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THESIS

**FIRE FIGHTERS' ABILITY AND WILLINGNESS TO
PARTICIPATE IN A PANDEMIC**

by

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March 2008

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**FIRE FIGHTERS' ABILITY AND WILLINGNESS TO PARTICIPATE IN A
PANDEMIC**

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Submitted in partial fulfillment of the
requirements for the degree of

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ABSTRACT

Current estimates predict that 30-40 percent of the population will be infected with the flu virus during a pandemic. Fire departments should anticipate a higher attack rate for their personnel because of increased exposure risk. Additionally, many variables will negatively influence fire fighter participation rates over and above these attack rates.

This thesis analyzes fire fighters' ability and willingness to participate in a pandemic through a comprehensive survey of fire fighters within the twelve National Capital Region fire departments. Issues that may influence fire fighters' ability and willingness to work include childcare, concern of family, adequate personal protective equipment, worker's compensation coverage, and availability of vaccines and antivirals. Collectively, these variables determine a workforce participation percentage (WPP) — the share of fire fighters who will be able and willing to participate in a response during a pandemic. Results indicate that between 30-70 percent of the fire fighters will not be able or willing to work during a pandemic. Although a fire fighter's participation is situationally dependent, fire departments should take urgent steps to address five core areas. These are included in a set of recommendations. Ultimately, the priority recommendation is for fire officials and regional public policymakers to rise to the challenge of the complexity of these issues. Leadership in the face of this recognized pandemic threat, however, remains an elusive solution.

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This is dedicated to those who fight this threat today, in the hopes that our children may never have to experience it tomorrow.

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I. INTRODUCTION

The fire departments within the National Capital Region (NCR)¹ have for a number of years worked collaboratively on many response and preparedness initiatives. The effective overall response to the September 11, 2001, attack on the Pentagon is indicative of this work. The *9/11 Commission Report* noted that the three reasons for the successful response were “first, the strong professional relationships and trust established among emergency responders; second, the adoption of the Incident Command System;² and third, the pursuit of a regional approach to response.”³

The post-September 11 environment has further enhanced this partnership between the NCR fire departments as their collective focus has centered on preparedness initiatives for potentially catastrophic events deemed a serious threat against the NCR. One of the most pressing issues within the NCR is pandemic/infectious disease preparedness. Although many NCR fire departments have initiated various preparedness and response efforts, a comprehensive regional response plan has not resulted from this cooperation even though a pandemic will likely affect all jurisdictions within the NCR equally and simultaneously.

A core question underlies any approach to a regional pandemic plan, or even separate jurisdictional plans: do we know fire fighters’ ability and willingness to participate in a response to a pandemic event? Research on professional responders in

¹ The National Capital Region (NCR) is defined by the Metropolitan Washington Council of Governments (COG) as the area containing the following jurisdictions: the City of Alexandria, Arlington County, the District of Columbia, Fairfax County, Loudoun County, Montgomery County, Prince George’s County, Prince William County, and all inclusive municipalities.

² “In March 2001, the Washington area Council of Governments adopted the NIIMS ICS model. Thus, there is a common understanding of basic working relationships among local jurisdictions. However, establishing and maintaining command of the response to the Pentagon attack was daunting. There were thousands of people and hundreds of equipment apparatus from more than a dozen different jurisdictions, as well as many Federal, State, and Arlington County government agencies, and scores of volunteer organizations, businesses, and individuals. This understandably challenged the leadership of a fire department that usually directs the efforts of some 260 uniformed personnel. Although the ACFD performed well in responding to the terrorist attack on the Pentagon, the actual experience of coordinating the multifaceted response proved significantly more challenging than previously envisioned.” Titan Systems Corporation, *Arlington County: After-Action Report on the Response to the September 11 Terrorist Attack on the Pentagon* (Arlington, VA: The County, 2002), A-21.

³ National Commission on Terrorist Attacks Upon the United States, *The 9/11 Commission Report: Final Report of the National Commission on Terrorist Attacks upon the United States* (New York, NY: W.W. Norton & Company, Inc., 2004), 314.

other emergency services shows that only a fraction will respond, or are able to respond, to the new biological threats. For planning purposes, an assessment of fire fighters' response would begin with determining a workforce participation percentage (WPP): the share of fire fighters who will be able and willing to participate in a response during a pandemic. From the outset, this participation rate will be seriously affected by the spread of the disease itself. For instance, the Department of Health and Human Services' *Pandemic Influenza Plan* calculates plans for a clinical attack rate (the rate at which the disease will affect the population) of 30 percent.⁴ For fire fighters,⁵ with an anticipated increased exposure, fire departments should anticipate a higher attack rate for their personnel. Additionally, there are many variables, specific to fire department personnel, which will negatively influence participation rates. Consequently, the WPP for fire fighters will be greater than the estimated 30 percent clinical attack rate. Fire department personnel are of course the critical node for all fire department operations. Whether or not departments can provide sufficient emergency and non-emergency services to their community is, therefore, primarily contingent upon adequate staffing levels.

This thesis has several objectives. First, it provides a baseline workforce percentage for fire fighter participation in a pandemic in the NCR. Although a variety of issues will collectively determine baseline workforce levels in an actual event, a reasonable estimate can be drawn from the available scientific data on past pandemics and data collected from a survey conducted specifically for this thesis. Determining a fact-based workforce participation percentage will assist fire departments in developing reasonable and practical pandemic plans.

Second, the thesis will examine the various influences on fire fighters' ability and willingness to respond to an emergency. With this assessment, fire departments will be challenged to design and implement corrective interventions that address these major influences. The goal of this analysis is to motivate fire departments to take measures to increase participation levels before a pandemic occurs.

⁴ U.S. Department of Health and Human Services (DHHS), *HHS Pandemic Influenza Plan* (Washington, DC: U.S. Department of Health and Human Services, November 2005), 18, <http://www.hhs.gov/pandemicflu/plan/pdf/HHSPandemicInfluenzaPlan.pdf> (accessed January 12, 2008).

⁵ Fire fighters within the NCR are trained to a minimum level of Emergency Medical Technician and are responsible for responding to medical emergencies on a daily basis. This is discussed at greater length in Chapter 4.

Third, the estimate of the rate of participation and the analysis of behavioral influences are used to identify and develop recommendations for fire department actions. These recommendations range from internal department initiatives to broader legislative changes. In each case, the underlying theme is for emergency planners and, specifically, fire departments to greatly improve their workforce planning as part of a broader strategy of preparing for a pandemic event.

The data for this thesis is drawn from a survey of NCR fire departments; their respective employees were surveyed, studied, and analyzed collectively to establish a significant data set which identifies fire fighters' concerns and issues with participating in a pandemic. It was also deemed necessary to do a comprehensive analysis on the region simply because a pandemic will likely affect the entire NCR equally and simultaneously. Regional preparedness, planning, and response will require coordination among the NCR fire departments. Analyzing fire fighters' ability and willingness to participate in a pandemic on a regional level is a critical first step of this process as these issues will be central to preparedness and planning efforts.

A. OVERVIEW OF THE NATIONAL CAPITAL REGION

The National Capital Region was created pursuant to the National Capital Planning Act of 1952 (Title 40, U.S.C., Sec. 71) and defined the jurisdictions within the NCR.⁶ Since 1952, the NCR has expanded to the District of Columbia and eleven jurisdictions in the State of Maryland and the Commonwealth of Virginia.⁷ The NCR is the fourth largest metropolitan region area within the United States, consisting of over 6,000 square miles and over 4.2 million people.⁸

The Metropolitan Washington Council of Governments (COG) is a regional organization of local governments within the NCR. "COG is composed of 21 local governments surrounding our nation's capital, plus members of the Maryland and

⁶ U.S. Department of Homeland Security, "National Capital Region - Office of the National Capital Region Coordination," http://www.dhs.gov/xabout/structure/editorial_0611.shtm (accessed February 15, 2008).

⁷ Ibid.

⁸ Ibid.

Virginia legislatures, the U.S. Senate, and the U.S. House of Representatives.”⁹ The NCR was the site for this research and the COG was the group used to facilitate the process. All of the surveyed jurisdictions are located within the NCR and are members of the COG. The following jurisdictions were participants in the survey: District of Columbia, Montgomery County and Prince George’s County in Maryland, and the City of Alexandria, Arlington County, Fairfax County, Fairfax City, Loudoun County, and Prince William County in Virginia.

B. PRE-SEPTEMBER 11, 2001, NCR FIRE DEPARTMENT COLLABORATION

Prior to the September 11, 2001 terrorist attack on the Pentagon, much of the collaboration between the NCR fire departments was facilitated through personal relationships between fire department leaders and participation in the Metropolitan Washington COG. This collaboration was a primary reason for the successful response at the Pentagon. The COG provides a suitable venue to address fire department pandemic preparedness, planning, and response. Not all jurisdictions, agencies and businesses within the NCR, though, participate in the COG.

COG provides a focus for action and develops sound regional responses to such issues as the environment, affordable housing, economic development, health and family concerns, human services, population growth, public safety, and transportation. Founded in 1957, COG is an independent, nonprofit association. It is supported by financial contributions from its participating local governments, federal and state grants and contracts, and donations from foundations and the private sector. Policies are set by the full membership acting through the board of directors, which meets monthly to discuss area issues.¹⁰

The COG is one of the primary venues for various fire-related groups from the NCR to meet and discuss jurisdictional, regional, and national issues. Perhaps the most influential collaboration occurred in 1995-96 with the development of the Metropolitan Medical Response Team (MMST). Following the sarin nerve agent attack in Tokyo, Japan in 1995, many progressive emergency response leaders recognized that the United States lacked the capacity and capability to respond to a similar type of event. The

⁹ Metropolitan Washington Council of Governments, "Metropolitan Washington Council of Governments: Serving the National Capital Region: About COG," <http://www.mwccog.org/about/> (accessed October 5, 2007).

¹⁰ Ibid.

chairman of the COG Fire Chiefs' Committee, Arlington County Fire Chief Edward Plaugher, requested that the COG Chairman, Jack Evans, send a letter to President Clinton requesting assistance for preparedness and response to weapons of mass destruction (WMD) incidents. As a result of this letter, the United States Public Health Service (USPHS) requested COG assistance in developing the nation's first locally-based WMD response team. The team was developed through the multi-jurisdictional COG fire subcommittees. The MMST was comprised of fire fighters, hazardous material technicians and specialists, and paramedics from the NCR fire departments. The group also included law enforcement personnel from the NCR police departments and doctors and nurses from various local hospitals. According to the *Arlington County: After-Action Report on the Response to the September 11 Terrorist Attack on the Pentagon*, "this pioneering work produced the framework for the Metropolitan Medical Response System (MMRS), [which is] now embraced by more than 100 U.S. metropolitan areas. It was the predecessor to the National Medical Response Team (NMRT), which played an important response role at the Pentagon."¹¹

The development of the MMST was truly a collaborative effort among the NCR emergency response organizations that established the foundation and enhanced the relationships for greater inter-jurisdictional cooperation and support. The COG is a mechanism that has facilitated and enhanced this collaboration between local governmental agencies and departments and has played an important role in facilitating fire department collaboration within the NCR. The challenge facing fire chiefs and the COG is continuing this effort in collaboration for enhanced regional preparedness.

Since September 11, 2001, the NCR fire departments have increased their capabilities to respond to WMD incidents through two primary methods. First, individual departments have enhanced their capabilities, training, and education for response to a WMD incident through individual initiatives. For example, Arlington County Fire Department purchased radiation dosimeters that were placed on every fire department

¹¹ Titan Systems Corporation, *Arlington County: After-Action Report on the Response to the September 11 Terrorist Attack on the Pentagon* (Arlington, VA: The County, 2002), 6, <http://www.arlingtonva.us/departments/Fire/edu/about/FireEduAboutAfterReport.aspx> (accessed January 30, 2008).

vehicle to assist in early recognition of the presence or absence of radiation. Although other fire departments addressed this particular issue, it was initiated independently.

Secondly, fire departments have also enhanced preparedness for WMD events through the collective acquisition of supplies and equipment purchased through available federal monies, such as Urban Area Security Initiatives (UASI) and Metropolitan Medical Response Systems (MMRS) grants. The focus has been on improving the preparedness and response capabilities for WMD incidents through identifying critical regional fire department deficiencies that would be necessary or essential for a significant emergency requiring regional assistance. Since 2003, the COG fire departments have received over \$66 million through UASI funded projects.¹² Through MMRS the region has received has received \$2.9 million and is poised to receive an additional \$900,000 in 2008.¹³ This funding has not only enhanced preparedness within the NCR, but has helped to foster collaboration between the twelve fire departments. Fire departments worked together to identify and prioritize deficiencies, develop grant proposals and applications, and accept and implement the equipment or initiatives awarded through the grant(s).

Table 1, COG Fire UASI Funded Projects, show the projects and dollar amount awarded to the NCR fire departments through the UASI grants.

¹² Council of Governments, *Council of Governments Fire UASI Funded Projects*. Powerpoint Presentation, September 7, 2007.

¹³ Personal Interview with James Schwartz, January 22, 2008.

Table 1. COG Fire UASI Funded Projects
(As of September 7, 2007)

Mass Casualty Support Units/Ambulance Buses	\$2,630,000
NCR Bomb Squads and Regional Caches	\$7,289,595
Mass Decontamination Program	\$2,000,000
Metro Subway Security Initiative	\$4,650,000
Mobile Air Unit	\$11,839,104
NCR Incident Management Team	\$786,674
NCR Radio Cache/Communications Training	\$6,274,613
Personal Protective Equipment	\$20,977,822
WMATA Communications Upgrade	\$8,898,885
WMD Operations Training	\$1,265,190
Total	\$66,611,883

Within the NCR, the focus of preparedness has, understandably, centered on WMD incidents. The attack on the Pentagon and the subsequent anthrax attacks occurring one month later had an indelible effect on the entire region. As a result, the priorities, outside of preventing another attack, focused on improving the capabilities and capacity to effectively respond to weapons of mass destruction.

However, from a fire department perspective, a core question is whether or not these priorities, and the focus on weapons of mass destruction, are our greatest threat? Now that the regional capabilities have improved, should the focus shift to preparing for other threats? The imminence of a pandemic and its potential catastrophic consequences suggest that such an event should be placed at the top of the list.

C. PANDEMIC

A pandemic occurs when a new influenza virus manifests itself and is spread easily from human to human through coughing and sneezing. Federal authorities describe this process a bit more formally: “A pandemic occurs when a novel influenza virus emerges that can infect and be efficiently transmitted among individuals because of

a lack of pre-existing immunity in the population. The extent and severity of a pandemic depends on the specific characteristics of the virus.”¹⁴ While influenza pandemics are rare, occurring three times in the previous century (1918, 1957, 1968), they have the potential to cause more death and illness than any other public health threat. According to the Congressional Budget Office (CBO), “a pandemic that reaches the scale of the 1918 influenza outbreak would sicken approximately 90 million people, and kill 2 million more in the U.S. alone.”¹⁵ Almost 10 million people could be hospitalized during the course of the pandemic, which may take more than a year to evolve.¹⁶

According to the World Health Organization (WHO) an influenza pandemic is a reoccurring event.¹⁷ Although a pandemic is certain to occur, when and how it emerges is unknown. Currently, the scientific and public health community has a particular concern with the virus H5N1. Commonly referred to as “avian” or “bird flu,” H5N1 is a strain of influenza that has primarily infected wild and domestic birds in Asia and parts of Europe. As the birds migrate, the virus spreads to other countries. According to the WHO, as of February 13, 2008 there have been 360 confirmed cases with 226 deaths.¹⁸ In the majority of the reported cases, the cause of the infection has been due to close contact with the infected birds. The Department of Health and Human Services observes that:

Of additional concern are the few instances where secondary transmission from person to person may have occurred. Given these events, we are currently in a Pandemic Alert Phase 3, defined by WHO as ‘human infections with a new subtype but no human-to-human spread or at most rare instances of spread to a close contact.’¹⁹

¹⁴ DHHS, *HHS Pandemic Influenza Plan*, 4.

¹⁵ U.S. Congress, House Committee on Homeland Security Subcommittee on Emergency Preparedness, Science and Technology, *Protecting the Homeland: Fighting Pandemic Flu from the Front Lines*, February 8, 2006, 2, http://www.upmc-biosecurity.org/website/resources/hearings/content/Hearings_2006/20060208protecthtmlnd.pdf (accessed November 13, 2006).

¹⁶ DHHS, *HHS Pandemic Influenza Plan*, 4.

¹⁷ World Health Organization, "Ten Things You Need to Know about Pandemic Influenza," <http://www.who.int/csr/disease/influenza/pandemic10things/en/> (accessed February 13, 2008).

¹⁸ World Health Organization, "Cumulative Number of Confirmed Human Cases of Avian Influenza A(H5N1) Reported to WHO," http://www.who.int/csr/disease/avian_influenza/country/cases_table_2005_11_07/en/ (accessed February 13, 2008).

¹⁹ DHHS, *HHS Pandemic Influenza Plan*, 5.

D. WHY FIRE DEPARTMENTS SHOULD BE PREPARED

Traditionally, the fire service responds to emergencies that can be seen and felt – structure fires, automobile accidents, and medical emergencies. In the mid-1980s, however, the fire service began to expand its mission to justify its existence in the face of a decline in the incidents of structure fires. Fire departments were ideally positioned throughout communities and so became the logical agencies to take on increased responsibilities. The fire service became responsible for responding to, and providing a variety of emergency services for, incidents involving medical emergencies, hazardous materials mitigation, technical rescue, and WMD response. Government leaders and the general public now expect fire departments to effectively and efficiently respond and mitigate any emergency. This has placed a tremendous burden on the fire service to position itself to respond to and mitigate “all hazards” and to adequately train and prepare fire fighters for such eventualities. In the past, “out of the ordinary” emergency incidents, such as a chlorine leak or window washer rescue, were handled by specialized response teams that were trained to handle such emergencies. The trouble and challenge for “unknown” events, specifically radiological and infectious disease incidents, is that they will likely require all fire fighters to respond in some manner or form. Fire departments are forced to prioritize preparedness and training objectives and consequently these low probability/high consequence events are placed on the backburner; fire fighters are not given the knowledge or training necessary to prepare them practically or psychologically. The expanded mission of the fire service has not been matched with equitable support, funding, or personnel. Fire departments throughout the United States struggle to maintain a balance between the fundamental, traditional mission and that of the new, expanded mission in the post-September 11th world.

Since September 11, these expectations have continued to grow as the threat of an influenza pandemic has intensified. Fire departments are expected to participate in a pandemic response and will likely play a significant role as the demand for emergency services increases exponentially. For these reasons, fire departments must again balance priorities.

This expectation, in addition to the increased demand for medical services and the potential catastrophic consequences of the pandemic, suggests that fire departments need

to be better prepared. Fire departments themselves will be faced with personnel and equipment shortages which will hinder and impede service to the community. In preparing, fire departments can address many of these issues prior to a pandemic, likely resulting in a larger workforce being available and subsequently providing more services to the community.

One area of improved preparedness is likely to be an ability to anticipate and manage a higher rate of infection among fire fighters than the general population. The fire service should anticipate that fire fighters, who are trained and responsible for providing medical care, will have a greater exposure risk (over and above the attack rate) than the general population during a pandemic.

