in embryonated chicken eggs, the vaccine may take from 6 to 9 months to prepare (HHS, 2005a).

Dr. Roland Laveandowski, Chief of the influenza, SARS and Other Viral Respiratory Disease Section at the National Institute of Allergy and Infectious Diseases, believes the H5N1 vaccine will be valuable even if a pandemic occurs from a different strain. According to Dr. Laveandowski, vaccines from other related strains can provide immunological priming and provide a booster type response once a more specific vaccine is available (Buxbaum, 2006). The U.S. Department of Health and Human Services (HHS), also believes antiviral drugs will serve as the first line of defense before a strain specific vaccine can be developed. They point to the two classes of antiviral drugs available against influenza; neuraminidase inhibitors and M2-ion channel blockers called adamantanes. HHS reports that studies have shown that neuraminidase inhibitors may reduce the complications of influenza in some people while H5N1 viruses are known to be resistant to adamantanes (HHS, 2005).

Two neuraminidase inhibitors found to be active against both influenza type A and type B are the drugs zanamivir and oseltamivir. Zanamivir is a dry powder administered by inhalation and oseltamivir is distributed as an oral capsule (CDC, 2002).

Human influenza viruses are transmitted from person-to-person via exposure to droplets generated when an infected person coughs, sneezes or speaks. The large droplets can then be directly deposited into the upper respiratory tract of persons who are within three feet of the infected person (Homeland Security, 2006a).

One of the more disturbing possibilities of a modern-day influenza pandemic is its ability to kill healthy young adults. In the Spanish Flu pandemic of 1918, healthy young adults and the usual high-risk groups saw high mortality rates. However, the mortality rate was highest among healthy adults 20 to 50 years old (National Vaccine Program Office [NVPO], 2006).

There seems to be unilateral agreement among the many sources investigated by this author that the current production of the medication Tamiflu will remain in short supply for the foreseeable future. There is additional controversy within the medical community as to appropriateness of using Tamiflu as a prophylactic means to prevent illness. Dr. Diana Yu, Public Health Director in Thurston County, WA, related that by the end of September 2007, there will be enough Tamiflu available to vaccinate only 20% of the population living within Thurston County. According to Dr. Yu, in the event of a pandemic, the first priority will be to make the antiviral medication available to the health care community and local first responders who will stand as the communities first line of defense. Dr. Yu also noted that due to the continually changing nature of the influenza virus, Tamiflu may not be effective in the event a pandemic epidemic were to actually occur (Dr. Yu, personal communication, October 26, 2006).

In an October 12, 2006 memo to elected and appointed officials, Dr Yu noted that because the anti-viral supply is limited, it is advisable to only use Tamiflu for treatment after exposure and at the first sign of illness. At that time, a full course of medication should be taken in hopes of decreasing spread of illness, and preventing possible complications of influenza. Dr. Yu stated she does NOT recommend taking the anti-viral to prevent illness. Taken as a prophylactic, she relates that the recommended duration of treatment is to remain on the medication until the risk of contagion is gone. This likely could be 6-8 weeks for each pandemic wave (Yu, 2006a).

Pandemic Phases

The World Health Organization (WHO) has identified Global Pandemic Phases established to assist the international community and national governments in preparedness and response to pandemic influenza (WHO,2005). The six pandemic phases are as follows:

Interpandemic Period

Phase 1. No new influenza virus subtypes detected in humans. Influenza subtype that has caused human infection may be present in animals. If present in animals, the risk of infection or disease is considered to be low.

Phase 2. No new influenza virus subtypes have been detected in humans. However, a circulating animal influenza virus subtype poses a substantial risk of human disease.

Pandemic Alert Period

Phase 3. Human infection(s) with a new subtype but no human-to-human spread or at most rare instance of spread to a close contact.

Phase 4. Small cluster(s) with limited human-to-human transmission but spread is highly localized, suggesting the virus is not well adapted to humans.

Phase 5. Larger cluster(s) but human-to-human spread is highly localized, suggesting that the virus is not well adapted to humans.