The attack rate is defined as “the cumulative incidence of infection in a group observed over a period during an epidemic.”²⁰ Experts generally agree that the clinical attack rates will be between 25 and 30 percent.²¹ This alone will drastically impact fire department workforce levels, as a quarter of the workforce will likely be infected during a pandemic. Simultaneously, the attack rate will significantly increase the demand for emergency medical services, as a quarter of the population becomes infected.

This increase in demand will result in an increased exposure risk to fire fighters who are called to assist, treat, and transport flu victims. Increased exposure and contact with flu victims will raise the likelihood of personal infection and subsequently increase the risk of exposure to fire fighters’ families. Fire fighters who become infected will not be able to participate in further fire department response operations and the potential infection of family members will reduce the willingness of fire fighters to participate in further response operations.

²⁰ John M. Last and J. H. Abramson, *A Dictionary of Epidemiology*, 3rd ed., eds. J. H. Abramson and others (New York: Oxford University Press, 1995), 9.

²¹ Congressional Budget Office, *A Potential Influenza Pandemic: Possible Macroeconomic Effects and Policy Issues* (Washington, DC: Congressional Budget Office, 2006), 8, (accessed January 30, 2008).

Fire fighters' participation rates will also vary due to other personal and family conditions. These influences fall in to two categories: willingness and ability.²² Willingness refers to individual decisions on whether or not to show up for work. Ability relates to a variety of independent factors which may affect a fire fighter's capacity to work and reflects the likelihood of an individual actually participating (rather than willingness to work if capable). Some fire fighters may be willing to participate in a pandemic, but are not able; others may be able to respond, but are not willing.

E. APPLICABILITY TO FIRE DEPARTMENTS NATIONWIDE

The data gained from this study has applicability to fire department throughout the United States. Perhaps the greatest utility will be in pandemic planning as this data will provide a solid, reliable estimate for fire fighter participation which can be utilized by departments in the development of their plans. Additionally, the variations in fire department structure within the National Capital Region, mirrors variations found in fire departments throughout the U.S. Although no "all-volunteer" fire departments were surveyed, combination departments and "all-paid" departments were.

Although the majority of fire departments within the U.S. are strictly volunteer, and many fire departments within the NCR utilize volunteers to supplement their workforce, the focus of this study centered on professional fire fighters. It is recommended that further studies be conducted on volunteer fire fighters' ability and willingness to participate in a pandemic. It is possible to infer that, generally, the issues for all-volunteer departments would be consistent with those found in this study.

F. SUMMARY

Our communities and government leaders expect that fire department services will be available during a pandemic. The range of fire department services will be dependant upon the number of fire fighters available to work. At a minimum, fire departments must anticipate a workforce reduction of 30 percent due to the clinical attack rate; however, additional concerns may impact the ability and willingness of fire fighters to participate in a pandemic. These concerns, if not sufficiently addressed prior to the

²² Gershon K. Qureshi, *Health Care Workers' Ability and Willingness to Report to Duty during Catastrophic Disasters* (New York, NY: Oxford University Press, 2005); Shelly Schechter, *Medical Reserve Corps Volunteers' Ability and Willingness to Report to Work for the Department of Health during Catastrophic Disasters* (Monterey, CA: Naval Postgraduate School, March 2007), <http://bosun.nps.edu/uhtbin/hyperion-image.exe/07Mar%5FSchechter.pdf> (accessed January 30, 2008).

next pandemic, will significantly reduce the workforce participation percentage (WPP). Fire departments can positively influence the WPP by addressing these concerns through independent departmental programs and through collaborative initiatives developed and maintained through the COG. The certainty and potential consequences of a pandemic warrant that greater attention be paid to these issues by fire departments throughout the NCR.

II. LITERATURE REVIEW

Before pandemic response plans can be developed, fire departments must determine what percentage of the workforce will be able and willing to participate in a pandemic, epidemic or other infectious disease event. In addition to the clinical attack rate of the virus, many factors and variables affect fire fighters' ability and willingness to participate in a pandemic. Collectively, these variables are used to determine a workforce participation percentage (WPP). A WPP is the estimated percentage of fire fighters that will be able and willing to participate in a pandemic response with their respective department. Determining the WPP will allow fire departments to establish realistic and practical pandemic response plans because these rates will be based on available fire department personnel. The identification of the issues that may impede participation will assist departments in implementing measures to increase future participation.

International and national health organizations estimate that 25 to 40 percent of the population will be infected with the virus during the course of a pandemic. As part of its planning assumptions, for instance, the *HHS Pandemic Influenza Plan* states "The clinical disease attack rate will be 30% in the overall population."²³ This number is often used as a planning assumption for various agencies, businesses, or professions, and for the majority of these institutions this assumption is appropriate. However, for those agencies, businesses, and professions that are expected to play a significant role during a pandemic, i.e. police and fire departments, hospitals, and public health workers, many variables, over and above the clinical disease attack rate, come into play, affecting the overall WPP. For example, profession-specific studies have shown that nearly half of local health department workers are likely not to report to duty during a pandemic.²⁴ Concerns, independent of the clinical attack rate, affect participation. These concerns vary for different professions; the worries or challenges health care workers have regarding participation in a pandemic will be different than the worries and challenges of police officers. Thus, it is necessary to conduct specific studies for specific professions.

²³ U.S. Department of Health and Human Services, *HHS Pandemic Influenza Plan* D-12.

²⁴ Ran D. Balicer, et al., "Local Public Health Workers' Perceptions Toward Responding to an Influenza Pandemic," *BMC Public Health* 6 (2006), 99-106, http://www.hopkins-cepar.org/downloads/publications/Local_Pub_Health.pdf (accessed January 30, 2008), 1.

The primary focus of this chapter is on the applicability and comparison of the existing literature on participation rates in other professions to fire fighting. The objective is to identify the conditions that influence other professions' response to emergencies and to evaluate the strength and value of these conditions in understanding the firefighters' potential behavior in the National Capitol Region.

A. WORKFORCE PARTICIPATION STUDIES

Few, if any, studies have been conducted on fire department workforce participation levels during a pandemic. As a result, the best guidance in exploring emergency participation comes from studies of other professional groups, including health care workers and the public health community in general. Analyzing these studies is important because these occupations have similar responsibilities and will play a significant role in a pandemic. According to the American Public Health Association (APHA) "projections estimate that up to forty percent of the active workforce may be seriously ill and therefore unable to work during some portion of a flu pandemic. Therefore, if staffing levels remain stagnant, the current health care workforce cannot be depended on in the event of a flu pandemic."²⁵ Identifying accurate and reliable workforce levels for a pandemic is critical to the development of effective and practical plans for all emergency responders.

The report, *Health Care Workers' Ability and Willingness to Report to Duty During Catastrophic Disasters*, examines both the ability and willingness of health care workers (HCW) to report to work during various catastrophic events.²⁶ The study assessed the ability and willingness of HCW in the New York City region to report to work during different types of catastrophic events.²⁷ Over 6,400 HCW from forty-seven health care facilities in and around New York City participated in the study. The majority of the respondents were full-time employees, working on day-shift, most were female, and nearly half were forty-five years of age or older.²⁸

²⁵ American Public Health Association, *APHA's Prescription for Pandemic Flu* (Washington, DC: American Public Health Association, 2007), 3, <http://www.apha.org/NR/rdonlyres/D5017DB9-F400-4399-A656-939C4C8DF259/0/FLUpolicycomplete.pdf> (accessed March 18, 2007).

²⁶ Qureshi, *Health Care Workers' Ability*, 378.

²⁷ *Ibid.*, 379.

²⁸ *Ibid.*

At the time this survey was conducted, no study had previously examined both the willingness and ability of HCW to report to work during catastrophic events.²⁹ The report suggests that there is a distinct difference between the two concepts. The authors define ability as “the capability of the individual to report to work.” Willingness, they write, “refers to a personal decision to report to work.”³⁰ Results indicate that HCW were most able to report to work for a mass casualty incident (MCI) (83%) and environmental disasters (81%) and were most willing to report to work during a snow storm (80%) or MCI (86%). Factors which influenced willingness were fear, concern for family and self, and personal health problems. Factors influencing ability included transportation problems, child care, eldercare, and pet care obligations.³¹

A group of Israeli researchers have also examined the willingness of state-wide hospital personnel to report to work following an unconventional missile attack. In their study, entitled *Willingness of Staff to Report to Their Hospital Duties Following an Unconventional Missile Attack: A State-Wide Survey*, these researchers examined the willingness of hospital personnel to report to work in a hypothetical scenario in which a chemical warfare missile attack has occurred and the hospital staff has been asked to report to their respective hospitals before an “all clear” has been given. Overall, 42 percent of the responding staff was willing to report under the presented scenario; however, the willingness increased appreciably when safety measures were provided.³² The purpose of the survey was to assist in determining a national policy for adequate staffing levels for hospitals on alert.

A survey of 308 health care workers was conducted at three Maryland health departments to assess factors influencing their ability and willingness to report to duty in a pandemic.³³ The results suggest that almost half of the public health workers will not report to work in a pandemic. “...the data suggest[s] that regardless of the expected

²⁹ Qureshi, *Health Care Workers' Ability*.

³⁰ Ibid.

³¹ Ibid., 378.

³² Ibid.

³³ Balicer, et al., *Local Public Health Workers' Perceptions*, 1.

morbidity among personnel during an influenza pandemic, nearly half of the local health department workers are likely not to report to duty during such an extreme public health crisis.”³⁴

1. Specific Issues and Concerns Impacting Workforce Participation

Existing surveys also identify a range of potential influences on emergency responders’ behavior that may be useful in anticipating firefighters’ actions. Gershon Qureshi’s study of public health nurses, for example, found that 90 percent of the nurses reported at least one perceived barrier to reporting to work during an emergency.³⁵ “Child/elder care obligations were noted as the most important barrier (32%), followed by lack of transportation (14%), and personal health issues (14%).”³⁶

Researchers have also identified appropriate training and the availability of PPE as critical influences on medical and public health workers’ willingness to work in catastrophic events. Qureshi’s study of HCW demonstrated that increasing safety measures resulted in a significant increase in willingness to report to work.

The Qureshi study also found “the most frequently cited reasons for employees’ unwillingness to report to duty during a disaster was fear and concern for the safety of their families and themselves.”³⁷ This fear could be exacerbated for fire department personnel because of the potential for extended work periods and the increased and intense patient contact involved in a pandemic response. Furthermore, the study showed that the willingness of health care workers to report to work during a catastrophic event were lowest for events “in which the employees are more likely to perceive the highest degree of risk to themselves or their family (smallpox, chemical, radiation, and SARS).”³⁸

Other studies support these concerns for family and personal health. Nancy Demme’s study of police officers’ roles during a biological event establishes that the

³⁴ Balicer, et al., *Local Public Health Workers’ Perceptions*, 5.

³⁵ Gershon K. Qureshi, et al., "Emergency Preparedness Training for Public Health Nurses: A Pilot Study," *Journal of Urban Health* 79, no. 3 (September 2002), 415.

³⁶ *Ibid.*, 415

³⁷ Qureshi, *Health Care Workers’ Ability*, 386.

³⁸ *Ibid.*, 385.

number one priority of officers is the safety of their families.³⁹ Additional concerns of officers included their sense of duty, availability of vaccine, and personal protective equipment. Shelly Schechter surveyed the ability and willingness of Medical Reserve Corp volunteers to participate in public health emergencies. Her survey identified six possible barriers to ability to respond to a public health emergency: child care, lack of training, elder care, personal health problems, pet care obligations, and other job commitments.⁴⁰ Four barriers to willingness were identified as: concern for personal health and safety, lack of personal protective equipment, concern for health of family members, and lack of information regarding risk.⁴¹

Various personal issues will undoubtedly reduce the available health care workforce as medical professionals remain home to care for sick family members or refuse to come to work altogether for fear of becoming infected and thus potentially infecting family members. “During a catastrophic event, employers must recognize that their health care workers are likely to be as (or even more) concerned than the average citizen, because they might have a greater understanding of the associated risks.”⁴²

2. Fire Fighter Participation

There are many similarities in the expressed concerns and issues of the professions mentioned previously and fire fighters within the NCR. As a fire fighter and a manager of a regional weapons of mass destruction (WMD) response team (comprised primarily of fire fighters within the NCR), I am uniquely positioned to interact and discuss these issues in a regional context. To my knowledge, there have been no studies conducted specifically on fire fighters ability and willingness to participate in a pandemic. Therefore these discussions and interactions become a reasonable source for determining fire fighters’ concerns and priorities, not only in responding to WMD incidents but in pandemics as well. Additionally, many of the concerns that exist for fire fighters responding to a WMD incident parallel their concerns when responding in a

³⁹ Nancy Demme, *Government Expectations and the Role of Law Enforcement in a Biological Incident* (Monterey, CA: Naval Postgraduate School, March 2007), <http://bosun.nps.edu/uhtbin/hyperion-image.exe/07Mar%5FDemme.pdf> (accessed January 30, 2008), 33.

⁴⁰ Schechter, *Medical Reserve Corps Volunteers*, 29.

⁴¹ *Ibid.*, 30.

⁴² Qureshi, *Health Care Workers’ Ability*, 386.

pandemic. Concern for families and children and appropriate personal protective equipment are consistent with previous studies and from discussions with other fire fighters.

Unique issues, absent in previous studies and specific to fire fighters, are also identified through these discussions. For example, in developing the *COG Radiological Dispersal Device Response Guideline*,⁴³ there was much discussion on the short- and long-term health consequences of exposure to radiological materials and the subsequent protection afforded through worker's compensation. Due to the similarities between the two events, one can infer that because these issues were a concern in a radiological emergency, they would be a concern in during a pandemic.

Issues such as the availability of vaccines and antivirals and the lack of fire department plans have also been identified through these discussions and planning meetings. Collectively, all of these factors become critical variables to a fire fighter's ability and willingness to participate in a pandemic because there is no certainty that these protections will be in place or available before the next pandemic strikes.

3. Solutions to Increase the Fire Fighter Workforce Participation Percentage

Previous studies of the ability and willingness of emergency responders to participate in various events attempted to identify new policies and practices that could improve the likelihood of a response. The Israeli study, for example, identified four intervention measures that would increase the participation by 75 percent.⁴⁴ The sum of these recommendations is a call for a multilayer approach requiring action by individual fire fighters, fire departments, and the local, state, and federal government. A complex set of legal, moral, and ethical issues interact with personal and departmental priorities to determine participation rates. The challenge for fire departments and government in

⁴³ This standard operating guideline, for which I was the primary author, seeks to establish a model procedure that provides safe and efficient response for first-arriving emergency service personnel during a radiological dispersal event. This model provides a framework for building a regional protocol tailored to the National Capitol Region (NCR). It was developed so that a first responder will have knowledge of the broader process in which they may be requested or required to assist. It outlines response parameters and gives consistent dose limits for fire department personnel in a response to a radiological incident within the NCR.

⁴⁴ Yaron Shapira, et al., "Willingness of Staff to Report to their Hospital Duties Following an Unconventional Missile Attack: A State Wide Survey," *Israel Medical Science Journal* 27 (1991), 710.

general is to find ways to influence this complex set of issues if they hope to maximize the rate at which their emergency responders will be both able and willing to show up and be effective during a pandemic.

This complexity is evident in several recommendations to governments and agencies. For example, the American Public Health Association (APHA), in their report *APHA Prescription for Pandemic Flu*, makes recommendations on improving and strengthening federal plans and strategies to ensure that all individuals, families, and communities are as prepared as possible for a flu pandemic. The Association recommends that legal protections focus on licensure reciprocity, protections from legal liability, workers' compensation coverage, and employee protection.⁴⁵ Additionally, APHA recommends reforming the national Vaccine Injury Compensation Program (VICP). This program:

Has created a no-fault system that pays for injuries caused by specific immunizations...Congress added influenza to VICP in 2004. However, the VICP only covers trivalent (annual) influenza vaccine. Health care workers and patients would be less likely to volunteer without a fair compensation system, as the failed smallpox vaccination campaign demonstrated.⁴⁶

The federal government's Occupational Safety and Health Administration (OSHA) also provides direction on health protection to employers for protecting their employees against avian viruses and provides technical information on the viruses. The document gives guidance for a variety of workers who may be exposed to the virus, ranging from poultry employees to healthcare workers.⁴⁷

The World Health Organization (WHO) created a model similar in concept to the American volunteer fire department, whereby they can "call up" the required experts needed to respond to an outbreak or situation that outstrips the response capacity or capability of the WHO. These experts are located in universities and hospitals throughout the world and

⁴⁵ American Public Health Association, *APHA's Prescription for Pandemic Flu* (Washington, D.C.; American Public Health Association, 2007), 3.

⁴⁶ *Ibid.*, 10.

⁴⁷ U.S. Department of Labor, Occupational Safety and Health Administration, *OSHA Guidance Update on Protecting Employees from Avian Flu (Avian Influenza) Viruses* (Washington, DC: Department of Labor, Occupational Safety and Health Administration, 2006), http://www.osha.gov/OshDoc/data_AvianFlu/avian_flu_guidance_english.pdf (accessed February 10, 2008).

volunteer their services when requested by the WHO. This year (2005), thousands of deaths were prevented following the tsunami thanks to this coordinated effort. Last year, meningitis outbreaks which swept across northern Africa were controlled with massive vaccination campaigns. And right now teams from North and South America, from Europe, and from Africa are fighting to keep Marburg outbreak contained in Angola.⁴⁸

One of the few fire departments to focus on pandemic planning and anticipated workforce reductions is the Seattle Fire Department. Its draft pandemic/infectious disease plan addresses workforce protection issues and how the department will adapt services based on the available resources and personnel.⁴⁹ Pandemic plans will have added value, in the Seattle FD's view, if they can be adopted to all hazards which cause a simultaneous increase in demand and stress on the department's capabilities. Having an "all hazards" response plan may increase the incentive for fire departments to develop pandemic plans, as these plans can then be utilized or adapted for a variety of responses.

B. SUMMARY

The value of these earlier studies and reports lies primarily in their identification of general conditions that influence emergency response behavior. Some of these general circumstances will likely apply to firefighters. For example, family safety and personal health issues may apply across professional groups. Other conditions, however, may be specific to fire fighters. The purpose of the next chapter is to begin to explore these shared and unique influences on fire fighters through a recent survey of the fire departments throughout the National Capitol Region.

⁴⁸ House Committee on Health, Education, Labor, and Pensions, *Twenty-First Century Biological Threats*, 109th Cong., 1st sess., 2005, Committee Print, 29, <https://www.hsdl.org/homesec/docs/legis/nps17-042806-01.pdf&code=914032755131b4e00df3a587fd35357a> (accessed March 3, 2007).

⁴⁹ *The Seattle Fire Department Pandemic/Infectious Disease Plan* (Seattle, WA: Seattle Fire Department, April 20, 2007).

III. RESEARCH METHODOLOGY

The overall objective of the research conducted for this thesis was to collect experiences and opinions on participating in a response to a pandemic event from fire fighters throughout the NCR. Through documentation of these views, this thesis should contribute to fire departments' preparedness planning.

A. RESEARCH DESIGN

Research with NCR's fire fighters requires support from leaders throughout the area. On June 14, 2007, I met with Arlington County Chief James Schwartz, head of the COG Fire Chiefs Committee, to obtain his commitment to the research project and his assistance in working with the twelve NCR fire department chiefs. Chief Schwartz agreed to send a letter to the NCR fire chiefs, briefly explaining the project and requesting their departmental participation. All the fire chiefs agreed to support the effort and provide a departmental representative to coordinate contact with fire fighters throughout the region.

This study utilized a web-based survey tool to collect quantitative data on ability and willingness to participate in a pandemic response. Departmental master rosters or email lists provide an updated, accurate count of total personnel. Each department's master list also provides the population counts from which the sampling fractions were derived. A random sample was drawn from each list and a survey was sent by email to each selected respondent. In the case of a few small departments, everyone on their list received a survey. A minimum of three email requests were sent to each jurisdictional sample to request their initial response and to follow up subsequently with those who did not reply. The survey period closed on January 19, 2008, nearly four months after the initial request.

1. Description of the Population and Sample

At the time the survey was initiated there were approximately 7,597 fire department employees (FDE) within the twelve NCR fire departments. FDE refers to any individual employed by the fire department, including uniform and non-uniform personnel. This inclusiveness reflects the reality that, in a pandemic, fire department personnel would be equally and simultaneously exposed. The initial sample was a proportional random sample, reflecting the broad variation in department size across the

NCR. The largest department in the region is the District of Columbia, which has a total of 2,017 firefighters. The smallest department is Manassas Park Fire Department, with only twenty-five firefighters. Smaller departments have limited resources and greater dependence on the willingness and ability of their fire fighters to participate at the time of an emergency. To ensure that these small departments have sufficient numbers in the survey to support an analysis of their potentially unique circumstances, the sample was stratified proportionally. In the smallest departments, the survey went to everyone on the master list.

This sampling design met with one particular problem. The Montgomery County Fire Department leaders chose to distribute the survey to the entire department, rather than allowing for a random sample of all their personnel. The department's cooperation was certainly welcomed, but it delayed the process until later November 2007. Follow-up requests were also handled by the department. The president of the International Association of Fire Fighters (IAFF) Local 1664, the Montgomery County career fire fighters union, provided additional assistance by soliciting its members to complete the survey. Through his efforts, the number of survey completions nearly doubled from 172 to 305. Unfortunately, however, the response time had to close shortly after his efforts began. As a result, the sample drawn from the Montgomery County fire department was not necessarily a random selection. Although no obvious biases based on who responded appears in a comparison of the Montgomery County group and all other fire fighters in the NCR, the analysis throughout the thesis will take into account that these 305 respondents were self-selected rather than drawn from a probability sample.

The figures in Table 2 below compare the number of persons sampled from each of the twelve fire departments with the number of respondents who returned a survey. For most of the departments, the intended sample was 15 percent of the total personnel. Table 3 shows the final counts of surveyed respondents for each of the twelve fire departments compared with the total number sampled from. When all respondents are grouped together for the analysis, each case will be weighted according to its appropriate share of the underlying population.

Table 2. Population Size and Sample

Department	Number of Members	15%of the Total Members	Completed Survey 1-19-07
Alexandria City Fire Department	326	49	22
Arlington County Fire Department	325	49	40
City of Manassas Park Fire Department	25	25	16
District of Columbia Fire and EMS Department	2,017	303	111
Fairfax City Fire Department	76	76	55
Fairfax County Fire & Rescue	1,619	243	130
Fort Myer Fire Department	31	31	27
Loudoun County Fire and Rescue	378	57	41
Metropolitan Washington Airport Authority	133	65	43
Montgomery County Fire & Rescue Service	1,339	1,335	305
Prince George's Fire & EMS	892	134	54
Prince William County Dept Fire & Rescue	436	65	31
Total	7,597	2,432	875

Table 3. Comparison of Montgomery County to All Other Jurisdictions

Department	Number of Members	Number of Surveys Distributed	Completed Survey	Percentage Completed
ALL 11 Other Departments	6,258	1,097	570	51.95%
Montgomery County Fire & Rescue Service	1,339	1,335	305	22.84%
Combined	7,597	2,432	875	35.97%

B. RESPONSE ANALYSIS

Excluding Montgomery County, the overall survey response rate was 52 percent. The return rate was much higher in the smaller departments, with 87 percent of the members of the Fort Myer Department participating in the survey. The District of Columbia Fire and Rescue Department (DCFEMS), Fairfax County Fire and Rescue Department, and the Prince George's Fire and EMS (PGFD) Department have 2,017, 1,619, and 892 employees respectively and their individual survey completion rate was 36.6 percent, 53.5 percent, and 40.3 percent. Fairfax County Fire and Rescue's survey completion rate was higher than that of Alexandria and Prince William; DCFEMS and PGFD had the lowest survey completion rate.

Another possible reason for a higher completion rate (other than size of department) has to do with efforts by local leaders to inform their members about the survey. Several fire chiefs, or their appointed representatives, requested further information about the study to help inform their membership of its purpose and to encourage a response. In several instances, the fire chief or a senior officer distributed a department-wide email or attached comments to the initial email. In the case of Montgomery County, when the local union president became involved the response rates soared. As anticipated, though, without that help the Montgomery County response rate was low. Only 23 percent of the total membership responded to the survey.

Table 4. Jurisdiction Survey Completion Rate

Department	Number of Surveys Distributed	Completed Survey	Percentage Completed
Alexandria City Fire Department	49	22	44.89%
Arlington County Fire Department	49	40	81.63%
City of Manassas Park Fire Department	25	16	64%
District of Columbia Fire and EMS Department	303	111	36.63%
Fairfax City Fire Department	76	55	72.36%
Fairfax County Fire & Rescue	243	130	53.49%
Fort Myer Fire Department	31	27	87.09%
Loudoun County Fire and Rescue	57	41	71.92%
Metropolitan Washington Airport Authority	65	43	66.15%
Montgomery County Fire & Rescue Service	1335	305	22.84%
Prince George's Fire & EMS	134	54	40.29%
Prince William County Dept Fire & Rescue	65	31	47.69%

1. Comparison of Respondents to All Firefighters

Despite these variable response rates, survey respondents appear generally representative of the general population of fire fighters within the NCR. However, no comprehensive fire fighter statistics for the NCR are available; this assumption is based primarily on the similar characteristics of the firefighters across the departments that were randomly sampled, as well as information generally known in the fire fighter community in the NCR.

2. Characteristics of Survey Population

The majority of the respondents were white males averaging nearly twenty-eight years of age (27.8). Sixty-five (64.4) percent of the respondents were married; 75.3 percent had children. Three out of four fire fighters (74.6%) live outside of the jurisdiction in which they work. Three-quarters (74.5%) worked twenty-four-hour shifts and nearly all (99.6%) used their personal vehicle as their primary method of transportation to work.

Although the vast majority of personnel were classified as “Fire and/or Medical Operations,” more than one in ten (13.4%) work in “Administrative/Support” positions. The most common rank of those classified as “Fire and/or Medical Operations” was “Fire fighter/Emergency Medical Technician,” with 36.9% representation. The majority of respondents (67.9%) were classified as not holding a command/managerial position.

C. WORKFORCE PARTICIPATION PERCENTAGE

One of the primary objectives of this thesis is to determine a baseline workforce participation percentage (WPP) for fire fighters in the NCR. This is challenging because many factors play into an individual’s ability and willingness to participate, requiring a collective analysis of both variables. Willingness refers to individual decisions on whether to work. Ability relates to a variety of independent factors which may affect a fire fighter’s capacity to work. Ability refers to the likelihood of actually participating, rather than whether you would be willing if you could. Fire fighters may be willing to participate in a pandemic, but are not able; likewise, they may be able, but are not willing. Although 68.8 percent of the fire department employees said they would be willing to participate in an avian influenza (bird flu) outbreak, only 30.4 percent said they would be able to work if an immediate family member was seriously ill. Willingness and ability will be analyzed independently to examine the specific concerns fire fighters have with each. Willingness and ability will also be analyzed collectively to determine a WPP.

1. Baseline Willingness

The survey asked a wide range of willingness questions on a fire fighter’s ability to participate in a pandemic. To determine the baseline for willingness however, a single question was used: “In your current fire department position, would you be willing to participate in your fire department’s response to an avian influenza (bird flu) outbreak?”

Just under 69 percent (68.8%) of the respondents said that they were willing to participate in a response to an avian influenza outbreak, with 22.1 percent saying they were “not sure.” Although 68.8 percent of the respondents said that they were willing to participate in a response to an avian influenza (bird flu) outbreak with their fire department, when asked to “rate their level of willingness” great disparity exists.

The respondents were asked to rate their level of willingness, whereby a “1” would indicate not a very strong willingness to participate and a “10” would represent a strong willingness, with no concern whatsoever about participating. Only 11.1 percent of the respondents answered “10.” The majority of the respondents (38.6) answered “5,” suggesting that although they maybe willing to participate in an avian influenza outbreak, their level of concern was significant. The higher the level of concern, the less willing a fire fighter will be to participate in a pandemic. Although 68.8 percent of the fire fighters surveyed said they would be willing to participate in a pandemic, it is likely this number will be lower due to the average level of concern.

Additional factors influencing fire fighters’ willingness to participate in a pandemic are family, self, adequate personal protective equipment (PPE), fire department pandemic plans, worker’s compensation coverage, pharmacological interventions (antivirals and vaccines), training and education, and various psychological issues.

2. Baseline Ability

The most telling indicator of a fire fighter’s ability to participate in a pandemic would come from a measurement of their ability to participate when there is an immediate family member who is seriously ill. The “immediate family member” allows for the greatest range of respondents, as this would likely have applicability to single and married fire fighters alike. The vast majority of fire fighters likely have someone they consider an “immediate” family member; conversely, not every fire fighter has dependents or living parents. This variable was used to determine the baseline ability participation rate. Only 30.4 percent of the respondents said they would be able to work for their fire department during a pandemic if a member of their immediate family was seriously ill; 27.2 percent said they would not be able and 42.5 percent said they were “not sure.”

Respondents were asked to rate their level of ability to participate in a pandemic. A “1” means there are no factors affecting ability to participate. A “10” means there are a significant number of factors affecting ability to participate. Only 9.4 percent of the fire fighters said there were “no factors” affecting their ability to participate. The mean score was 4.18. This suggests that the majority of fire fighters have a couple of factors which will affect their ability to participate in a pandemic. The higher the score, the more likely fire fighters will not be able to participate in a pandemic.

The principal variables affecting fire fighters’ ability to participate in a pandemic centers around family. Fire fighters’ ability to participate in a pandemic will be dependant upon the well-being of their dependents, parents, and siblings. Additional variables include child/dependent care issues, spouses required to work during a pandemic, and the care of pets.

A determination of the baseline willingness and ability participation rates are important for comparison reason; however, further analysis and breakdown is necessary to achieve a detailed and accurate understanding of the variables associated with each. Only then can an accurate WPP be obtained. The following section will analyze in detail the variables impacting ability and willingness.

IV. ANALYSIS

Fire fighters are, in general, an altruistic group, often putting themselves in compromising, dangerous positions for the sole purpose of helping and saving others. In the survey conducted for this study, over 50 percent (50.4%) of the fire fighters in the National Capitol Region said the primary reason for joining the fire service was because they “wanted to serve the community” or they “wanted to help people.” Another 34.9 percent said that “a sense of duty” was the principal reason for continued involvement in the fire service. This collective public commitment was clearly on display during 9/11, Hurricane Katrina and, more recently, the spectacular Southern California wildfires. Perhaps more importantly, this commitment is acted upon in thousands of daily emergencies across the nation.

This core commitment to serving the public even during moments of great personal risk does not, however, override the many strong personal, family, and social pressures and obstacles affecting a fire fighter’s ability and willingness to serve during emergencies. As found in earlier literature on other emergency professionals’ propensity to serve, fire fighters must overcome a wide range of potential obstacles, some of which can be more easily bypassed if fire departments plan early to offer protection and other assistance.

This chapter will examine the obstacles that are certain to impact fire fighter participation during a pandemic. Initially we will examine the consequences of the clinical attack rate and the increased risk of exposure fire fighters face during a pandemic or any infectious disease outbreak. Next is a detailed discussion on the willingness and ability of fire fighters to participate in a pandemic and the independent variables affecting each individual. Lastly, the interaction of these concepts will be examined to determine the Workforce Participation Percentage (WPP) – the share of fire fighters who will be able and willing to participate in a response to a pandemic.

A. CLINICAL DISEASE ATTACK RATE

Among many of the factors that impact fire fighter participation levels, the most fundamental is the clinical disease attack rate for a pandemic. This is the estimated

percentage of the population that will become infected with the virus. The rate is independent of the severity of the flu virus. For the three previous pandemics, the clinical disease attack rate was similar. The DHHS's *Pandemic Response Plan* uses a clinical disease attack rate of 30 percent for the population in general.⁵⁰ *Pandemicflu.gov* states the attack rate will likely be 30 percent or higher in the overall population.⁵¹

If fire departments use this attack rate as the core participation number, the planning assumption is that nearly a third of their fire fighters will be infected during the course of a pandemic and likely not show up for work while they are ill. During the peak flu month of October in Baltimore, Maryland, during the 1918 pandemic, one in four critical personnel failed to report for duty.⁵² "Civil servants, industrial workers, and operators of public utilities were unable to work, stricken with influenza themselves or nursing ill family members at home....All city hall departments reported understaffing. Fire companies functioned far short of their normal complement, with up to a third of uniformed members' off-duty during the second week of October."⁵³

Using the clinical attack rate as the planning participation rate, however, may be an underestimate. Fire department employees may face a higher attack rate because of their anticipated increased exposure to flu patients. Fire fighters will respond to, and encounter with greater frequency than the normal, community members who already are sick and those who have no prior immunity to the virus. While treating and transporting sick patients, fire fighters will face an elevated exposure rate and likely a higher probability of contracting the infectious disease.

The experiences of health care workers during the severe acute respiratory syndrome (SARS) epidemic offer some evidence of this greater risk resulting from care and treatment of patients. The first readily transmissible disease of this century emerged

⁵⁰ DHHS, *HHS Pandemic Influenza Plan*, 18.

⁵¹ U.S. Department of Health and Human Services, *Pandemicflu.Gov*, <http://www.pandemicflu.gov> (accessed February 9, 2008).

⁵² Monica Schoch-Spana, "Psychosocial Consequences of a Catastrophic Outbreak of Disease: Lessons from the 1918 Pandemic Influenza," in *Bioterrorism: Psychological and Public Health Interventions*, eds. Robert Ursano, Ann Norwood and Carol Fullerton (New York, NY: Cambridge University Press, 2004), 42.

⁵³ *Ibid.*, 42-43.

in November 2002 in China's Guangdong Province.⁵⁴ SARS spread relatively quickly to various regions around the globe, having a significant impact on various regions, cities, and health care systems. "Five probable SARS patients in Singapore were each linked to events resulting in the apparent infection of ten or more health care workers, family, or social contacts, or unrelated hospital visitors, accounting for 103 of the 205 probable SARS cases."⁵⁵ In Hong Kong, "ultimately, sixty-nine health workers and sixteen medical students developed SARS directly attributable to workplace exposure to the index case; the disease then spread to family members (and other contacts) of the affected workers."⁵⁶

Fire fighters have not been included in any of these former studies. Still, fire fighters within the NCR are likely to have an increased risk of contracting a virus for several reasons. All of the fire fighters within the NCR are trained as emergency medical technicians, they are assigned to fire trucks dispatched to medical emergencies, and each individual performs or assists in providing advanced medical procedures in the field. As such, all fire fighters within the NCR will have an increased risk of exposure and likely will have an increased attack rate during a pandemic.⁵⁷

The potential exposure of fire fighters to a wide range of infected community members comes from a number of their routine activities. Over the last few decades, fire incidents have decreased. Nationwide less than 10 percent of the emergencies fire departments are called to actually involve fire.⁵⁸ During this same time, fire departments have recognized that providing emergency medical services has become a priority. As shown in Figure 1 below, the single most frequent task undertaken by fire fighters today involves medical and rescue responses. Over 55 percent (55.2%) of the emergencies nationwide are medical and rescue in nature.⁵⁹

⁵⁴ Jason W. Sapsin, et al. "SARS and International Legal Preparedness," *Temple Law Review* 77 (2004), 155, <http://www.temple.edu/iilpp/Docs/Sapsin,%20Final%20to%20Publisher.%2012-08-04.pdf> (accessed January 12, 2008).

⁵⁵ *Ibid.*, 158.

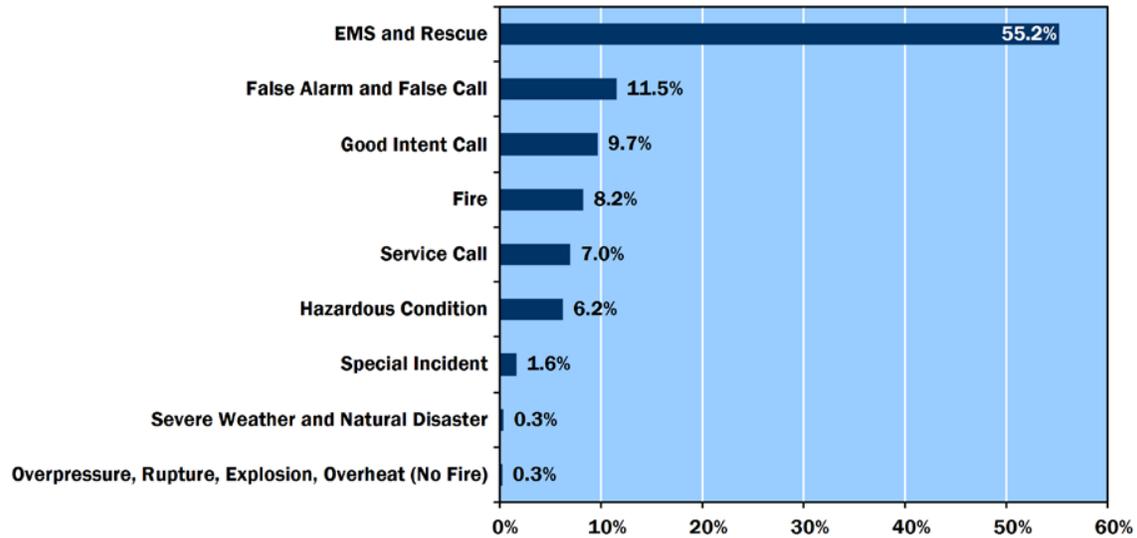
⁵⁶ *Ibid.*, 160.

⁵⁷ Personal Interview with Reed Smith, January 14, 2008.

⁵⁸ "Fire Department overall Run Profile," *Topical Fire Report Series 7*, no. 4 (December, 2007) 1, <http://www.usfa.dhs.gov/downloads/pdf/tfrs/v7i4.pdf> (accessed February 9, 2008).

⁵⁹ *Ibid.*

Figure 1. Fire Department Overall Runs by Incident Type (percent of runs, 2004)⁶⁰
Source: 2004



The fire fighters within the NCR face the same challenges and all have some level of medical training. This allows fire departments to utilize all personnel and equipment to assist medical emergencies throughout the communities they serve. Typically, fire departments throughout the NCR will dispatch a fire truck on all advanced life-support emergencies, or when they are the closest unit in any emergency. The primary reason fire trucks are dispatched on advance life-support calls is to assist ambulance or medic unit personnel with the triage, treatment, and transport of the patient.