Pandemic Period

Phase 6. Pandemic phase: increased and sustained transmission in the general population.

Postpandemic Period

Return to the Interpandemic Period (Phase I)

Thurston County Medic One (TCMO, 2006) has included three additional EMS Operational Level subcategories under Phase 6 to assist with their planning efforts. These subcategories include:

EMS Operations Level 3: Human pandemic exists somewhere in the world. No cases identified in Thurston County.

EMS Operations Level 2: Human pandemic cases identified in Thurston County. No significant impact on EMS and medical systems.

EMS Operations Level 1: Human pandemic has achieved rapid, effective, local (Thurston County) human-to-human transmission with increased morbidity and mortality. Significant impact on EMS and medical systems (Thurston County, 2006).

Currently, the WHO reports a pandemic alert phase 3 with no or very limited human-to-human transmission.

What impact would pandemic flu have on department operations?

Failure of employees to report to work during a pandemic flu outbreak is a major concern during the development of a pandemic flu plan. This concern is reinforced by a study conducted by Dr. Daniel Barnett, instructor at Johns Hopkins University Center for Public Health Preparedness in Baltimore. In the study, 308 health care employees were surveyed with forty-two percent stating they would not respond in the event of a pandemic flu outbreak. In addition, only 40 percent of the employees believed they would be asked to work should pandemic flu materialize and only 33 percent felt they were knowledgeable of the health impact of pandemic flu (Reinberg, 2006). Interestingly, another study conducted by Harvard researchers found that it may actually be difficult to prevent many U.S. workers from reporting to work. In the survey, 25% of the adult respondents stated there was no one to care for them at home if they became ill.

Another 25% felt they could not afford to miss work for even a week fearing they would lose their job or business if they had to stay home from seven to ten days. One in five expressed fear the boss would insist they come into work even if they were sick and contagious (Harvard, 2006).

The literary review and discovery of the Johns Hopkins (Reinberg, 2006) health care employee study influenced the author to determine whether fire district members held similar opinions. Subsequently, a questionnaire was distributed to fire district members in order to ascertain their willingness to remain as a first responder during an influenza pandemic.

Economic Impact

The Homeland Security Council related the significant economic and societal disruption that would likely result from an influenza pandemic.

“Absenteeism across multiple sectors related to personal illness, illness in family members, fear of contagion, or public health measures to limit contact with others could threaten the functioning of critical infrastructure, the movement of goods and services, and operation of institutions such as schools and universities. A pandemic would thus have significant implications for the economy, national security, and the basic functioning of society” (Homeland Security Council, 2006 p.1).

The National Vaccine Program Office stated that the impact of pandemic shouldn't be measured only by the number of people that would die, but also by the major social consequences that would occur. If millions of people were sick, doctors and nurses would be unable to care for the sick. If local police force is infected, community safety might be at risk. If air traffic controllers are infected, air travel could be seriously disrupted, interrupting not only

personal travel and business but also the transport of life-saving vaccines and drugs (NVPO, 2006).

Bill Bullock and Lucian Deaton wrote that due to the predicted scarce supply of vaccine and antiviral medications in the U.S. and the high employee absenteeism at the onset of a pandemic, first responder groups and others in critical infrastructure must develop contingency plans for how to maintain essential services during the peak weeks of a pandemic (Bullock, Deaton, 2005).

The Homeland Security Council reports,

“Unlike many other catastrophic events, an influenza pandemic will not directly affect the physical infrastructure of an organization. While a pandemic will not damage power lines, banks, or computer networks, it will ultimately threaten all critical infrastructure by its impact on an organization’s human resources by removing essential personnel from the workplace for weeks or months” (Homeland Security Council, 2006, p.165).

For the Fire District, failure of the organizations internal infrastructure could result in an inability to process payments to vendors and payroll for employees. At the operational, external infrastructure failure could result in the inability to obtain needed medical supplies and logistical items such as apparatus fuel and parts.

Health Care

An influenza pandemic will severely tax the U.S. healthcare system. Published estimates suggest there could be more than 839,000 to 9,625,000 hospitalizations, 18-42 million outpatient visits, and 20-47 million additional illnesses (HHS, 2005).