Fire fighters will assist in any number of ways, depending upon their level of medical training. The pre-hospital care and procedures conducted in the field by fire department employees are quite advanced and often parallel procedures conducted in hospitals. Procedures such as intubation, nebulizer treatment, chest decompressions, cricothyroidotomy, administering intravenous fluids, and intraosseous access are advanced procedures that expose all treating fire department personnel to bodily fluids and aerosolized secretions of the patient. During the SARS epidemic, direct patient

⁶⁰ "Fire Department overall Run Profile."

contact was a factor in the increased attack rates for health care professionals. “Attack rates among workers with direct patient care roles have been observed as high as 10.0 and 11.8% in Canada and Hong Kong, respectively.”⁶¹

Although direct patient contact will likely increase the attack rates, a study by Mary Reynolds and others proved that non-clinical staff is susceptible to increased attack rates as well. During the SARS outbreak in Hanoi, for example, 19 percent of the cases were reported among Vietnamese non-clinical personnel, including housekeepers and other cleaning staff, kitchen staff, and receptionists.⁶² The SARS patient in this study was admitted to the hospital on February 26th, but it was not until March 6th that infection control practices were put into place. This is a likely reason for the high attack rates. But the study is important because it demonstrates the range of workers who may become infected simply by their proximity to an infected patient.⁶³

Working within the context of increased exposure, the clinical disease attack rate for fire fighters should be higher than the average estimated in general population studies. If the rate is increased to 40 percent, the consequences can be dramatic. A 30 percent clinical attack rate for the 7,597 fire fighters in the NCR projects that 2,279 will be infected with the flu virus during the course of a pandemic. At a 40 percent attack rate, the estimate jumps to 3,039. These additional 750 ill firefighters represent approximately two platoons of fire fighters for DCF&EMS, or the combined department personnel from Arlington, Alexandria, Manassas Park and Fairfax City. The impact of these rates of infection on the NCR fire departments is shown in Table 5 below. In the smaller departments, such as Manassas Park, this level of infection nearly incapacitates the capability to provide any medical emergency response. In the larger departments, the workforce will be dramatically reduced and the ability to serve the local community, let alone provide support to neighboring jurisdictions, will be severely constrained.

⁶¹ Mary Reynolds, et al., "Factors Associated with Nosocomial SARS-CoV Transmission among Healthcare Workers in Hanoi, Vietnam, 2003," *BMC Public Health* 6 (August 14, 2006), 4, <http://www.biomedcentral.com/content/pdf/1471-2458-6-207.pdf> (accessed February 6, 2008).

⁶² Ibid.

⁶³ Ibid., 9.

Table 5. Clinical Disease Attack Rates

Department	Number of Members	Clinical Disease Attack Rate - 30%	Increased Exposure - 10%
Alexandria City Fire Department	326	97.8	130.4
Arlington County Fire Department	325	97.5	130
City of Manassas Park Fire Department	25	7.5	10
District of Columbia Fire and EMS Department	2017	605.1	806.8
Fairfax City Fire Department	76	22.8	30.4
Fairfax County Fire & Rescue	1619	485.7	647.6
Fort Myer Fire Department	31	9.3	12.4
Loudoun County Fire and Rescue	378	113.4	151.2
Metropolitan Washington Airport Authority	133	39.9	53.2
Montgomery County Fire & Rescue Service	1339	401.7	535.6
Prince George's Fire & EMS	892	267.6	356.8
Prince William County Dept Fire & Rescue	436	130.8	174.4
Total	7,597	2,279.1	3,038.8

Using either the 30 or 40 percent clinical disease attack rate as the core level of illness throughout the course of a pandemic obviously does not mean that everyone will be ill at the same time. Depending on the cycles and severity of the virus, and the demographic characteristics of the neighboring population, the rate will vary considerably. Although little can be done to influence the underlying attack rate, other influences on the ability and willingness of fire fighters to respond to an emergency are much more amenable to intervention and change. According to Ran Balicer, a study of 308 employees at three health departments in Maryland found that:

Current national contingency plans account for possible personnel shortages within the healthcare and public health settings, mainly due to the expected influenza morbidity among workers. Yet our data suggest that regardless of the expected morbidity among personnel during an

influenza pandemic, nearly half of the local health department workers are likely not to report to duty during such an extreme public health crisis. In fact, most of the workers (and nearly three out of four technical/support workers) do not believe they will even be asked to report to work.⁶⁴

Outside of the clinical disease attack rate, then, there are numerous factors which affect fire fighters' ability and willingness to participate in a pandemic. Independently, these factors will significantly impact fire fighter workforce levels. Although these issues will vary for each fire fighter, departments face planning for workforce levels that are affected by both an infection rate and broad social and personal conditions. Fortunately, fire departments may be able to influence these social and personal conditions far more positively than the epidemiological rate of virus infection.

B. WORKFORCE PARTICIPATION PERCENTAGE

How can fire departments effectively plan or respond in a pandemic if there is no accurate estimation of the number of fire fighters who will be able and willing to work? Fire department personnel are the critical node for all fire department operations and even more so during a pandemic. The capability of any fire department to provide emergency and non-emergency services to its community is primarily contingent upon adequate staffing levels.

Although a variety of issues will collectively determine baseline workforce levels in an actual event, a reasonable estimate can be drawn from the available scientific data on past pandemics and data collected from this survey. Willingness and ability will be analyzed independently to examine the specific concerns fire fighters have with each. Willingness and ability will also be analyzed collectively to determine a WPP. Determining a fact-based WPP will assist fire departments in developing reasonable and practical pandemic plans.

1. Baseline Willingness

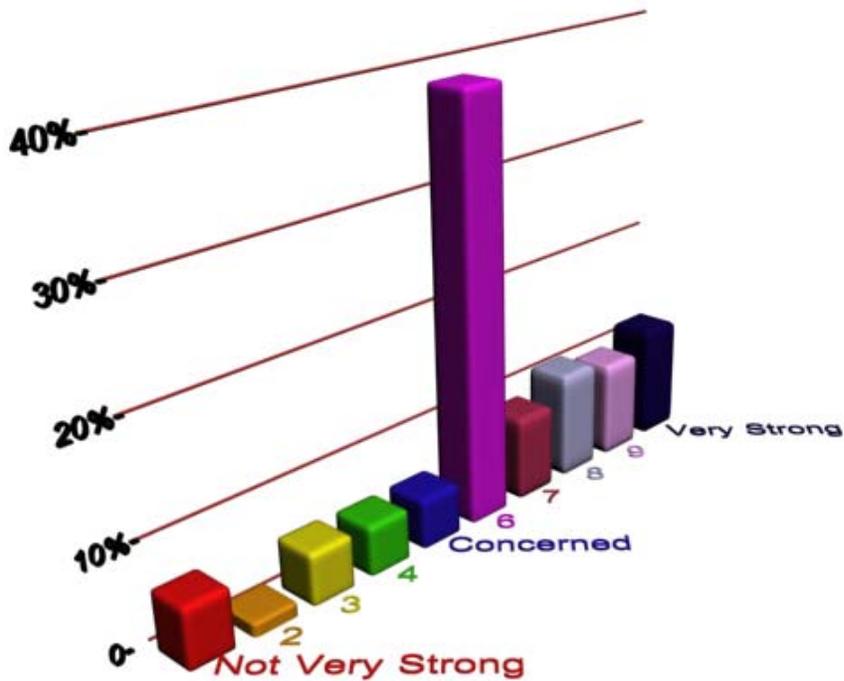
The survey asked a wide range of willingness questions on fire fighter's ability to participate in a pandemic. To determine the baseline for willingness however, a single question was used: "In your current fire department position, would you be willing to participate in your fire department's response to an avian influenza (bird flu) outbreak?" Just under sixty-nine percent (68.8%) of the respondents said that they were willing to

⁶⁴ Balicer, et al., *Local Public Health Workers' Perceptions*, 105.

participate in a response to an avian influenza outbreak, with 22.1% saying they were “not sure.” Although 68.8% of the respondents said that they were willing to participate in a response to an avian influenza (bird flu) outbreak with their fire department, when asked to “rate their level of willingness,” great disparity emerges.

Table 6 illustrates fire fighters’ level of willingness. The respondents were asked to rate their level of willingness; whereby a “1” would indicate not a very strong willingness to participate. A “10” would represent a strong willingness with no concern whatsoever about participating. Only 11.1 percent of the respondents answered “10.” The majority of the respondents (38.6%) answered “5,” suggesting that although they maybe willing to participate in an avian influenza outbreak, their level of concern was significant. The higher the level of concern, the less willing a fire fighter will be to participate in a pandemic. Although 68.8 percent of the fire fighters surveyed said they would be willing to participate in a pandemic, it is likely this number will be lower due to the average level of concern.

Table 6. Rated Level of Willingness

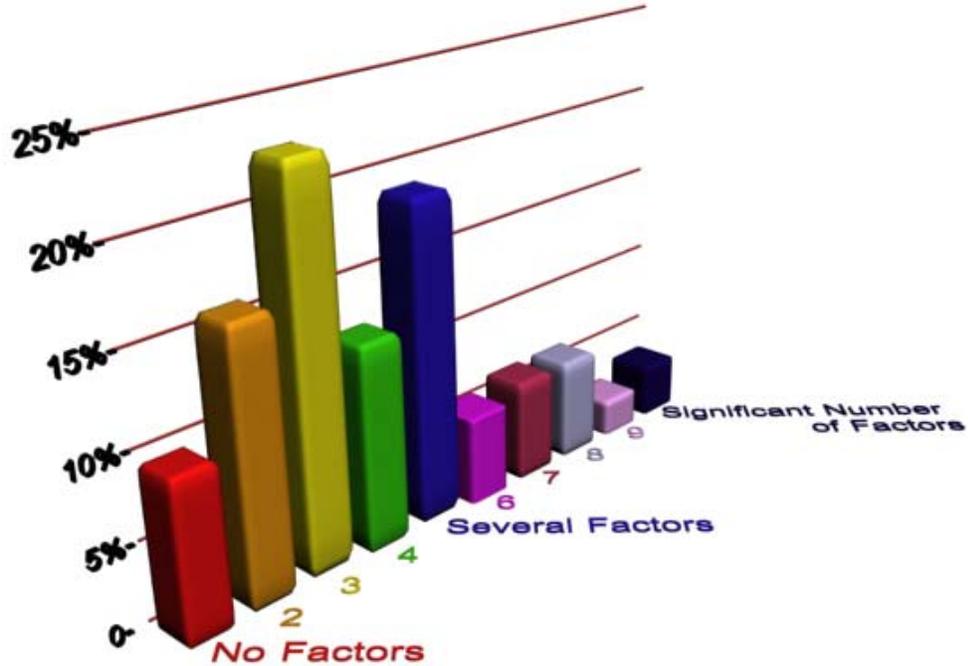


2. Baseline Ability

To determine a level of ability, that ability it must be measured against something. Although it may have been possible to ask fire fighters if they would be able to participate in a pandemic, it was deemed as too generic a question. There are many variables to one's ability, such as child care, transportation, personal health issues, and the care of pets. The most telling indicator of a fire fighter's ability to participate in a pandemic would come from a measurement of his or her ability to participate when an immediate family member is seriously ill. The "immediate family member" allows for the greatest range of respondents, as this would likely have applicability to single and married fire fighters alike. The vast majority of fire fighters likely have someone they consider an "immediate" family member; conversely, not every fire fighter has dependents or living parents.

Only 30.4 percent of the respondents said they would be able to work for their fire department during a pandemic if a member of their immediate family was seriously ill; 27.2 percent said they would not be able and 42.5 percent said they were "not sure." Overall, the respondents were asked to rate their level of ability to participate in a pandemic. Table 7 illustrates the fire fighter's level of ability. A "1" means there are no factors affecting ability to participate; a "10" means there are a significant number of factors affecting ability to participate. Only 9.4 percent of the fire fighters said there were "no factors" affecting their ability to participate. The mean score was 4.18. This suggests that the majority of fire fighters have a couple of factors which will affect their ability to participate in a pandemic. The higher the score, the more likely fire fighters will not be able to participate in a pandemic.

Table 7. Rated Level of Ability



A determination of the baseline willingness and ability participation rates is important for comparison reasons; however, further analysis and breakdown is necessary to get a detailed and accurate understanding of the variables associated with each. Only then can an accurate WPP be obtained. The following section will analyze in detail the variables impacting ability and willingness.

3. Fire Fighters’ Willingness to Participate -- General

As mentioned previously, just under 69 percent (68.8%) of fire department employees said they would be willing to participate in a response to an avian influenza (bird flu) outbreak. Although at first glance this appears to be a relatively high level of willingness for participation in a pandemic-like event, it is significantly lower than the willingness to participate in the more traditional fire department responses. The respondents were asked to rate their willingness to participate in four types of significant emergency responses: (1) an event similar to the Pentagon response on September 11, 2001; (2) a hurricane; (3) a radiological/nuclear event; and (4) an avian influenza (bird flu) outbreak.

Over 95 percent of the fire fighters were willing to participate in a response similar to September 11, 2001(95.3%), with 95 percent willing to participate in a hurricane response. The response rate for willingness to participate in a radiological/nuclear event was 69.7 percent, with 17.9 percent “not sure.” The response rate for willingness to participate in an avian influenza outbreak was 68.8 percent, with 22.1 percent “not sure.”

Table 8. Comparison of Percentage of Willingness Based on Type of Incident

<i>Incident</i>	<i>Willing</i>	<i>Not Willing</i>	<i>Not Sure</i>
Similar to September 11, 2001	95.3	1.4	3.3
Hurricane Response	95.0	2.3	2.7
Radiological/Nuclear	69.7	12.4	17.9
Pandemic	68.8	9.1	22.1

This comparison provides greater insight and perspective on the willingness of fire fighters to participate in extreme and catastrophic emergencies. First, it demonstrates that fire fighters are largely not opposed to participating in certain types of major emergencies where the potential for death and injury is significant. Secondly, it shows the disparity in willingness to participate between classifications of emergencies. There are two reasons which may influence a fire fighter’s willingness to participate in a radiological or pandemic type event over a hurricane or Pentagon attack: (1) these responses are generally considered outside the traditional mission of the fire department and (2) the psychological fear of the unknown. These issues are discussed in greater detail in the following chapter.

4. Variables to Willingness

The survey further broke down the levels of fire fighters’ willingness to participate in a pandemic based on issues or variables identified in similar studies, discussions with fire fighters, pre-survey testing, and the hypotheses of the author. Qureshi’s study of health care workers found the reasons for not being willing to report to work during a catastrophic event were family, self, personal health problems, and child or

eldercare issues.⁶⁵ The Shapira study determined the reasons affecting willingness to participate were: fear of leaving home, transportation difficulties, fear of opening the family's sealed room, necessity of caring for their family, and vision problems due to inability to use glasses while wearing a gas mask.⁶⁶ (Several of these reasons were specific to the circumstances of the Israeli hospital personnel and thus not applicable to this study.

Balicer's study found that the most influential construct associated with willingness to report to duty was "the perception of the importance of one's role in the agency's overall response."⁶⁷ It was determined that this issue was important but would be addressed separately from the willingness section of this survey.

A final determination was then made as to which variables from these studies would be applicable to fire fighters' willingness to participate in a pandemic. Utilizing these variables would allow for further comparison between studies of the individual factors affecting willingness.

The following topics are used to assess fire fighters' willingness to participate in a pandemic: family, personal protective equipment, fire department pandemic response plans, worker's compensation, and pharmacological interventions (vaccine and anti-viral).

The safety of one's family is consistently a primary concern of respondents in previous studies. Qureshi's study of health care workers found that fear and concern for family was the primary reason respondents were not willing to report to work.⁶⁸ In the study of the Israeli hospital personnel, 63 percent stated "necessity to care for their family" as one of the reasons for their unwillingness to work. Demme's study on law enforcement's role in responding to a biological incident found "that the safety of the family was paramount in determining whether to respond to work or not during a

⁶⁵ Qureshi, *Health Care Workers' Ability*.

⁶⁶ Shapira, et al., *Willingness of Staff to Report*, 708.

⁶⁷ Balicer, et al., *Local Public Health Workers' Perceptions*, 105.

⁶⁸ Qureshi, *Health Care Workers' Ability*, 383.

biological related incident.”⁶⁹ Schechter’s study on the medical reserve corps volunteers found that family health was the greatest concern regarding barriers to willingness to work in catastrophic disasters.⁷⁰

It is not surprising that concern for the safety of family is a primary factor in one’s willingness to participate in a pandemic. This study found that if an immediate family member was seriously ill during a pandemic, 32.2 percent of fire fighters were either “not willing” or “not at all willing” to work. Only 10.7 percent said they would be “very willing” to work. Likewise, if dependents were seriously ill during a pandemic, 34.9 percent of the respondents were either “not willing” or “not at all willing” to work. Only 6.9 percent said they would be “very willing” to work if a dependent were seriously ill.

Sixty-four percent of the fire department employees said they were “not willing” or “not at all willing” to participate in a pandemic if adequate PPE was not provided during a pandemic. This was a significant finding in the study of Israeli hospital personnel as well. That study determined that if adequate safety measures were provided the willingness to report to duty would increase from 42 percent to 86 percent.⁷¹ The safety measures included a complete protective suit and spectacles suitable for a gas mask.⁷²

There is the expectation that sufficient PPE will be provided by (or through) the fire department to fire fighters in a pandemic. Over 63 percent (63.2%) of the respondents were either “confident” or “very confident” that their respective fire departments would provide sufficient PPE during a pandemic. Furthermore, 64.9 percent of FDE said providing adequate and sufficient PPE was critical for fire department pandemic preparedness.

Several independent variables, not discussed in previous studies, were found to be particularly relevant to fire fighters’ willingness to work. These issues were determined primarily by the author as being important considerations for fire fighters specifically for

⁶⁹ Demme, *Government Expectations and the Role of Law Enforcement*, 24.

⁷⁰ Schechter, *Medical Reserve Corps Volunteers' Ability*, 31.

⁷¹ Shapira, et al., *Willingness of Staff to Report*, 704.

⁷² *Ibid.*, 708.

participation in a pandemic. These variables were substantiated in discussions with fire fighters and during the pre-survey analysis. The main independent variables are fire department pandemic plans, worker's compensation coverage, and pharmacological interventions.

Just under 40 percent (38.6%) of the respondents said they were "not willing" or "not at all willing" to participate in a pandemic if their fire department did not have a pandemic response plan. Nearly 75 percent (74.8) of the respondents believed having a fire department plan was "very important" or "critical." Over seventy percent of the respondents indicated that if their respective department had a pandemic response plan, it would increase their willingness to participate in a pandemic; however, only 14.7 percent were familiar with their respective fire department's pandemic operational plan; 63.2 percent did not know their operational plans and 22.2 percent were unsure.

Seventy-six percent of the fire department employees said they were "not willing" or "not at all willing" to participate in a pandemic if they were not covered under worker's compensation for any illness contracted during a pandemic. Only 2.2 percent said they would be "very willing" to participate. Over 65 percent (65.4%) of the respondents believed worker's compensation issues were "very important" or "critical."

Nearly 53 percent (52.8%) of the fire department employees said they were "not willing" or "not at all willing" to participate in a pandemic if vaccine or anti-viral medication were not available. Seventy-nine percent of the respondents believed vaccine and antiviral medications were "very important" or "critical."

There are additional considerations impacting fire fighters' willingness to participate in a pandemic. These include outside employment, training and education, and a perception of one's perception to overall operations.

Almost 39 percent (38.6%) of the respondents indicated they had employment outside of their occupation with the fire department and more than 16 percent (16.2%) of the respondents indicated that this outside employment provided essential income. Since the respondents classified their secondary employment as essential, it is believed that this would likely have a greater impact on their willingness than ability. Fire fighters who

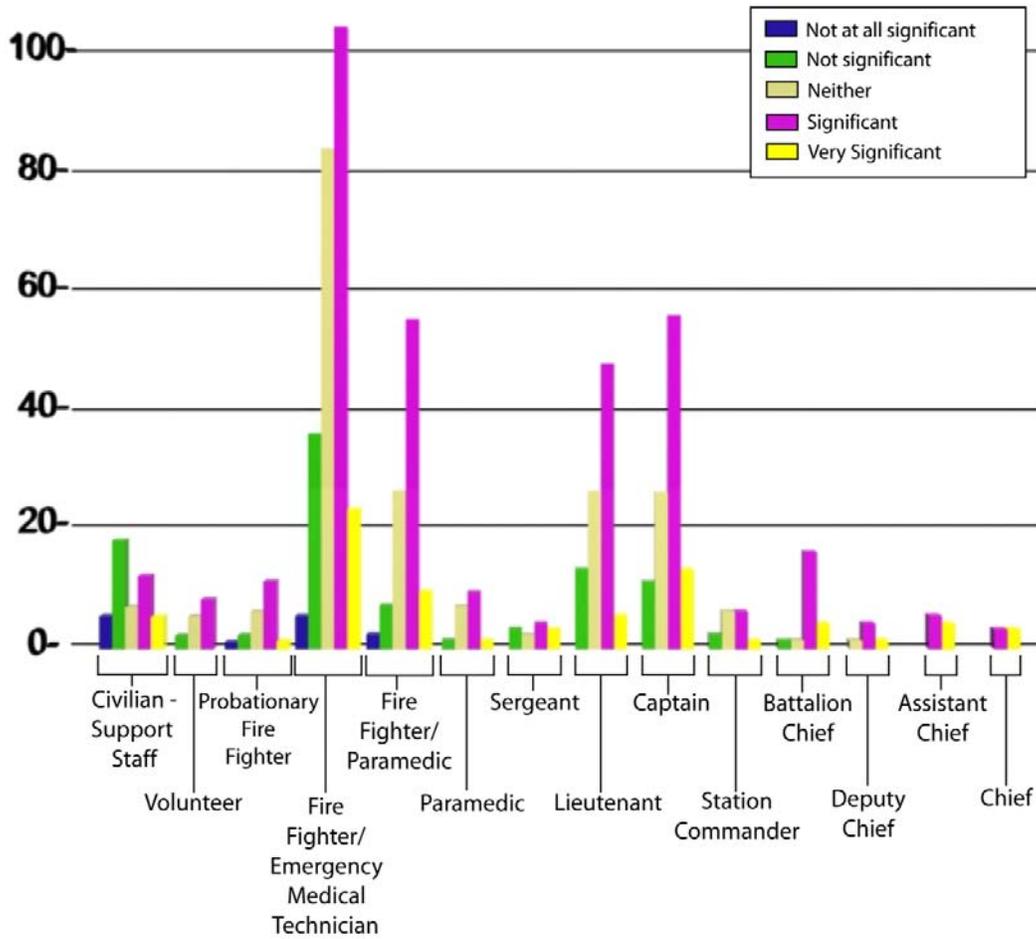
deemed their “outside” employment as essential may be less willing to participate with their fire departments in a pandemic because the income and/or benefits from this secondary employment is indispensable.

Training is an important consideration as well and impacts the willingness of fire fighters to participate in a pandemic. Over 98 percent (98.2%) of the respondents indicated that pre-event training and preparation were “important” or “very important;” however, 58.1 percent of the fire department employees had received no fire department training or education for response to a pandemic. Only 3.9 percent of the fire department employees said they were “very knowledgeable” about pandemic flu. Nearly 38 percent (37.8%) said they were “knowledgeable” and 31.1 percent said they were either “not knowledgeable” or “not at all knowledgeable.” Just over 27 percent (27.3%) answered “neither” suggesting only a very basic understanding of pandemic flu.

The perception of the importance of one’s role in a pandemic response was analyzed. The respondents were asked how significant a role they thought they would play in their department’s overall pandemic response. Nearly 50 percent (47.5%) believed they would play a significant role, with 10.1 percent responding “very significant.” Nearly 30 percent (27.3%) answered “neither” and 13.3 percent and 1.8 percent said their role would be “not significant” or “not at all significant.”

The highest percentage for those who believed their role was “very significant” in a department’s pandemic response were in the position of chief and assistant chief. It is interesting to note that a greater percentage of civilian-support staff believed their role was “very significant,” as compared to fire fighter/EMTs, fire fighter paramedics, lieutenants, and station commanders. However, civilian-support staff also had the highest percentage in the “not at all significant” category with 10.6 percent. No one above the rank of fire fighter/paramedic believed their role was “not at all significant.” The majority of the respondents within each group believed that they played a “significant” role in a pandemic response.

Table 9. Perception of the Importance of One's Role in a Pandemic Response



5. Willingness Summary

Although 68.8 percent of the respondents said they would be willing to participate in a pandemic response, significantly lower numbers resulted when specific questions on willingness were presented. Likewise, the results from the rated level of willingness question suggest that fire fighters may not be as willing to participate. The wide range of variables associated with willingness resulted in great variation in fire fighters' willingness to participate. This suggests that fire fighters' willingness to participate in a pandemic is situation dependant.

C. ABILITY TO PARTICIPATE – GENERAL

Ability to work is significantly different from willingness to work. Although individuals may be willing to participate in a particular event or scenario, independent factors or variables may prevent, minimize, or altogether not allow their participation. To assist in validating the independent ability factors which may affect fire fighters, a review of previous studies was conducted. Qureshi’s study of health care workers’ ability to report to duty during catastrophic disasters found that the primary reasons health care workers would not be able to report to work were “transportation issues (33.4%), childcare (29.1%), personal health concerns (14.9%), eldercare responsibilities (10.7%), pet care (7.8%) and second job obligations (2.5%).”⁷³ A different study conducted by Qureshi found the main barriers to nurses reporting to work during an emergency were child/elder care obligations, transportation, and personal health issues.⁷⁴ Although transportation and personal health concerns were significant reasons in the Qureshi study, they will not be addressed in the ability section of this study. It was believed, and confirmed in this study, that transportation would not be a significant hindrance for fire fighters within the NCR, as it would be for health care worker’s living and working in New York City. This study found that over 99.6 percent of the fire fighters use a personal vehicle as their primary method of transportation.

The personal health concerns in this study were addressed separately in a “concern” section (discussed later in this chapter). It is believed that personal health concerns would impact fire fighters’ willingness to participate in a pandemic more than their ability. As a result, fire fighters’ ability to participate in a pandemic was measured against the following variables: seriously ill immediate family member, seriously ill parent or sibling, seriously ill child or other dependent, and pets.

As discussed previously, the best gauge of a fire fighter’s ability to participate in a pandemic would come from a measurement of his or her ability to participate when there is an immediate family member who is seriously ill. The “immediate family member”

⁷³ Qureshi, *Health Care Workers’ Ability*, 383.

⁷⁴ Qureshi, et al., “Emergency Preparedness Training for Public Health Nurses,” 415.

allows for the greatest range of respondents, as the vast majority of fire fighters likely have someone they consider an “immediate” family member; conversely, not every fire fighter has dependents or living parents.

Only 30.4 percent of the respondents said they would be able to work for their fire department during a pandemic if a member of their immediate family was seriously ill; 27.2 percent said they would not be able and 42.5 percent said they were “not sure.”

This was broken down further by asking the respondents if they would be able to work if their parents or siblings were ill and or children and other dependents. The reason for this distinction was to attempt to separate the significant family relationships between the younger, typically unmarried, fire department members from the older married ones. The thought being that the younger members who were not married with children would be more concerned with the health and safety of their parents and siblings, and so be less inclined to participate should they become ill. Of the survey respondents, 20.2 percent were not married and had no children. When comparing this group against single with children, married with no children, married with children, and others, there was not a significant difference in ability to participate.

Overall, 50.5 percent of the respondents indicated they would be able to participate during a pandemic if their parents or siblings were seriously ill; 16 percent said they would not be able and 33.6 percent were “not sure.” There was more than 20 percent (20.1%) increase in ability to participate between seriously ill “immediate” family member and a seriously ill parent or sibling. A possible reason for this increase is parents and siblings are likely functioning adults who do not require the assistance of the fire department employee; in contrast to an immediate family member, who is likely to be a spouse or dependent child.

Out of all the variables possibly impacting the ability of fire fighter participation, it is believed that being responsible for children or “other dependents” would result in the lowest participation rates, if these dependents were seriously ill. Nearly 53 percent (52.9%) of the respondents were responsible for children. Over 14 percent (14.1%) were responsible for elders and 66.9 percent were responsible for pets. Just over 5 percent (5.5%) were responsible for physically or mentally disabled people.

When asked if they would be able to work for their fire department during a pandemic, if their child(ren) or other dependents were seriously ill, only 16.1 percent answered “yes.” Nearly 35 percent (34.7%) answered “no,” with 26.2 percent answering “not sure.” Nearly a quarter (23.2%) of the respondents indicated that the question was not applicable to them.

Although 74 percent of the respondents indicated they were responsible for pets, this factor did not impact ability to participate significantly. Of those responsible for pets, 89.5 percent indicated they would be able to work during a pandemic, 2.6 percent answered “no,” and 7.9 percent were “not sure.”

Additional considerations affecting fire fighters’ ability to participate include childcare and a spouse or partner having to work during a pandemic. Childcare is a particularly important consideration for fire fighters when assessing ability to participate during a pandemic for two primary reasons: the anticipated extended work hours and the unique work schedule of most fire fighters. Although all fire department employees were surveyed within each jurisdiction, the vast majority (74.5%) work a twenty-four-hour shift. Shift-work poses unique challenges for finding childcare under normal circumstances, much less during a pandemic, when fire departments may require or need employees to work extended hours to cover personnel shortages.

The fire department employees were asked if they anticipated having childcare/dependent care issues for an event requiring their extended participation. After adjusting for the 19.8 percent of respondents who indicated that child/dependant care was “not applicable” to their current situation (likely because they had no children or those children were grown), 26.1 percent believed child/dependent care would be an issue. Although 58.5 percent said this would not be an issue, 15.6 percent were unsure. Nearly 42 percent (41.7%) of the fire department employees were certain or not sure that child/dependant care would be an issue if they were required to participate for an extended period of time.

Having a spouse or partner who would have to report to work during a pandemic would certainly impact, in most circumstances, one’s own ability to participate. This is particularly true when other variable exists such as children, pets, or dependant parents.

Even without these variables, ordinary daily responsibilities must be addressed between couples; paying bills, home-care issues, and personal issues do not disappear.

Over 27 percent (27.2%) of the respondents said their spouse or partner would have to report to work during a pandemic, epidemic, or biological event, with another 19.5 percent responding they were “unsure.” With over a quarter of the fire department employees’ spouses having to report to work during a pandemic, this will certainly impact the ability of the fire fighter to work.

D. SUMMARY OF ABILITY

Only 30.4 percent of those surveyed affirmatively responded that they would be able to participate in a pandemic if a member of their immediate family member was seriously ill. Although this is believed to be the best measure of ability, several other factors will influence one’s ability to participate in a pandemic. Collectively, these variables determine an individual’s overall ability to participate. It is impossible to determine definitively, from this survey, an individual’s ability to participate in a pandemic response. However, in analyzing the number of variables affecting one’s ability to participate, we can infer that the greater the number of variables, the less likely individuals will be able to participate in a pandemic. As was stated previously, only 9.4 percent of the fire fighters said there were “no factors” affecting their ability to participate in a pandemic. The mean score on factors affecting ability to participate was 4.18. Consequently, there are a number of factors affecting fire fighters’ ability to participating in a pandemic. These variations must be analyzed along with the variations in willingness as this interaction will provide a greater understanding and perspective of what challenges a pandemic poses to fire fighter participation.

E. INTERACTION BETWEEN WILLINGNESS AND ABILITY

This section will first discuss how the respondents were categorized based on their responses to the core questions on ability and willingness. Second, an analysis will be conducted of the general categories of willing, able, and unsure and the distribution of the respondents thereof. Lastly, a detailed discussion will examine the interaction between the three categories.

To best analyze the interaction between willingness and ability it was determined that the survey respondents should be grouped into one of nine categories: willing and

able; willing, but not able; not willing, but able; not willing and not able; willing and not sure; not willing and not sure; not sure willing but able; not sure willing and not able; and not sure and not willing. The classification was determined based upon the respondents' answers to the core questions on ability and willingness: questions 32 (willing) and 39 (able). Respondents who answer they were willing for question 32 and able for question 39 received a 1 in the new variable, denoting "willing and able." Those who answered willing for 32 and not able for 39 received a 2 in the new variable, denoting "willing and not able." Those who answered not willing for 32 and able for 39 received a 3 in the new variable, denoting "not willing and able." Those who answered not willing for 32 and not able for 39 received a 4 in the new variable, denoting "not willing and not able." Those who answered willing for 32 and not sure for 39 received a 5 in the new variable, denoting "willing and not sure." Those who answered not willing for 32 and not sure for 39 received a 6 in the new variable, denoting "not willing and not sure." Those who answered not sure for 32 and able for 39 received a 7 in the new variable, denoting "not sure on willing, but able." Those who answered not sure for 32 and not able for 39 received an 8 in the new variable, denoting "not sure on willing and not able." Those who answered not sure for both 32 and 39 received a 9 in the new variable, denoting "not sure on willing and not sure on able." Those who answered only one of the two questions (32 or 39) and left the other blank received a 98 in the new variable. Those who answered neither 32 nor 39 received a 99 in the new variable.

Table 10 illustrates the breakdown of the categorization. One hundred and forty-six of the respondents could not be categorized into one of these nine groups because they either answered only one of the two questions, or they did not answer either of the two questions. Over 6 percent (6.9%) of the 873 respondents only answered one of the questions and another 9.9 percent failed to answer either question. The remaining 727 respondents could be classified.

The following discusses how the willingness and ability classifications were distributed. Nearly 60 percent (57.7%) of the respondents indicated they were "willing" to participate in an avian influenza outbreak. Over 7 percent (7.5%) said they were "not willing" and 17.9 percent said they were "not sure." The ability classifications were broken down as well, into the following categories: able, not able, and not sure. Just over

25 percent (25.3%) indicated they would be “able” to work, 22.6 percent said they were “not able,” and 35.28 percent indicated they were “not sure.”

Table 10. Classification of Respondents

	ABLE	NOT ABLE	NOT SURE ABILITY	TOTALS
Willing	187 (21.4%)	117 (13.4%)	200 (22.9%)	504 (57.7%)
Not Willing	11 (1.3%)	32 (3.7%)	23 (2.6%)	66 (7.5%)
Not Sure Willingness	23 (2.6%)	49 (5.6%)	85 (9.7%)	157 (17.9%)
Totals	221 (25.3%)	198 (22.6%)	308 (35.28%)	

An analysis of the interaction between willingness and ability is significant because it shows that a significant portion of fire fighters are unsure of their ability or willingness to work during a pandemic. This suggests that fire fighter participation may largely be dependent upon the situation they are presented with. Of the 17.9 percent of respondents who answered “not sure” regarding their willingness, 2.6 percent were “able” to work, 5.6 percent were “not able,” and 9.7 percent were “not sure” on their ability to work. Of the 35.2 percent who indicated they were “not sure” on their ability to work, 22.9 percent said that they would be “willing,” 2.6 percent said they would be “not willing,” and again 9.7 percent indicated they were “not sure” on their willingness.

The largest percentage of respondents (22.9%) who indicated they were “not sure” were categorized as “willing, but not sure” on their ability to participate. In contrast, only 2.6 percent indicated they were “able, but unsure” on their willingness.

The large portion of respondents who indicated they were unsure of their willingness and/or ability to participate in a pandemic is a positive finding because conceivably these individuals can be influenced; they have are not committed to not being able or willing to participate. However, when additional analysis was conducted between the categorical response generated from the core questions and other willingness

and ability questions, inconsistency in the respondents' answers was prevalent. This further demonstrates that fire fighter participation rates will be situationally dependent.

One would presume that fire department employees categorized as both willing and able would be likely to participate in a pandemic given any situation or circumstance. One hundred and eighty-seven of the respondents stated affirmatively that they would be both willing and able to participate in a pandemic. However, when their responses are analyzed against other willingness questions, some interesting findings emerge. Twelve (5.8%) of these 187 respondents indicated that they would not be willing to participate if an immediate family member was seriously ill. Likewise, fourteen (7.5%) said they would not be willing if a dependent was seriously ill. Over 36 percent (36.1%) said they were "not at all willing" or "not willing" if adequate PPE was not provided. One hundred and twenty five (42.1%) of the respondents said they were "not at all willing" or "not willing" to participate if they were not covered under worker's compensation. Just over 14 percent (14.3) were "not at all willing" to participate if vaccines and antivirals were not available.

Analyzing the "not willing and not able" category also shows inconsistencies. Although the discrepancies are not as significant as in the "willing and able" category, the number of respondents classified as "not willing and not able" was significantly less. The thirty-two respondents answered definitively that they would not be willing to participate in their fire department's response to an avian influenza outbreak and they would not be able to work if a member of their immediate family was seriously ill. One would suspect that, for this group, no variance would be found when asked additional questions on ability and willingness. However, when asked if they would be willing to participate if their dependent were seriously ill, 8.33% of this group indicated they would be willing. One of the respondents in this group said they would be willing even if adequate PPE was not provided. Six percent of these respondents said they would be willing if their fire department did not have a pandemic plan. It appears that although a fire fighter responded that he or she would be not willing and not able to participate in a pandemic, this may not be the case.

1. Summary of Interaction between Willingness and Ability

The discrepancies and inconsistencies found in fire fighters' answers regarding their ability and willingness to participate in a pandemic demonstrate that participation will be situationally dependent. The complexity of a pandemic and magnitude of variables that come into play do not allow for a relatively simple categorization of fire fighters. Likewise, asking fire fighters if they would be willing or able to participate in a pandemic is far too general and basic a question; it does not allow for the situation, and variables affecting the situation, to be placed into context.

Fire fighters will determine their availability during a pandemic based on their particular situation and circumstance. The rated level of willingness questions support this assessment. Again, fire fighters suggested that there were fairly significant numbers of factors impacting their overall willingness and ability to participate in a pandemic. Although fire fighters said they may be willing or able to participate in a pandemic, only a very small portion said there were no factors affecting this decision. In fact, 11.1 percent of the respondents said there were no factors affecting their willingness and only 9.4 percent said there were no factors affecting their ability. For the overwhelming majority of fire fighters there are various issues and concerns associated with their participation in a pandemic. One of the consequences of this finding is that a specific WPP cannot be obtained – it is possible only to provide a range.

F. DETERMINING THE WORKFORCE PARTICIPATION PERCENTAGE

The WPP is the number of fire fighters who will be able and willing to participate during a pandemic. The WPP for fire fighters in a pandemic will be between 30 and 70 percent. This range was determined using the core questions on ability and willingness. For ability, 30.4 percent of the fire department employees said definitively they would be able to work for their department in a pandemic if an immediate family member was seriously ill. This percentage is used to define the lower range of the WPP. At a minimum, fire departments should expect a third of their membership to participate. There is, however, room to improve this percentage, as 42.5 percent were “not sure” of their ability to work during a pandemic.

At the high end of the WPP, 70 percent was determined from the 68.8 percent of the respondents who said that they would be willing to participate in an avian influenza

outbreak. This percentage has room for improvement as well because 22.1 percent answered “not sure.” However, caution is recommended in adjusting the estimated WPP upward, due to the rated level of willingness.