With the possibility of hundreds of sick citizens within the fire district and a failing healthcare system, the fire district would find itself attempting to cope with an escalating call volume, a depleted workforce and a lack of healthcare facilities to transport the infected patients. In anticipation of an overloaded health care system, the author is participating on a planning committee established by Thurston County Public Health to establish two Emergency Support Assessment Centers (ESAC's) on the west side of Olympia. These ESAC's would provide an additional layer in the health sector's pandemic response. Patients, suspected of being infected with avian flu would be transported to an ESAC where they would be assessed for illness, and if ill, would either be sent to a hospital or alternate care center (ACC) for treatment or provided medication and self-care advice. Medical professionals, volunteer health providers and possibly EMS personnel would staff these centers (Yu, 2006b).

The author found literature consistent in the message of measures that can be taken to minimize personal infection. The Public Health Service, *Guideline for isolation precautions in hospitals*, provides standard precautions that are used as the standard today. Standard precautions include recommendations for hand washing, glove usage, mask, eye and face protections, gown usage, patient care equipment, environmental control, linen, occupational health and bloodborne pathogens and patient placement.

Within the literature, the author found discrepancies regarding the minimum level of respiratory protection that should be utilized by responders for avian influenza. The International Association of Firefighters (IAFF) recommends P-100 disposable respirators as the minimal level of respiratory protection for responders citing NIOSH regulations and specifications contained in the World Health Organization's *Hospital Infection Control Guidance for SARS* (IAFF, 2006). The IAFF further bases their recommendation for the "P"

designation (meaning oil proof) on the fact that members frequently respond to *unknown condition* environments. This recommendation exceeds the respiratory protection requirements recommend by other sources investigated by the author. The Department of Health and Human Services acknowledges the controversy surrounding respirator use and points to the large amount of incorrect, incomplete and confusing information being distributed through media and via the internet and reinforces that scientific data related to the transmission of the influenza viruses remains unchanged with N-95 masks being the minimum recommended respiratory protection for activities that have the potential of generating infectious respiratory aerosols (HHS, 2006b). The Occupational Safety & Health Administration (OSHA) also recommends that health care workers that transport or treat avian flu patients use at a minimum N95 masks in accordance with 29 CFR 1910.134 (OSHA, 2006). Steve Romines, Director of Thurston County Medic One, stated he believes that N95 respirators are consistent with current CDC recommendations but added that the exhalation valve contained within the N100 mask may increase wearer for individuals tasked with wearing masks for long periods of time. Mr. Romines believes that the exhalation valve decreases the build up of carbon dioxide that can occur when individuals wear the standard N95 mask for long periods (Steve Romines, personal communication July 16, 2006).

What steps should the department take to prepare for pandemic flu?

If a pandemic influenza occurs, it is essential that the governmental entities be capable of providing essential public safety services. It is critical that public safety agencies be fully prepared to support public health officials and be prepared to address the challenges associated with such an outbreak. It is also essential that public safety agencies protect the safety and health

of their workers to ensure their workers can safely and effectively perform their assigned roles (Homeland Security Council, 2006).

Continuity of Operations Planning (COOP) is an all-hazards approach that can be utilized to prepare an organization to maintain essential services when experiencing a hazard, like avian influenza, that has the potential to disrupt department operations. FEMA warns, without good COOP planning, organizations risk leaving their citizens without vital services in what could be their greatest time of need (FEMA, 2004). Both FEMA, and NFPA 1600 *Standard on Disaster/Emergency Management Business Continuity Programs* (NFPA, 2000) provide guidance into the development of continuity programs. NFPA 1600 identifies various elements that should be included in a COOP program. These elements include:

- Identifying Laws and Authorities
- Conducting a hazard identification and risk assessment
- Implementing a mitigation strategy to eliminate hazards or minimize hazards that cannot be eliminated.
- Establishing a program to identify and priority essential functions and determine staffing requirements.
- Developing a written program policy that includes the development of the following plans:
 - Strategic Plan
 - Emergency Operations Plan
 - Mitigation Plan
 - Recovery Plan

Guidance in the development of these plans can also be found in FEMA's *Interim guidance on continuity of operations planning for state and local governments* (FEMA, 2006).