As a planning assumption fire departments should anticipate a WPP between 30 and 70 percent, over and above the clinical attack rates. Fire departments should anticipate higher participation rates if more of the fire fighters’ issues and concerns have been addressed. For example, fire departments that have stockpiled sufficient quantities of PPE and initiated department-wide pandemic training can use a higher WPP for their planning assumptions than departments who have done nothing in these areas.

The WPP can be influenced through a number of initiatives, discussed in the following chapter, but first it is necessary to identify what initiatives or concerns, if addressed, will influence the participation rates of fire fighters. It is imperative that fire departments understand that their efforts will positively affect fire fighters’ willingness and ability to participate.

1. Factors Which Would Influence Fire Fighters’ Participation

Fire department employees were asked a series of questions to determine if their willingness to participate in a pandemic could be positively influenced. The questions specifically addressed the following areas: family, dependent care, pandemic response plans, worker’s compensation, and vaccines and antivirals. The questions only addressed whether it would increase the willingness to participate, not the ability. This is a potential weakness in this study; however, several of the questions asked do relate directly to ability and the answers likely reflect ability as well as willingness.

Over 80 percent (83.1%) said if assistance were provided to their family, it would increase their willingness to participate. The type of assistance was not specifically identified, which may suggest that any type of assistance would increase willingness. Suggestions on providing assistance to families are discussed in the following chapter; however, it is recommended that further analysis is conducted on the types of family assistance which would be most beneficial to fire fighters. For every question, over 70 percent of the respondents suggested their willingness to participate would increase if specific issues and concerns were addressed. Nearly 80 percent (79.1%) said if dependent

care issues were taken care of their willingness to participate would increase. Over 70 percent (70.8%) said their willingness would increase if their fire department had a pandemic response plan. Almost 80 percent (77.9%) indicated their willingness would increase if they were covered under worker's compensation for any illness they received while participating in a pandemic response with their fire department. Nearly 90 percent (87.7%) said their willingness would increase if vaccines and antivirals were available. Additionally, over 85 percent (85.2%) said their willingness to participate in a pandemic would increase if antivirals and vaccines were provided to their families.

G. SUMMARY

These areas provide the foundation for recommendations on improving the WPP. As was determined in this chapter, these issues cannot be addressed independently in the hopes of increasing the WPP. Because the variables associated with willingness and ability are situationally dependent and vary for each fire department employee, many different areas must be addressed. The core areas which are likely to influence fire fighter ability and willingness to participate in a pandemic are categorized and discussed in detail in the following chapter.

V. RECOMMENDATIONS

This chapter will focus primarily on the core areas on which fire departments should focus their efforts to improve fire fighters' ability and willingness to participate in a pandemic, with the goal of increasing the WPP. First, a discussion of the psychological impact on fire fighters responding to a pandemic will ensue. This will assist in putting many of the fears associated with responding to "unknown" events into perspective and give greater credence to the recommendations. Next, fundamental planning assumptions for a pandemic will be discussed. Lastly, the five central issues impacting fire fighters' ability and willingness to participate in a pandemic will be presented. Recommendations will also be provided, specific to each issue, to improve the overall WPP.

A. PSYCHOLOGICAL IMPACT ON FIRE FIGHTERS RESPONDING TO THE "UNKNOWN"

The fear of the "unknown" will have a significant impact on fire fighters just as it has on the general public. Although the psychological impacts have not been sufficiently studied within the fire service community, sufficient evidence exists, from which correlations can be drawn, in studies conducted of the general population. In comparing the tangible impacts (actual deaths and injuries) verses the intangible (the psychological consequences) of emergencies and disasters, the intangibles far out number the tangibles. "History suggests that there may be many more psychological victims than physical victims in a terrorist attack."⁷⁵ This was the case for the September 11th and anthrax attacks in 2001. The psychological casualties far outnumbered those directly involved in the actual incidents.

These psychological consequences will be magnified not only for the general public, but for fire fighters in emergencies or incidents involving infectious diseases, radiation, or any other "unknown" event. An "unknown" can be defined as an incident where there is no defined "response area." There is a general lack of knowledge or understanding; the main source, cause, or threat can not be seen, felt, or defined; and the potential health consequences are significant. The threat of terrorism and the H5N1

⁷⁵ Robyn Pangi, "After the Attack: The Psychological Consequences of Terrorism," *Perspectives on Preparedness*, no. 7 (August, 2002), 1, http://www.mipt.org/pdf/ksg_popno7.pdf (accessed January 12, 2008).

(avian flu) virus has increased both awareness and the likelihood of fire fighters throughout the U.S. having to deal with incidents with “unknown” characteristics. The fear associated with these “unknown” events will reduce the willingness of fire fighters to participate, if and when they occur.

A major factor in fire fighters’ willingness to participate in any emergency or incident involves their perceptions prior to joining the fire service. Sixty-three percent of the survey respondents indicated that, at the time they joined the fire service, they never anticipated responding to an event similar to the Pentagon attack. Just over 35 percent (35.2%) never anticipated participating in a hurricane response. Fifty-three percent said they never anticipated responding to a radiological or nuclear event and 60 percent never anticipated having to participate in a pandemic, epidemic, or biological event.

The survey data was then analyzed based on the date of hire. For each incident, with the exception of a hurricane, those hired before 2000 had a significantly higher percentage (of not having anticipated responding to these events) than those hired after 2001.

Table 11. Never Anticipated Responding Prior to Joining the Fire Department:

Types of Responses	Hired 1965-2000	Hired 2001-2007
Pentagon Attack	70%	26%
Hurricane	36%	31%
Radiological/Nuclear	56%	41%
Pandemic/Epidemic/Biological	66%	30%

The events of September 11, 2001 raised awareness in those joining the fire service that fire departments will play a role in these types of events. Consequently, fire fighters who joined after 2001 may be more willing to participate in such response because they anticipated this responsibility and possible eventuality prior to joining their

respective departments. Although there was not a significant distinction in willingness to participate in these emergencies for those hired before and after 2001, further discussion and study would be worthwhile.

Fire fighters are likely more willing to participate in responding to a hurricane or an event similar to the attack on the Pentagon primarily because of the seeming lack of health consequences associated with these events. Additionally, although these events are atypical emergencies, they utilize traditional fire fighting and emergency response tactics and training. Overall, fire fighters are more willing to participate in response to these more “traditional” emergencies than to a radiological or influenza incident. Over 95 percent (95.3%) of the fire fighters said they would be willing to participate in a response similar to the Pentagon attack and 95 percent said they would be willing to participate in a hurricane response. Conversely, only 69.7 percent of the fire fighters said they would be willing to participate in a radiological/nuclear event and 68.8 percent said they would be willing to participate in an avian influenza outbreak. There was not a significant distinction in willingness to participate in these emergencies for those hired before 2001 and those hired later.

The vast majority of emergency response situations throughout the United States have defined boundaries, whether it is a hurricane, heart attack victim, or gasoline leak. The parameters can be drawn and the hazard zones designated, either formally or informally. This is psychologically important for fire fighters because it defines the hazard, which consequently means there is a defined safe area where refuge can be found. For “unknown” incidents there are no boundaries and, consequently, there are no safe areas; potentially, everyone or everything is contaminated. “The psychological consequences, particularly when the rescue worker may be putting his or her life at risk by entering a contaminated area, can be extreme.”⁷⁶ The contaminated area is not clearly defined for radiological and infectious diseases; as a result the psychological consequences will be magnified, whether or not there is a risk to life.

Fire fighters generally have limited knowledge or understanding of these “unknown” events because they have not been trained or provided education. The

⁷⁶ Pangi, *After the Attack*, 4.

psychological consequences of having inadequate information for these incidents are significant. “In the aftermath of ... terrorist attacks, the intensity of responders’ work, the long duration of the response campaigns, the multiplicity of risks, the horrifying outcomes of the attacks, and the lack of knowledge about hazards all contributed to stress.”

The health consequences associated with unknown events likely create the greatest anxiety. This is particularly true for radiological and infectious disease incidents. The short- and long-term health consequences of radiation exposure are uncertain and the delayed signs and symptoms from exposure to flu victims will certainly create more anxiety. Fire fighters may never know if their exposure will result in cancer or death from radiological incidents and may not know for days if they have contracted the flu virus. This anxiety is perhaps the single greatest reason affecting the willingness of fire fighters to participate in these emergencies.

There is significant data available on the health impacts of natural disasters, but “there is almost no data on the mental health impacts of outbreaks of disease.”⁷⁷ The SARS epidemics in Asia and Canada provides the most recent information on mental health consequences from outbreaks of disease. Analyzing the mental health impacts on the general population and health care workers will provide insight to the potential effect on fire fighters of participating in an infectious disease emergency. During the SARS outbreak “upwards of 40% of the community population experienced increased stress in family and work settings...[and] 16% showed signs of traumatic stress levels...Studies of the nurses who treated SARS patients indicated high levels of stress and about 11% rates of traumatic stress reactions, including depression, anxiety, hostility and somatization symptoms.”⁷⁸

Fire fighters will be needed to treat and transport victims during an infectious disease outbreak. It is anticipated that the number of victims requiring advance medical assistance and intervention during an outbreak will increase appreciably. As such, all

⁷⁷ Center for the Study of Traumatic Stress, *Mental Health and Behavioral Guidelines for Response to Pandemic Flu Outbreak* (Bethesda, MD: Center for the Study of Traumatic Stress, n.d.), 1, <http://www.usuhs.mil/psy/CSTSPandemicAvianInfluenza.pdf> (accessed January 12, 2008).

⁷⁸ Ibid.

medical personnel (including fire fighters) will have a higher probability of contracting an infectious disease due to this increased exposure. This, in addition to the delayed onset of disease, will reduce fire fighters' willingness to participate.

There are many similarities between infectious disease and radiological emergencies, allowing for comparisons to be drawn in the analysis of the health impacts. Radiological emergencies create significant anxiety because of the uncertainty associated with the health consequences. In September of 1987 in Goiania, Chile, two people unknowingly disassembled a cesium-137 teletherapy unit that was left behind after a private radiotherapy institute moved away. The radiological source was unintentionally spread and shared. Once discovered, the psychological impact on the general population was noteworthy. Perhaps the most important finding in examining the Goiania event, however, was the fact that of the first 60,000 individuals to be monitored, approximately 5,000 (8.3%) presented acute stress or allergic symptoms (i.e. rash around neck and upper body, vomiting, diarrhea, etc.). Curiously, the majority of these individuals claimed that these symptoms had begun after the capsule was broken but before the announcement in the news media. Not a one of these individuals was contaminated! This has profound implications for the study of perceived risk in general and "special" nuclear-related impacts in particular.⁷⁹

Another study examined the impact of radiation exposure on clean-up workers from Estonia during the Chernobyl nuclear emergency. The report found that suicide was the leading cause of death among these workers. "These findings suggest the strong influence on mental health of uncertainty about long-term health effects of exposure to radiation."⁸⁰ Not only does this have implications for fire fighters' willingness to participate during the event, but it has absolute implications for the long-term psychological treatment and care of fire fighters.

The psychological implications of a pandemic will greatly influence fire fighter participation rates. This fire service mission brings with it new concerns and issues for fire fighters that, if not effectively addressed, will allow fear and anxiety to metastasize. In addressing the five core areas of concern fire fighters' have regarding participating in a pandemic, fire departments will reduce the fear and anxiety and increase the participation

⁷⁹ John S. Petterson, "Perception Vs. Reality of Radiological Impact: The Goiania Model," *Nuclear News* 31, no. 14 (November, 1988), 89.

⁸⁰ Gloria R. Leon, "Overview of the Psychosocial Impact of Disasters," *Prehospital and Disaster Medicine* 19, no. 1 (January-March, 2004), <http://pdm.medicine.wisc.edu/19-1%20pdfs/Leon%20Overview.pdf> (accessed January 8, 2008), 6-7.

rates. To effectively do this, the discussion must first be put into the context of established planning assumptions. These assumptions provide the framework for the general consequences and impact of the pandemic and provide perspective for the recommendations.

B. OVERVIEW OF GENERAL PANDEMIC PLANNING ASSUMPTIONS

The ultimate impact and exact consequences of the next pandemic can not be fully determined prior to its occurrence. Although the consequences will certainly be significant, pandemic experts and planners must develop and use assumptions for planning purposes. These assumptions are primarily based upon the three pandemics which occurred in the 20th century (1918, 1957, 1968). Both the 1957 and 1968 pandemics have been classified as “moderate” pandemics, with the 1918 pandemic classified as “severe”⁸¹ “This difference is largely related to the severity of infections and the virulence of the influenza viruses that caused the pandemic.”⁸² However,

[The] Medical Planning Resources and the former director of medical contingency operations for the Office of the Secretary of Defense, explained: “The impact of a pandemic now could be significantly worse due to three important changes: (1) a tripling of the global human population, creating a significantly larger ‘population-at-risk’; (2) large geographic concentrations of immunocompromised populations due to HIV, straining the medical and public health infrastructure; and (3) the availability of a vast global air transportation network, creating a potential ‘vector accelerant’ (or exponentially rapid) platform for the spread of the disease.”⁸³ Regardless, establishing a foundation for planning assumptions is necessary. It is essential that these assumptions be revisited regularly as new data and circumstance become available.

The Department of Health and Human Services’ *Pandemic Response Plan* contains several key planning assumptions, based on the previous pandemics, which are

⁸¹ DHHS, *HHS Pandemic Influenza Plan*, 18.

⁸² *Ibid.*

⁸³ *Closing the Seams: Developing an Integrated Approach to Health System Disaster Preparedness* (PriceWaterhouseCoopers, 2007), 7, <http://www.pwc.com/extweb/pwcpublications.nsf/docid/9CEC1E9BD3BCAC478525737F005C80A9> (accessed November 25, 2007).

used for pandemic planning. These assumptions are critical as they give perspective on the potential consequences faced within the fire service. The following assumptions are from DHHS’s *Pandemic Response Plan*:

- Susceptibility to the pandemic influenza subtype will be universal.
- The clinical disease attack rate will be 30 percent in the overall population. Illness rates will be highest among school-aged children (about 40%) and decline with age. Among working adults, an average of 20 percent will become ill during a community outbreak.
- Of those who become ill with influenza, 50 percent will seek outpatient medical care.
- The number of hospitalizations and deaths will depend on the virulence of the pandemic virus. Estimates differ about ten-fold between more and less severe scenarios. Because the virulence of the influenza virus that causes the next pandemic cannot be predicted, two scenarios are presented based on extrapolation of past pandemic experience (Table 12).

Table 12. Number of Episodes of Illness, Healthcare Utilization, and Death Associated with Moderate and Severe Pandemic Influenza Scenarios*

Characteristics	Moderate (1958/68-like)	Severe (1918-like)
Illness	90 million (30%)	90 million (30%)
Outpatient medical care	45 million (50%)	45 million (50%)
Hospitalization	865,000	9,900,000
ICU care	128,750	1,485,000
Mechanical ventilation	64,875	742,500
Deaths	209,000	1,903,000

*Estimates based on extrapolation from past pandemics in the United States. Note that these estimates do not include the potential impact of interventions not available during the 20th century pandemics.⁸⁴

⁸⁴ DHHS, *HHS Pandemic Influenza Plan*, 18.

- Risk groups for severe and fatal infections cannot be predicted with certainty. During annual fall and winter influenza season, infants and the elderly, persons with chronic illnesses and pregnant women are usually at higher risk of complications from influenza infections. In contrast, in the 1918 pandemic, most deaths occurred among young, previously healthy adults.
- The typical incubation period (the time between acquiring the infection until becoming ill) for influenza averages two days. We assume this would be the same for a novel strain that is transmitted between people by respiratory secretions.
- Persons who become ill may shed the virus and can transmit infection for one-half to one day before the onset of illness. Viral shedding and the risk for transmission will be greatest during the first two days of illness. Children will shed the greatest amount of virus and, therefore are likely to pose the greatest risk for transmission.
- On average, two secondary infections will occur as a result of transmission from someone who is ill. Some estimates from past pandemics have been higher, with up to three secondary infections per primary case.
- In an affected community, a pandemic outbreak will last approximately six to eight weeks. At least two pandemic disease waves are likely. Following the pandemic, the new viral subtype is likely to continue circulating and to contribute to seasonal influenza.
- The seasonality of a pandemic cannot be predicted with certainty. The largest waves in the U.S. during 20th century pandemics occurred in the fall and winter. The pattern of the 1957 pandemic may be instructive in that the first U.S. cases occurred in June but no community outbreaks occurred until August and the first wave of illness peaked in October.⁸⁵

These assumptions should be incorporated into pandemic planning on every level, as they provide a valuable perspective on the potential consequences of a pandemic.

⁸⁵ DHHS, *HHS Pandemic Influenza Plan*, 18-19.

Specifically for the fire service, these assumptions are important in determining fire fighter workforce participation levels and developing fire department pandemic response plans. For example, knowing that a pandemic will last between twelve and sixteen weeks becomes a fundamental planning parameter for determining PPE stockpiling requirements. These assumptions, along with the survey data, will be used to support and discuss the recommendations throughout this chapter.

C. REASONS TO IMPROVE WORKFORCE PARTICIPATION

Fire departments have a vested interest in improving workforce participation levels – to maximize the services that can be provided to the community. Without adequate manpower, services will have to be reduced and/or cut. Fire (and police) departments, perhaps more than most businesses, agencies or services, have a responsibility to ensure that, within reason, these services are continued during any emergency. The primary way to ensure that these services are continued and maximized is to make certain an adequate workforce is available. Fire departments need to have a clear understanding of the extent to which their workforce will be available. The Shapira study noted that “knowledge of the extent to which hospitals can rely upon personnel willing to report to their planned duties is a key operational consideration in hospital staff management during a prolonged potentially unconventional war.”⁸⁶ While a valid reason to commit to these initiatives would be to increase participation levels, a more fundamental reason exists: a duty to protect our fire fighters.

1. Recommendations on Improving Fire Fighter Participation

There are five core areas on which fire departments within the National Capital Region should focus their attention to improve fire fighters’ ability and willingness to participate in a pandemic. These issues were identified through the survey and were then categorized into the following areas: family, training and education, pharmaceutical interventions, worker’s compensation, and personal protective equipment. For each of these areas, a discussion will ensue as to why they are important; how they will impact fire fighters’ ability and willingness to participate in a pandemic; and what fire departments can do to address them.

⁸⁶ Aspira et al., *Willingness of Staff to Report* 709.

a. Family Issues

As shown in this and other surveys of professional groups, the safety and security of family is of paramount importance to emergency responders. The Qureshi study found “the most frequently cited reason for employees’ unwillingness to report to duty during a disaster was fear and concern for the safety of their families and themselves.”⁸⁷ Demme’s thesis on law enforcements’ role during a biological event establishes that the number one priority for officers is the safety of their families.⁸⁸

There are many stressors involved for first responders when responding to or participating in a disaster. “The largest is that they must choose between professional and familial responsibilities.”⁸⁹ There are several examples in which professionals have tended to the care and safety of family before fulfilling their professional obligations to the communities they serve. The most prominent example of this occurred during Hurricane Katrina when a significant share of law enforcement personnel did not show up for work, although initial reports of officer absenteeism were overstated.⁹⁰ “At the time Hurricane Katrina made landfall, the New Orleans Police Department had a force of 1,668 sworn officers. By the time the storm had passed, at least 147 failed to report for duty, while 90 percent of the force remained on duty.”⁹¹ “During Hurricane Francis in 2004, 25 nurses were fired or suspended for leaving early or not reporting to work during that event.”⁹²

In a pandemic the concern for the safety and wellbeing of family will be continuous. Unlike most emergencies where there are defined boundaries, beyond which families can be taken to be out of harm’s way, there is no safe area during a pandemic.

⁸⁷ Qureshi, *Health Care Workers’ Ability*, 386.

⁸⁸ Demme, *Government Expectations and the Role of Law Enforcement*, 33.

⁸⁹ Pang, *After the Attack*, 4.

⁹⁰ U.S. Congress, Senate Committee on Homeland Security and Governmental Affairs, *Hurricane Katrina: A Nation Still Unprepared : Special Report of the Senate Committee on Homeland Security and Governmental Affairs* (Washington, DC: US Government Printing Office,2006), 488, <http://www.gpoaccess.gov/serialset/creports/katrinanation.html> (accessed December 9, 2006).

⁹¹ *Ibid.*, 490.

⁹² Qureshi, *Health Care Workers’ Ability*, 379.

The threat of contracting the flu virus will be ubiquitous and this threat will continue throughout the pandemic. Therefore fire departments must plan on fire fighter absences for the duration of the pandemic.

As shown in Chapter 4, fire fighters also hold the safety and concern for family as the number one priority in determining their own ability and willingness to participate in a pandemic. This study of NCR fire fighters found that only half (51.4%) of fire fighters would be willing to participate in a pandemic if an immediate family member was seriously ill. Even fewer, only 30.4 percent, said they would actually be able to participate.

Fire departments will be challenged in addressing this issue as a way to improve participation levels. Fire departments cannot force their fire fighters to work during a pandemic, particularly when departments allow sick leave to be used to care for family members who are ill. Rather, fire departments face the challenge of finding ways to remove obstacles and barriers to their employees' otherwise core desire to respond to an emergency. Family preparedness is clearly a very high priority. Involving families early in planning a response, educating the entire family, and encouraging families to develop a sheltering plan and stockpile supplies to minimize the necessity of going within the community during a pandemic (and thereby decreasing their exposure risk) will help to alleviate fire fighters' concerns for their families' wellbeing.

A primary recommendation would be the development of a support network within the fire departments. This concept is similar to the military's force protection strategy. Spouses of deployed soldiers lead family readiness groups to support and care for families who remain home. Fire departments could develop fire fighter support networks that are station-based and are lead by the spouse of one of the members assigned to that station. Additional pay could be given to the member to encourage and support this position. The objective would be to develop a support network for all of the families assigned to that station or shift, so that in an emergency there is an established group that can assist or be called upon at anytime.

The Fairfax County Fire & Rescue Department's Virginia Task Force One - Urban Search and Rescue (USAR) team utilizes a similar concept. The focus of the

Family Support Services Team (FSST) is to provide information, resources, and support to families when team members are deployed.⁹³ The FSST is composed of task force family members who assist in the team deployment process and maintain contact with the team during deployment. The FSST was developed to assist families during the difficult times when loved ones are away assisting others.

The fire department support network would perform a similar service, but as an ongoing endeavor. The primary reason for the development of this team would not be in preparation for a pandemic; this network would have a larger application within the fire service as it could be utilized anytime a colleague or family member is sick or injured or anytime a family is in need. The main purpose would be for fire fighters to have a group of people they could rely on during any emergency, personal or work related.

For this concept to work however, it requires a foundation. Such a network can not be established and expected to function efficiently or effectively on the spur of the moment during a crisis or emergency. Family support networks must grow and be nurtured; families must become comfortable with one another, promoting the concept, and developing the trust and relationships necessary to make it work. For a relatively small investment, fire departments can demonstrate their support for fire fighters and their families by helping to develop this network. In any emergency, fire fighters will be more willing and able to work knowing their families have the support and assistance they need.

b. Training and Education

Training and education are perhaps the most important variables in the willingness of fire fighters to participate in a pandemic. Providing training and education for specific incidents is extremely important; doing so suggests that such an incident is a distinct possibility. Education will notify fire fighters that they will play a role in a pandemic and will provide a greater understanding of the pandemic in general. The more knowledge people have about pandemic influenza, the more willing they will be to participate because they have a greater understanding of the risks. Again, the responses of NCR fire fighters clearly demonstrated this point. In Chapter 4, results showed that only

⁹³ Virginia Task Force One Urban Search and Rescue Section, *Family Support Services Team* (Fairfax, VA: Fairfax County Fire & Rescue, 2008).

4 percent (3.9%) of the fire department employees surveyed said they were “very knowledgeable” about pandemic flu and just a third (37.8%) self-reported that they were knowledgeable. With a majority of NCR fire fighters admitting they do not know much about pandemic flu, any preparedness activities focused on increasing education and training could have a substantial impact on the rate at which these employees report to work during a pandemic.

Fire department training will likely increase the WPP. Qureshi’s study of emergency preparedness training for public health nurses, for instance, found a 12 percent increase in nurses’ intentions to report to work following such training. A 2002 study of the availability of Hawaiian medical professionals to staff non-hospital field medical facilities for mass casualty incidents resulting from the use of weapons of mass destruction found that the more knowledge and ability physicians and nurses reported, the more willing they were to help staff these facilities.⁹⁴ Training is vitally important as it will alert fire fighters to the fact they will play a role in a pandemic and, perhaps more importantly, that a pandemic is a distinct possibility.

General pandemic training and education can be provided to the NCR fire departments through a web-based program utilizing existing training developed by NCR fire departments. It is recommended the NCR fire departments utilize or increase their web-based training for all types of fire and EMS related training. The web-based training can be developed at a fraction of the cost of providing the traditional in-service training to all departments, can be taken by fire fighters at any location or time, can be tracked to ensure compliance, and can be used indefinitely. Additionally, if developed collaboratively or agreed upon prior to delivery, web-based training will ensure consistency of information, lessening conjecture and misinformation.

Education and training are critical factors in people’s ability and willingness to participate in a pandemic. For fire fighters, this is hardly a surprising or controversial observation or practical conclusion. From the earliest days of a fire

⁹⁴ Salvatore S. Lanzilotti, et al., "Hawaii Medical Professionals Assessment: A Study of the Availability of Doctors and Nurses to Staff Non-Hospital, Field Medical Facilities of Mass Casualty Incidents Resulting from the use of Weapons of Mass Destruction and the Level of Knowledge and Skills of these Medical Professionals as Related to the Treatment of Victims of of such Incidents," *Hawaii Medical Journal* 61, no. 8 (August, 2002), 168.

fighter's career in recruit school, the knowledge and training received provides the confidence and understanding to fight fires. If fire fighters were not provided this training, few, if any, would even consider entering a building that was on fire. Why then is this not being provided for pandemic preparedness?

c. *Pharmaceutical Interventions*

Vaccines and antivirals are considered possible pharmacological interventions in a pandemic. Although they are often grouped and discussed together, there are major differences in their use, availability, and purpose. It is likely the majority of fire department employees are not aware of these differences, as only 3.6% of respondents stated they were "very knowledgeable" about pandemics. Likewise, the prevailing assumption by fire fighters, and the fire service in general, is that these pharmacological interventions will be available and they will be used primarily as preventative measures, to block the virus from infecting fire fighters. The availability of these interventions is critical to fire department operations as 50 percent of the fire department employees surveyed said that they are "not willing" or "not at all willing" to work at their respective fire departments if vaccines or anti-viral medications are not available. The numerous variables involved with each intervention render the availability and use of these medications unlikely in a pandemic. Fire department leadership must communicate these issues to their workforce before a pandemic strikes; doing so will lessen the expectations of fire fighters that these interventions will be available.

Vaccines are considered to be the best preventive measure against pandemic flu. However, due to the development and manufacturing process, limited production capacity, limited availability, designated priority recommendations list, and distribution methods, they are likely not a viable option for fire fighters in the initial stages of a pandemic. "If an influenza pandemic starts, planners know that six months will elapse before current technology will allow development of a well-matched vaccine."⁹⁵

⁹⁵ U.S. Department of Health and Human Services (DHHS), *Pandemic Planning Update IV: A Report from Secretary Michael O. Leavitt* (Washington, DC: Department of Health and Human Services, July 18, 2007), 7, <http://www.pandemicflu.gov/plan/panflureport4.pdf> (accessed January 12, 2008).

Typically, it takes a relatively significant time to identify and manufacture a vaccine. The “flu vaccine is currently produced in chicken eggs in a time-consuming process with a six-month lead time. Since a vaccine could not be mass produced against a pandemic flu strain until that strain emerged, planning assumes that flu vaccine will not be available for initial global pandemic control.”⁹⁶ The concern over the H5N1 (avian flu) virus has spurred efforts to develop a vaccine in the event this virus becomes communicable. “In April 2007, the Food and Drug Administration (FDA) took an historic step when it approved the first human H5N1 vaccine...Some 12 million doses (enough for 6 million people) have been stockpiled by the U.S. government.”⁹⁷ This vaccine could be used at the beginning of a pandemic but the likelihood of its effectiveness remains suspect and will probably not be fully known until a pandemic strikes.

The limited production capacity within the United States greatly reduces both the availability of the vaccine and the capacity to “produce sufficient pandemic vaccine for all Americans in advance of a possible (many experts would say “likely”) second pandemic wave.”⁹⁸ The federal government is diligently working on this issue. “Over the next five years, vaccine manufacturers, spurred by a \$1 billion HHS investment, will develop the capacity to produce and deliver enough pandemic vaccine for every man, woman, and child in the United States within six months of the appearance of a pandemic virus.”⁹⁹ Until sufficient quantities exist for every citizen, or the United States is able to expand its production capacity, the vaccine will have to be stockpiled and distributed based on prioritization.

The federal government owns and maintains this vaccine.¹⁰⁰ If the H5N1 virus becomes readily communicable, the vaccine will be distributed through the Strategic National Stockpile (SNS) and dispersed to the states.¹⁰¹ If the virus comes from a completely separate flu strain, the H5N1 vaccine will likely be ineffective and not be

⁹⁶ Sarah A. Lister, *Pandemic Influenza: Domestic Preparedness Efforts* (Washington, DC: Congressional Research Service, November 10, 2005), 23-24.

⁹⁷ DHHS, *Pandemic Planning Update IV*, 7.

⁹⁸ *Ibid.*, 2.

⁹⁹ *Ibid.*, 8.

¹⁰⁰ Lister, *Pandemic Influenza: Domestic Preparedness Efforts*, 2.

¹⁰¹ *Ibid.*, 2.

distributed for use. If the H5N1 vaccine is to be used in a pandemic, can the vaccine be distributed and administered through the SNS before the influenza virus reaches the United States?

The federal government anticipates that a pandemic will likely originate overseas, most likely in Asia, and take approximately three months to spread to the United States. This will provide advance warning so that many of the federal interventions can be distributed and put into position. Although a pandemic vaccine will likely not be available within that first three months, this would certainly allow ample time to distribute additional supplies and equipment. However, these assumptions are not fool-proof. There is the possibility that the pandemic will originate in the United States, as was likely the case for the 1918 pandemic,¹⁰² and there is the further possibility that the virus will spread more quickly than the estimated three months. If either of these possibilities were to occur, the distribution of stockpiled pharmaceuticals, equipment, and supplies would be severely compromised. Pandemic stockpile distribution plans should be based on assumptions whereby the virus originates within the United States. If plans were developed based on this assumption, they could be used regardless of where the virus originates.

If the H5N1 vaccine is distributed before the influenza virus reaches the United States, who will receive the vaccine? Because there are not sufficient quantities of the vaccine for everyone, the allocation must be prioritized. See Table 13 for DHHS 's Vaccine Prioritization Recommendations.

¹⁰² John M. Barry, *The Great Influenza: The Epic Story of the Deadliest Plague in History* (New York, NY: Penguin Group, 2004), 4.

Table 13. Vaccine Priority Group Recommendations*

Tier	Subtier	Population	Rationale
1	A	<ul style="list-style-type: none"> • Vaccine and antiviral manufacturers and others essential to manufacturing and critical support (~40,000) • Medical workers and public health workers who are involved in direct patient contact, other support services essential for direct patient care, and vaccinators (8-9 million) 	<ul style="list-style-type: none"> • Need to assure maximum production of vaccine and antiviral drugs • Healthcare workers are required for quality medical care (studies show outcome is associated with staff-to-patient ratios). There is little surge capacity among healthcare sector personnel to meet increased demand
	B	<ul style="list-style-type: none"> • Persons > 65 years with one or more influenza high-risk conditions, not including essential hypertension (approximately 18.2 million) • Persons six months to 64 years with two or more influenza high-risk conditions, not including essential hypertension (approximately 6.9 million) • Persons six months or older with history of hospitalization for pneumonia or influenza or other influenza high-risk condition in the past year (740,000) 	<ul style="list-style-type: none"> • These groups are at high risk of hospitalization and death. Excludes elderly in nursing homes and those who are immunocompromised and would not likely be protected by vaccination

Tier	Subtier	Population	Rationale
	C	<ul style="list-style-type: none"> • Pregnant women (approximately 3.0 million) • Household contacts of severely immunocompromised persons who would not be vaccinated due to likely poor response to vaccine (1.95 million with transplants, AIDS, and incident cancer x 1.4 household contacts per person = 2.7 million persons) • Household contacts of children <6 month olds (5.0 million) 	<ul style="list-style-type: none"> • In past pandemics and for annual influenza, pregnant women have been at high risk; vaccination will also protect the infant who cannot receive vaccine. • Vaccination of household contacts of immunocompromised and young infants will decrease risk of exposure and infection among those who cannot be directly protected by vaccination
	D	<ul style="list-style-type: none"> • Public health emergency response workers critical to pandemic response (assumed one-third of estimated public health workforce=150,000) • Key government leaders 	<ul style="list-style-type: none"> • Critical to implement pandemic response such as providing vaccinations and managing/monitoring response activities • Preserving decision-making capacity also critical for managing and implementing a response
2	A	<ul style="list-style-type: none"> • Healthy 65 years and older (17.7 million) • Six months to 64 years with one high-risk condition (35.8 million) • 6-23 months old, healthy (5.6 million) 	<ul style="list-style-type: none"> • Groups that are also at increased risk but not as high risk as population in Tier 1B

Tier	Subtier	Population	Rationale
	B	<ul style="list-style-type: none"> • Other public health emergency responders (300,000 = remaining two-thirds of public health work force) • Public safety workers including police, fire, 911 dispatchers, and correctional facility staff (2.99 million) • Utility workers essential for maintenance of power, water, and sewage system functioning (364,000) • Transportation workers transporting fuel, water, food, and medical supplies as well as public ground public transportation (3.8 million) • Telecommunications/IT for essential network operations and maintenance (1.08 million) 	<ul style="list-style-type: none"> • Includes critical infrastructure groups that have impact on maintaining health (e.g., public safety or transportation of medical supplies and food); implementing a pandemic response; and on maintaining societal functions
3		<ul style="list-style-type: none"> • Other key government health decision-makers (estimated number not yet determined) • Funeral directors/embalmers (62,000) 	<ul style="list-style-type: none"> • Other important societal groups for a pandemic response but of lower priority
4		<ul style="list-style-type: none"> • Healthy persons 2-64 years not included in above categories (179.3 million) 	<ul style="list-style-type: none"> • All persons not included in other groups based on objective to vaccinate all those who want protection

*The committee focused its deliberations on the U.S. civilian population. ACIP and NVAC recognize that Department of Defense needs should be highly prioritized. DoD Health Affairs indicates that 1.5 million service members would require immunization to continue current combat operations and preserve critical components of the military medical system. Should the military be called upon to support civil authorities domestically, immunization of a greater proportion of the total force will become necessary. These factors should be considered in the designation of a proportion of the initial vaccine supply for the military.

Fire and emergency response personnel are classified in Tier Two of this prioritization; however, this prioritization is inconsistent with CDC guidance and *pandemic.gov*. According to the *Draft Guidance on Allocating and Targeting Pandemic Influenza*, issued October 17, 2007 and located on the *Pandemicflu.gov* and CDC's websites, EMS and fire personnel are classified as Tier 1 – the highest priority group.¹⁰³ It is uncertain whether this guidance trumps DHHS's Vaccine Prioritization Recommendations. What it does demonstrate is the confusion and complexity associated with vaccine prioritization.

There are too many variables involved with the manufacturing, availability, effectiveness, and distribution of vaccines to consider them a reliable pharmacological intervention that will be available to fire fighters before a pandemic influenza reaches the United States. It is recommended that the fire service assume that effective vaccines will not be available until six months into a pandemic. It is incumbent upon fire department leadership to understand these issues and convey them to their workforce. This should increase the overall WPP because fire fighters will understand that pharmaceutical interventions are not a practical option or solution to preventing the spread or infection of the flu virus. Additionally, fire fighters will also understand that vaccine availability is largely out of the control of their respective fire departments.

Since vaccines will likely not be available until six months after the pandemic, there has been great interest in alternative pharmaceuticals to treat or prevent serious illness resulting from the flu. The idea is to use these drugs to slow the spread of the flu and minimize the health consequences to the individual until an effective vaccine is developed and available. To slow the spread, antivirals would be given proactively to those potentially exposed through prophylactic treatment. To minimize the health consequences, antivirals would be given as a treatment to those who have the influenza virus.

The likelihood of fire fighters using antivirals as prophylaxis is remote, not only for the NCR but throughout the nation. It is currently not a practical option for

¹⁰³ *Draft Guidance on Allocating and Targeting Pandemic Influenza Vaccine* (Washington, DC: Department of Health and Human Services, October 17, 2007), <http://www.pandemicflu.gov/vaccine/prioritization.pdf> (accessed February 15, 2008).

fire departments because the antiviral medication would have to be administered a couple of times a day, potentially throughout the duration of the pandemic. Cost, uncertainty of effectiveness, availability, and the health consequences from long-term use are other limiting factors.

Using antivirals for preventive treatment requires that the medication be used prior to exposure and possibly throughout the duration of the pandemic, when continuous exposure to the flu virus is expected or anticipated, or until a vaccine is developed. In theory this would require an individual to take the medication two times per day for up to a year and a half.¹⁰⁴ The cost¹⁰⁵ and availability of the drug render this option unfeasible.

Currently, there are two types of antivirals used to treat seasonal flu: adamantanes and neuraminidase inhibitors (NIs).¹⁰⁶ The trouble is the H5N1 strain has shown resistance to adamantanes. “Hence, planning efforts for a possible H5N1 pandemic have focused on NIs. Two NIs are available, and both are licensed by the FDA: oseltamivir (Tamiflu®) and zanamivir (Relenza®).”¹⁰⁷ However, it is uncertain whether any antiviral will be effective against the flu virus during a pandemic. In January of 2008, the European Centre for Disease Prevention and Control (ECDC) reported that preliminary results indicate the seasonal flu strain circulating in Europe shows resistance to oseltamivir.¹⁰⁸

Perhaps most importantly, there is limited research on the medical implications and side effects from extended anti-viral use. Administration of the antiviral medication is likely to be safe in the short term; however, on November 13, 2006, the FDA approved a labeling supplement for oseltamivir to include a precaution about neuropsychiatric events.

¹⁰⁴ Telephone Interview with Dr. Reuben Varghese, November 30, 2007.

¹⁰⁵ On February 18, 2008, the cost of a single treatment regimen of Tamiflu, purchased from CVS, was \$103.99.