In addition, the author was also able to locate an Emergency Medical Service and Non-Emergency (Medical) Transport Organizations Pandemic Influenza Planning Checklist available from the CDC web site (HHS, 2006b).

The International Association of Fire Chief's (Bushman, Evans, 2006) offer additional recommendations specific to influenza pandemic, these recommendations include:

- Providing for annual flu shots for members.
- Inventorying and maintaining adequate supplies of personal protective equipment (PPE).
- Becoming familiar with hospitals pandemic flu plans.
- Development or alteration of patient care protocols through local medical director.
- Development of alternative staffing plans.
- Implementation of increased universal precautions and strict disinfection guidelines.
- Staffing of distribution centers.
- Education for pandemic preparedness for the general population and all levels of government and private sector.
- Monitoring of workers for the signs and symptoms of exposure to influenza.

HHS recommends creating a policy to deal with members who become ill. Elements of the policy should include; 1) procedure for handling staff that become ill at work; 2) when personnel may return from work after being ill; 3) when personnel that are symptomatic will be allowed to work; and 4) personnel who need to care for their family members (HHS, 2006a).

In summary, experts believe due to antigenic shift, the Avian Influenza virus H5N1 will likely someday lead to a worldwide pandemic. Because the H5N1 is highly pathogenic, it is anticipated that a world-wide pandemic could lead to a global health emergency with millions of deaths. With significant economic and societal disruption and absenteeism across multiple

sectors, a pandemic would have profound implications for the economy and basic functioning of society. At the local level, health care facilities would become severely overloaded and the fire district would be tasked to respond to an escalating call volume with a depleted work force.

In the event of a pandemic, it will be essential that the fire district remain capable of providing essential services. Continuity of Operations Planning is an all-hazards approach that prepares an organization to maintain essential services. A “Pandemic Plan” is actually a series of plans and actions that should be taken to adequately prepare the fire district for an avian flu pandemic.

PROCEDURES

This applied research project utilized descriptive research methodology to gather information needed to identify the risks associated with an avian influenza pandemic; the potential impact on department operations; and steps that should be taken to prepare for pandemic flu.

The first step of this research began with a literature review which commenced in April 2006 at the National Fire Academy’s (NFA) Learning Resource Center (LRC), while the author was in attendance at the academy for the *Leading Community Risk Reduction – R280*. The LRC was utilized due to its wide selection of books, periodicals, reports and Applied Research Projects. Using specific title searches for terms *Pandemic*, *Influenza* and *Avian* resulted in several books and numerous periodicals that were subsequently reviewed for pertinence while present at the LRC.

A comprehensive Internet web search was conducted from the Google and Google Scholar search engines using key words *Pandemic* and *Avian Influenza*. Dozens of web sites were reviewed that provided valuable information. Web sites from the Center for Disease

Control (CDC), the World Health Organization (WHO) and the U.S. Department of Health and Human Services (HHS) were found to provide the most accurate, up-to-date information available for this research. In addition, information was also collected from the US Census Bureau, the U.S. Department of Labor and Thurston County Public Health Department web sites.

Information was also collected from the State of Washington Public Health and handout materials from pandemic flu planning committee meetings attended by the author.

As a result of the research, the author contacted Dr. Diana Yu, Public Health Director in Thurston County Washington in regards to vaccination of health care workers and with Mr. Steve Romines, Director of Thurston County Medic One in regards to the use of N100 respirators. In addition, the fire districts current *Member Exposure Control Manual* was reviewed for completeness and its applicability to protect members from avian influenza.

LIMITATIONS

Several limitations existed in this research project. The author determined that due to the scope and time limitations of this paper to limit the assessment of potential absenteeism and knowledge proficiency to responders within the Fire District only. Due to the extensive amount of auto and mutual aid that occurs within the district, the true impact would need to include auto/mutual aid partners as well. In addition, time limitations of this paper prevented the author from including the final Thurston County Emergency Response Community Pandemic Plan and to assess the impact of the proposed Emergency Support Assessment Centers, both of which are currently in development.

Another limitation of this project was the lack of information that could be found within the literature in regards to actions fire service agencies are currently taking to prepare for avian

influenza. This lack of information prevented the author from presenting best practices information in this project report.

A limitation of the questionnaire was its inability to actually measure the respondents' knowledge in regards to avian influenza. As presented, the questionnaire actually measured the respondents' perception of their personal knowledge. That is, a respondent could have ranked him or herself high in regards to knowledge of the influenza, personal protection or decontamination procedures when in fact the respondent actually had a low knowledge base (unconscious incompetence). Further study beyond the scope and time limitations of the project would be needed to measure actual competency of the respondents.

The final limitation of this study is related to the respondents expressed willingness to serve as a first responder during an avian influenza pandemic. It cannot be determined from the questionnaire whether a full understanding of the risks associated with treating infected patients would affect the respondents' willingness to serve.

RESULTS

An Internet and paper based questionnaire was utilized as part of this applied research project. An email invitation and memo was sent out to each department member which comprised of eight career personnel, twenty-one volunteer and forty-five FEST firefighters. The questionnaire, hosted on the web server, SurveyMonkey.com™ provided the analysis tool. Questionnaires returned in hard copy form were entered into the web-based questionnaire by the author to aid in later analysis of the data. Completed questionnaires were received from 49 of the 74 department members (66%). The breakdown of returns by position in department included 5 of 8 career (62%), 35 or 45 (77%) FEST Firefighters and 8 of 21 (38%) volunteer firefighters. A second request sent out at the end of the initial two-week period resulted in only a

few additional responses. The questionnaire was designed to capture a “broad brush” look at the following: a) whether enhanced responder training should be identified as an action item for pandemic planning. b) the willingness of members to remain as responders during an avian influenza pandemic – which will have a direct impact on department operations.

Question #1: Should enhanced responder training be identified as an action item for pandemic planning.

Table 2

Member familiarity with Pandemic Flu

Member Type	“How familiar are you with the term Pandemic Flu”				
	Very familiar	Somewhat familiar	Not too familiar	Not at all familiar	I don’t know
Career	2	3	0	1	0
Volunteer	1	6	1	0	0
FEST Firefighter	2	10	15	6	2
Total:	5	19	16	7	0

The questionnaire revealed that nearly half the respondents (47%) reported that were not too familiar or not at all familiar with the term pandemic flu. Only five (14.3%) reported they were very familiar with the term. FEST Firefighters reported to have the lowest familiarity with pandemic flu with 60% of the respondents reporting little or no familiarity.

Table 3

Member familiarity with personal protective measures

Member Type	“How familiar are you with personal protective measures that you can take to prevent contracting avian influenza”				
	Very familiar	Somewhat familiar	Not too familiar	Not at all familiar	I don’t know
Career	1	3	0	1	0
Volunteer	1	5	1	0	1
FEST Firefighter	3	11	15	3	0
Total:	5	19	16	4	1

Nineteen department members (42.2%) reported they were somewhat familiar with personal protective measures that can prevent contracting avian influenza. An additional 44% of the department reported they were either not too familiar or not at all familiar. Only five (11.1%) of the respondents reported they were very familiar with personal protective measures. FEST Firefighters reported to least amount of familiarity with personal protective measures with 51% reporting either little or no familiarity.

Table 4

Member familiarity with decontamination procedures

Member Type	“How familiar are you with the decontamination procedures to prevent the transmission of the avian influenza to yourself and others				
	Very familiar	Somewhat familiar	Not too familiar	Not at all familiar	I don’t know
Career	2	1	2	1	0
Volunteer	1	2	4	1	0
FEST Firefighter	0	12	17	6	2
Total:	3	15	21	8	2

Over half the respondents (59.2%) reported they were not too familiar or not at all familiar with decontamination procedures to prevent the transmission of avian influenza. Only three respondents (6.1%) stated they were very familiar with the decontamination procedures. FEST firefighters reported the least amount of familiarity with 71.1% reporting being not too familiar, not at all familiar or didn’t know.

Table 5

Member familiarity with risk associated with avian influenza

Member Type	“How familiar are you with the risk associated with providing emergency medical care to a patient infected with avian pandemic flu?”				
	Very familiar	Somewhat familiar	Not too familiar	Not at all familiar	I don’t know
Career	1	2	2	1	0
Volunteer	1	2	4	1	0
FEST Firefighter	3	9	14	10	0
Total:	5	11	20	12	0

Thirty-two (65.3%) of the respondents reported either they were not too familiar or not at all familiar with the risk associated with providing care to a patient infected with avian pandemic flu. Only five (10.2%) members reported they were very familiar. FEST Firefighters reported the least familiarity with 68% reporting either not too or not at all familiar.

Question #2: How willing are members to remain as responders during an avian influenza pandemic?

Table 6

FEST Firefighters’ willingness to serve as volunteer firefighters

Member Type	“As a FEST Firefighter, I would continue to serve my community as a Volunteer Firefighter with the department.”				
	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
Career	-	-	-	-	-
Volunteer	-	-	-	-	-
FEST Firefighter	22	11	1	1	0

Willingness to continue serving as a volunteer firefighter was asked of only the FEST firefighters. This question was intended to assess potential future staffing levels in the event that the FEST Community College program was suspended by the college. 94% of the FEST

firefighters that responded stated they would continue to serve their community as volunteer firefighters. No attempt was made to correlate whether the member’s familiarity with pandemic flu, risk or decontamination procedures impacted their willingness to continue serving during a pandemic.

Table 7

FEST Firefighters’ willingness to serve as seasonal employee

Member Type	“As a FEST Firefighter, I would continue to serve my community as a seasonal employee of the department.”				
	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
Career	-	-	-	-	-
Volunteer	-	-	-	-	-
FEST Firefighter	24	9	0	0	0

Willingness to serve as a seasonal employee was designed to assess whether receiving pay (versus volunteering) would impact FEST firefighters willingness to serve during a pandemic. 100% of the FEST firefighters that responded stated they would continue to serve their community as seasonal employees of the district. Providing seasonal employment versus volunteer status to FEST firefighters resulted in a 4.1% increase in those strongly agreeing to serve and a 9.8% increase in those agreeing to serve. Similar to table 6, no attempt was made to determine whether member familiarity with pandemic flu impacted their willingness to serve as a seasonal employee.

Table 8

General membership willingness to serve as a first responder

Member Type	“If a pandemic were to occur, I would continue serving my community as a first responder.”				
	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
Career	2	1	1	0	0
Volunteer	5	2	0	0	0
FEST Firefighter	-	-	-	-	-
Total:	7	3	1	0	0

The question, “If a pandemic were to occur, I would continue serving my community as a first responder”, was asked of career and volunteer members. 91% of the respondents stated they would continue to serve as a first responder. Due to the low number of volunteer firefighters that responded to the questionnaire, an accurate assessment of their willingness to continue serving during a pandemic could not be determined.

DISCUSSION

The results of this research indicates that there are multiple steps Thurston County Fire District #9 should undertake to prepare the organization for an avian flu pandemic. This includes steps to ensure continuity of operations and enhanced training for members in personal protection and decontamination procedures.

The literature consistently highlights the risks associated with avian influenza and the potentiality of the avian H5N1 virus to undergo antigenetic shift which would lead to a world-wide pandemic. Reports from the U.S. Department of Health and Human Services (HHS, 2005a), the Center for Disease Control (2006) and World Health Organization (2006) and Kimery (2006) indicate that an avian H5N1 pandemic could quickly become a worldwide event leading to illness and millions of deaths.

The literature remains consistent in the assertion that the supply of antiviral drugs will be limited. The Homeland Security Council (2006) acknowledges that only a limited supply of matched vaccine will be available and the production of additional vaccine will take an additional 4 to 6 months. The ability for antiviral drugs such as Tamiflu to protect emergency workers during a pandemic remains controversial within the literature. While the immunological priming benefit of current vaccines reported by Dr. Lavenandowski (Buxbaum, 2006) against the H5N1 virus remains encouraging, the uncertainty of Tamiflu's likely effectiveness expressed by Dr. Diana Yu, highlights the importance of adequately training response personnel in the use of personal protective equipment and standard precautions to prevent contracting the illness from patients.

The willingness of members to continue serving as emergency responders during a pandemic was an unanticipated finding of this research project. The high percentage of department members stating they would continue to serve as responders during a pandemic was not consistent with research conducted by the Johns Hopkins University Center for Public Health and Preparedness in which 42% of health care workers surveyed stated they would not respond during a pandemic (Reinberg, 2000). In addition, the research rebutted the 75% staffing reduction planning assumption initially established by the author with 97% of the South Puget Sound Community College FEST Firefighters stating they would be willing to continue serving as volunteer firefighters during a pandemic.

Although department members may be willing to continue serving during a pandemic, illness within the workforce will inevitably result in a reduction of workforce. The research conducted by Harvard and Johns Hopkins University (Harvard, 2006; Reinberg, 2006) reinforces the assumption that a lack of available emergency personnel may exist due to absenteeism. In

addition, the general population's reluctance to stay away from the workplace may further propagate the spread of the virus in our community – both creating significant challenges in managing an increased call volume with a depleted workforce.

The questionnaire revealed that additional training needs to be provided to fire district members to safely respond during an avian influenza pandemic. With 86.7% of the respondents reporting they were only a little familiar or not too familiar with personal protective measures and 59% stating they were not too familiar with decontamination procedures, the questionnaire highlights the necessity of providing additional training to protect the health of emergency workers during a pandemic episode. The questionnaire also revealed that FEST firefighters are in the greatest need for pandemic training which was not surprising due to their limited time in the fire service. The author found the World Health Organization document *Avian Influenza, Including Influenza A (H5N1), in Humans: WHO Interim Infection Control Guideline for Health Care Facilities* (WHO, 2006b) to be the most comprehensive text available providing recommendations for personnel protective equipment, standard and transmission based precautions for dealing with patients infected with the H5N1 avian influenza virus.

Based upon the research, the author was unable to substantiate the recommendation by the International Association of Firefighters (IAFF) establishing P-100 respirators as the minimal level of respiratory protection for responders. The author found this recommendation exceeded the N-95 mask minimal respiratory protection level requirement established by both HHS and OSHA (HHS,2006; OSHA, 2006). However, there may be merit in the assertion made by Medic One Director Steve Romines (personal communication July 16,2006) that P-100 respirators may help to reduce carbon dioxide buildup and increase wearer comfort for individuals tasked with

wearing masks for long periods of time. Further study beyond the scope of this paper would be needed to quantitatively prove or disprove this theory.

Reports from the Homeland Security Council (2006) and FEMA (2004) highlight the necessity of public safety agencies being fully prepared to address the challenges associated with an influenza pandemic. These challenges range from addressing internal infrastructure issues such as maintaining staffing levels and processing employee payroll to external infrastructure issues such as obtaining medical supplies and logistical items such as apparatus fuel and parts.

Continuity of operations planning is consistently supported by the literature as an all-hazards approach that should be utilized to prepare organizations for an avian influenza pandemic. The Homeland Security Council (2006), FEMA (2004) and NFPA (2000) provide guidance in the development of a COOP program. In addition, the Emergency Medical Service and Non-Emergency (Medical) Transport Organizations Pandemic Influenza Planning Checklist (HHS,2006b) provides valuable guidance in the development of a COOP program. Lastly, recommendations provided by Bushman and Evans (2006) on the IAFC web site should be incorporated into a COOP program.

To summarize, the organizational benefits of this research are many. While the willingness of responders to continue serving their community during a pandemic remains high, continuity of operations planning must be conducted to ensure that our organization can continue to serve our community when it is needed most. COOP must address both internal and external infrastructure and must ensure the development of an adequately trained workforce proficient in the use of personal protective equipment and standard/airborne precautions in order to minimize absenteeism due to employee infection with the avian influenza.

RECOMMENDATIONS

The research presented in the study identifies numerous steps that should be taken by Thurston County Fire District #9 to adequately prepare the organization to respond efficiently and effectively during an avian influenza pandemic. Steps that should be taken by the fire district include:

1. A continuity of operations plan should be developed in accordance with FEMA's *Interim Guidance on Continuity of Operations Planning for State and Local Governments* (FEMA, 2004) and NFPA 1600 *Standard on Disaster/Emergency Management Business Continuity Programs* (NFPA, 2000)
2. A comprehensive training program should be developed to ensure that all members understand the implications of influenza pandemic, are proficient in standard / airborne precautions and are familiar with existing Thurston County EMS response plans.
3. The district *Member Exposure Control Manual* should be revised as necessary to ensure that it provides a comprehensive exposure control plan that provides maximum protection against infection for department members.
4. An employee absenteeism policy should be developed to provide guidance in dealing with department members who become ill.

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APPENDIX A

Questionnaire cover letter

(sent via email)

November 13, 2006

Dear Department member:

I am conducting research in the development of a pandemic flu plan for the department as part of an Applied Research Project course requirement of the National Fire Academy, Executive Fire Officer program in which I am a student.

I respectfully ask your assistance in completing a pandemic flu questionnaire. The questionnaire should take less than five minutes to complete and will provide me with crucial information.

The questionnaire has been placed in individual mailboxes and can also be accessed on-line at <http://www.surveymonkey.com/s.asp?u=933772883249>.

Please complete the survey before November 24th. Your responses will be kept anonymous. If you have any questions, please feel free to contact me.

Sincerely,

Steve North – Fire Chief

APPENDIX B

Avian Influenza Pandemic Questionnaire

The following questionnaire is designed to assess your current knowledge of pandemic avian influenza/infection control procedures and your willingness to continue serving as a responder during an avian influenza pandemic.

1. How familiar are you with the term “Pandemic Flu”?

- Very familiar
- Somewhat familiar
- Not too familiar
- Not at all familiar
- I don't know

2. How familiar are you with personal protective measures that you can take to prevent contracting avian influenza?

- Very familiar
- Somewhat familiar
- Not too familiar
- Not at all familiar
- I don't know

3. How familiar are you with decontamination procedures to prevent the transmission of avian influenza to yourself or others?

- Very familiar
- Somewhat familiar
- Not too familiar
- Not at all familiar
- I don't know

4. How familiar are you with the risk associated with providing emergency medical care to a patient infected with avian pandemic flu?

- Very familiar
- Somewhat familiar
- Not too familiar
- Not at all familiar
- I don't know

Public Health officials believe that an avian influenza pandemic would result in a global health emergency that could result in millions of deaths. If a pandemic occurs, people will have little or no immune protection from the virus. Currently no vaccine exists to definitively protect responders from the virus although antiviral medications may help to reduce the complications. In the event of a pandemic, it is anticipated that the state community college system would immediately close to prevent the spread of the virus among students – this would significantly impact our staffing levels at a time when call volumes are expected to rise exponentially.

5. Please indicate your current position in the department.

- Career - Skip to question 8
- Volunteer - Skip to question 8
- FEST Firefighter - Continue with questions 6 and 7, skip question 8.

6. As a FEST Firefighter, I would continue to serve my community as a Volunteer Firefighter with the department.

- Strongly Agree
- Agree
- Neither Agree nor Disagree
- Disagree
- Strongly Disagree

7. As a FEST Firefighter, I would continue to serve my community as a seasonal employee of the department.

- Strongly Agree
- Agree
- Neither Agree nor Disagree
- Disagree
- Strongly Disagree

8. If a pandemic were to occur, I would continue to serve my community as a first responder.

- Strongly Agree
- Agree
- Neither Agree nor Disagree
- Disagree
- Strongly Disagree

Thank you for taking the time to participate in this important questionnaire! Your responses will greatly assist me in developing a pandemic flu plan for the department. The results of this questionnaire and Applied Research Project will be made available upon request.