¹⁰⁶ Lister, *Pandemic Influenza: Domestic Preparedness Efforts*, 30.

¹⁰⁷ Ibid.

¹⁰⁸ Lisa Schnirring, "Europeans Find Tamiflu Resistance in Seasonal Flu Virus," Center for Infectious Disease Research and Policy, <http://www.cidrap.umn.edu/cidrap/content/influenza/general/news/jan2908antiviral.html> (accessed February 17, 2008).

The revision is based on postmarketing reports (mostly from Japan) of self-injury and delirium with the use of Tamiflu in patients with influenza. The reports were primarily among pediatric patients. The relative contribution of the drug to these events is not known. However, people with the flu, particularly children, may be at an increased risk of self-injury and confusion shortly after taking Tamiflu and should be closely monitored for signs of unusual behavior.¹⁰⁹

Additionally, the health consequences of long-term antiviral use have not been sufficiently studied and are not known.

The availability of antivirals also remains uncertain. The goal of the federal government has been to stockpile enough antiviral drugs to treat 25 percent of the population.¹¹⁰ The federal government has stockpiled approximately 81 million doses, the majority of which are available primarily in the SNS; 31 million doses have been made available to individual states.¹¹¹ The states are required to develop plans on the prioritization and distribution of the antivirals.

The distribution of these stockpiles is also problematic. “State and local planners often lack the necessary systems, staffing, and training for distributing stockpiled drugs and supplies. Peak demand usually occurs within the first 24 hours of a disaster, and national stockpiles were designed to supplement local capabilities rather than as a first-response tool.”¹¹² One has to question the probability of antivirals reaching their final destination in sufficient time to be effectively utilized. It is unreasonable to expect that these drugs will be distributed to their respective locations through the SNS and subsequently re-distributed to a particular group or location prior to the influenza striking.

In January of 2007, the National Infrastructure Advisory Council recommended that the federal government “develop an appropriate forum to identify,

¹⁰⁹ "Antiviral Drugs: Summary of Side Effects," Centers for Disease Control and Prevention, <http://www.cdc.gov/flu/protect/antiviral/sideeffects.htm> (accessed February 9, 2008).

¹¹⁰ DHHS, *HHS Pandemic Influenza Plan*, 20.

¹¹¹ DHHS, *Pandemic Planning Update IV*, 9.

¹¹² *Closing the Seams*, 2.

quantify, and qualify potential prioritization and distribution methods and channels.”¹¹³ I participated in a discussion at the Institute of Medicine in December 2007, on the distribution of antiviral medications. The IOM committee on the Implementation of Antiviral Medication Strategies for an Influenza Pandemic was convened to discuss various issues surrounding implementing an antiviral drug program in an influenza pandemic. It is evident from the discussion that prioritization of antiviral medication has not been finalized, nor have the methods of distribution.

The COG Health Officials Committee, a committee comprised of local public health directors within the NCR, recommended against using Urban Area Security Initiative (UASI) funding for stockpiling antivirals. The Health Officials Committee recommended the following issues be considered before the stockpiling and use of Tamiflu: (1) because of the scarcity of Tamiflu, the best and most ethical use will change during the pandemic; (2) treatment of ill patients will always take priority; and (3) it is not efficient to use Tamiflu for prophylaxis. There are other variables that must be considered, including the amount of Tamiflu[®] available in the world, nationally and locally; the effectiveness and availability of other antivirals; the expected time line to having the vaccine available, the number of people ill, how easy it is to transmit the disease; and how deadly the disease is, the status of essential supplies and services; etc.¹¹⁴ This essentially means that unless fire departments or individual jurisdictions purchase antivirals on their own behalf, or federal stockpiles become available, antivirals will not be available to fire department employees for preventive measures.¹¹⁵

Currently, fire department employees believe that antivirals and vaccines will be available. In fact, providing vaccines, antivirals, or medication to fire department employees was considered critical by 65.4 percent of the respondents. Ninety-eight

¹¹³ National Infrastructure Advisory Council, *The Prioritization of Critical Infrastructure for a Pandemic Outbreak in the United States Working Group: Final Report and Recommendations by the Council* (Washington, DC: National Infrastructure Advisory Council, 2007), 41, http://www.dhs.gov/xlibrary/assets/niac/niac-pandemic-wg_v8-011707.pdf (accessed January 12, 2008).

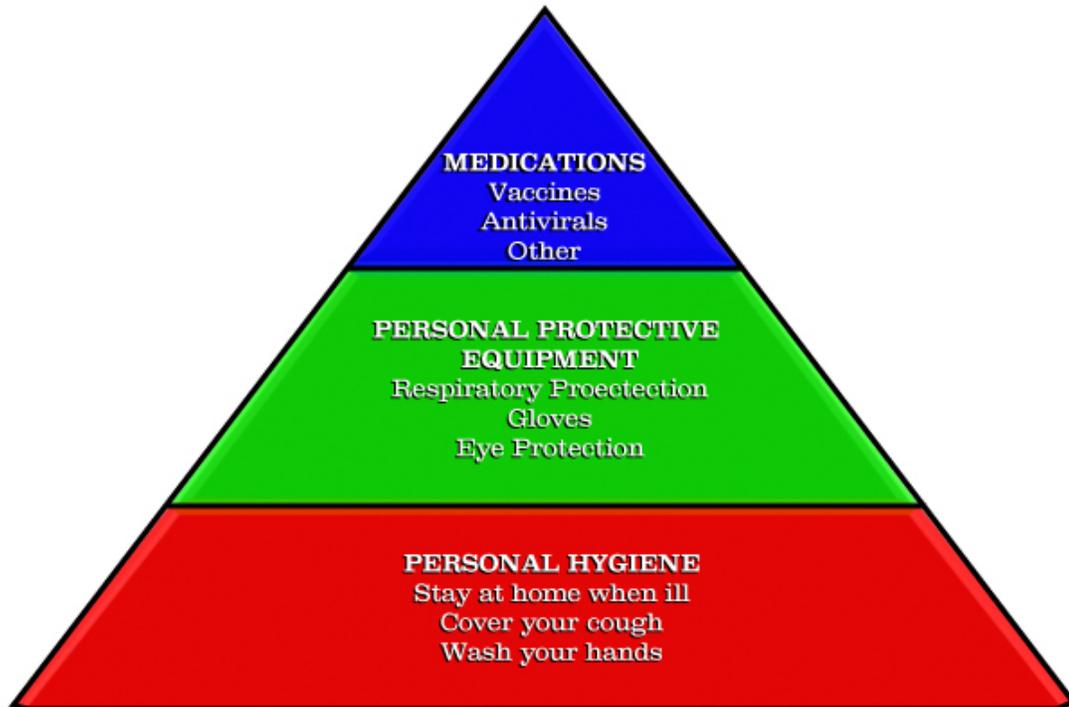
¹¹⁴ Metropolitan Washington Council of Governments Health Officials Committee, “*Recommendations on Stockpiling and Use of Tamiflu.*” Received via email from a member of the Council of Governments, January 13, 2008.

¹¹⁵ The NOVA jurisdiction, through MMRS, purchased a small stockpile of antiviral medication that can be used during an initial pandemic outbreak. First responders may have access to this medication if they were directly involved in this initial outbreak.

percent of the respondents considered it as important, very important, or critical. For these reasons, fire departments must inform their employees that vaccines will likely not be available for up to six months from the start of the pandemic; and antivirals likely will not be used as a prophylaxis measure during a pandemic. Education becomes critical in providing a balanced understanding of the probable interventions available to fire fighters during a pandemic. Through education, fire fighters will understand that vaccines and antiviral interventions are largely outside the control of the fire department, and that their overall availability and effectiveness is suspect. For planning purposes, fire departments should consider these pharmaceutical interventions as unlikely and instead focus on traditional infection control measures.

A layered approach to infection control is the recommended approach for fire departments to adhere to and practice. The following figure (Figure 2) shows the Layers of Infection Control to which fire departments should subscribe. Practicing proper hygiene is the foundation of infectious control. This includes staying home when ill, covering the mouth when coughing, and washing hands. PPE is the middle layer of infection control; having appropriate and sufficient quantities of PPE available is certainly achievable for fire departments and provides enhanced protection for all fire fighters. The last layer of protection, and the most unreliable, are medications. If available, these interventions probably should be used, but they do not render the other layers obsolete. Proper protection from the influenza virus, or any infectious disease, requires all layers be utilized to afford maximum protection.

Figure 2. Layers of Protection Diagram



d. Worker's Compensation

Worker's compensation is an important issue for fire fighters within the NCR with over 76 percent of the respondents stating they would be "not willing" or "not at all willing" to participate in a pandemic if they were not covered for ANY illness received during a pandemic. This means illnesses contracted as a result of patient contact and illnesses resulting from the administration of pharmacological interventions – antivirals and vaccines. A significant reduction in workforce levels will likely result if fire fighters are not comprehensively covered under worker's compensation for any illness contracted during the course of their work.

Currently, fire departments and state legislatures are at an advantage because fire fighters generally assume that they will be covered under worker's compensation for any injury or illness they contract during the course of their employment. Consequently, these issues tend only to become concerns once fire fighters understand that they will not be covered. Because a pandemic has not yet occurred and

fire fighters have not become ill or died, they are likely to participate in larger numbers than if they knew prior to a pandemic occurring that they would not be covered. States and fire departments do not have an obligation to inform their employees of the extent of their worker's compensation coverage; however, should this information become available, and should workers *not* be covered, it will likely have a considerable impact on the WPP.

Fire fighters need to be protected, under the law, for any illness, death, or disease that can be directly linked or presumed to result from their employment. It is imperative that this protection include illnesses, deaths, and diseases that result, either directly or indirectly, from the flu virus or antiviral and vaccine administration. Comprehensive protection is necessary because the health consequences of pandemic influenza and antiviral and vaccine interventions are not completely known and tested. "The HHS final plan notes that if a pandemic were to spread swiftly, pandemic vaccine may be pressed into service before standard safety and efficacy tests could be completed. Such unlicensed vaccine could be used under FDA's Investigational New Drug provisions."¹¹⁶

Perhaps most importantly, fire fighters need to be covered under worker's compensation for illnesses contracted due to exposure to flu victims. Fire fighters will have increased exposure to flu victims – and an increased chance of contracting the flu virus – due to the increased number of flu patients. The health consequences resulting from such exposure are unknown, but are likely to be severe, as no one will have prior immunity to the virus. There is a very real likelihood that many fire fighters will become ill and die after contracting the virus.

Should a pandemic occur today, Virginia fire fighters would most likely be covered under worker's compensation if they were to contract the flu virus. Further analysis needs to be conducted on the laws in Maryland and the District of Columbia to determine the extent of coverage afforded fire fighters in these localities.

The Commonwealth of Virginia already recognizes that fire fighters are at greater risk of contracting certain diseases and sets parameters within the law to classify

¹¹⁶ Lister, *Pandemic Influenza: Domestic Preparedness Efforts*, 27.

such exposure as “occupational disease.” “The term ‘occupational disease’ means a disease arising out of and in the course of employment, but not an ordinary disease of life to which the general public is exposed outside of the employment.”¹¹⁷ Virginia also identifies occupational disease whereby “the death... or any health condition or impairment...resulting in total or partial disability shall be presumed to be occupational disease, suffered in the line of duty, that are covered by this title unless such presumption is overcome by a preponderance of the evidence to the contrary.”¹¹⁸ In essence, certain diseases contracted by fire fighters, who meet the minimum time requirement and have documented exposures, are considered to have been contracted through and due to their employment and are covered by worker’s compensation. In Virginia, respiratory diseases, hypertension or heart disease, leukemia or pancreatic, prostate, rectal, throat, ovarian or breast cancer fall under presumptive diseases.¹¹⁹

Currently, pandemic influenza is not covered as a presumptive illness under Virginia law. If Virginia fire fighters were to become stricken with the pandemic influenza they would have to prove that they contracted the virus through the course of their employment. Technically, this requires the fire fighter to prove that, at a particular time and place during their employment, they contracted the virus. Obviously this would be impossible, as the virus will be ubiquitous and can be spread from one person to the next before symptoms occur.¹²⁰ Fire fighters who contract the flu virus will not be able to unequivocally prove where and when they contracted the virus, particularly when family members and co-workers are ill. It is for this reason that pandemic flu should be classified under law as a presumptive disease.

¹¹⁷ *Occupational Disease” Defined*, Public Law 65.2-400, <http://leg1.state.va.us/cgi-bin/legp504.exe?000+cod+65.2-400> (accessed December 7, 2007).

¹¹⁸ *Presumption as to Death Or Disability from Respiratory Disease, Hypertension Or Heart Disease, Cancer*, Public Law 65.2-402, <http://leg1.state.va.us/cgi-bin/legp504.exe?000+cod+65.2-402> (accessed December 7, 2007).

¹¹⁹ *Ibid.*

¹²⁰ Tara O’Toole, “*Protecting the Homeland: Fighting Pandemic Flu from the Front Lines*,” Testimony before the House Committee on Homeland Security, Subcommittee on Emergency Preparedness, Science and Technology, *February 8, 2006*, 5, http://www.upmc-biosecurity.org/website/resources/hearings/content/Hearings_2006/20060208protecthtmlnd.pdf (accessed November 13, 2006).

Classifying pandemic influenza as a presumptive disease is a cost-neutral proposition for Virginia. Currently, the Virginia Professional Fire Fighters Union is attempting to have pandemic influenza covered as a presumptive disease through House Bill 532 and Senate Bill 500. For every bill submitted, a fiscal impact estimate is conducted. The fiscal implication for House Bill 532 states:

The legislation may result in an increase in the number of claims filed with the Virginia Workers' Compensation Commission on behalf of either the claimant or employer when there has been a work-related diagnosis of an occupational disease, which would require the declaration of a state of emergency by the Governor. The potential increase in the number of claims filed under the Virginia Workers' Compensation Act cannot be determined. The legislation also expands the definition of infectious disease presumption, which would limit the number of claims litigated.¹²¹

Essentially, costs will only be incurred in the event of a pandemic in which the governor has declared a state of emergency.

The proposed bills only cover pandemic influenza. There are no provisions for coverage for illnesses resulting from the administration of antivirals and vaccines. The Virginia Department of Health *Pandemic Influenza Plan* states that "VDH will review legal issues such as worker's compensation laws to determine how they apply to healthcare workers and other essential workers who take antivirals for prophylaxis."¹²² It is extremely important that these issues are addressed well in advance of a pandemic and the decisions conveyed to fire fighters throughout the state.

Worker's compensation coverage for vaccine administration may be a little more challenging, as vaccines are federally controlled but distributed through the states. Regardless, either states or the federal government should protect fire fighters when mandating or recommending vaccines. Currently, certain vaccines are covered under the National Vaccine Injury Compensation Program (VICP)... Congress enacted the program in 1986 as a no-fault alternative to the tort system for resolving personal injury claims resulting from adverse reactions to recommended childhood vaccines...

¹²¹ Virginia Department of Planning and Budget, *2008 Fiscal Impact Statement for HB 532 Infectious Disease Presumption: Emergency Declaration by Governor*, January 15, 2008, <http://leg1.state.va.us/cgi-bin/legp504.exe?081+oth+HB532F122+PDF> (accessed February 3, 2008).

¹²² Virginia Department of Health, *Draft Virginia Department of Health Emergency Operations Plan - Pandemic Influenza Plan*, Supplement 7 (Revised March 2006), 7.

Congress added *trivalent* flu vaccine (the annual vaccine that contains three strains) to the VICP list in the American Jobs Creation Act of 2004 (P.L.108-357). Since the law explicitly covered trivalent vaccine, *monovalent* (or single-strain) pandemic vaccines would not be covered under VICP.¹²³ Obviously the federal government has recognized the importance of affording protection to those who have taken certain vaccines. The government should consider affording this protection to fire fighters in the event of a pandemic.

Following the events of September 11, 2001, politicians and elected officials praised first responders and their mission and position within the communities they serve. These officials emphasized the importance of first responders' collective well-being by providing for and doing whatever was necessary to protect them. Many of these politicians understood the new roles and responsibilities fire departments would now face – having to respond and mitigate a variety of new possibilities, both manmade and natural. The *National Preparedness Guidelines* listed the fifteen National Planning Scenarios. These scenarios “depict a diverse set of high-consequence threat scenarios of both potential terrorist attacks and natural disasters.”¹²⁴ Legislative authorities are aware of the potential catastrophic emergencies outlined in the National Preparedness Guidelines. These leaders have distributed billions of dollars to ensure fire fighters are better equipped and prepared for these events. However, not enough has been done in the legislative arena to protect fire fighters and their families from illness contracted in the line of duty. As New Jersey State Senator Stephen Sweeney said upon introducing emergency worker compensation legislation in December, 2007: “But these brave men and women, they don’t hesitate, they’re there looking out for us, we have to look out for them.”¹²⁵

e. Personal Protective Equipment

Fire departments have an obligation to provide adequate personal protective equipment (PPE) for their employees. If fire departments have accepted a certain responsibility or adopted a particular mission, they have the responsibility to

¹²³ Lister, *Pandemic Influenza: Domestic Preparedness Efforts*, 27-28.

¹²⁴ U. S. Department of Homeland Security, *National Preparedness Guidelines* (Washington, DC: Department of Homeland Security, September 2007), iii, http://www.dhs.gov/xlibrary/assets/National_Preparedness_Guidelines.pdf (accessed January 12, 2008).

¹²⁵ Trish G. Graber, "Sweeney Pushes Disaster Workers' Comp," *Gloucester County Times*, December 4, 2007, www.nj.com (accessed December 7, 2007).

ensure their members are adequately trained, equipped, and protected. This has occurred throughout the fire service on several occasions within the last thirty years when the fire service expanded its mission to include emergency medical services, hazardous materials mitigation, and technical rescue. As this mission has expanded, fire departments have had to provide the necessary training and equipment to the fire fighters responsible for fulfilling these missions.

If a particular fire department is responsible for providing wild-land fire protection to the community it serves, and the threat is significant, there is a reasonable expectation that the fire department has the responsibility to provide adequate wild-land PPE to its members. The same can be said for any potential scenario, situation, or circumstance for which there is a reasonably significant threat. This argument can also be applied to response to a pandemic, epidemic, or other biological event.

Fire departments have a responsibility to provide adequate and sufficient PPE to their members for a response to a pandemic. In fact, providing adequate and sufficient PPE is viewed as critically important by 64.9 percent of the respondents. It is viewed as important, very important, or critical by 98.5 percent. Fire departments providing adequate and sufficient PPE to members is a significant factor in fire department employees' willingness to participate in a pandemic. If adequate and sufficient quantities of PPE are not provided and made available to employees, fire departments should expect a significant reduction in participation. Adequate protection refers to recommended PPE for which there is sufficient evidence that the proper utilization of such equipment will reduce the likelihood of infection due to exposure of infected patients. "The findings of Shapira et al. support this idea that provision of appropriate PPE can serve to facilitate HCWs willingness to report to duty during a WMD event."¹²⁶

The challenge for fire department leadership is in providing sufficient quantities of PPE to its employees during a pandemic. "During the SARS outbreak, a single Ontario teaching hospital used 18,000 N95 masks per day."¹²⁷ Fire departments

¹²⁶ Qureshi, *Health Care Workers' Ability*, 387.

¹²⁷ O'Toole, *Protecting the Homeland*, 3.

must determine not only the quantity of PPE, but what types to stockpile for a pandemic. In April of 2007, DHS issued *Pandemic Influenza Best Practices and Model Protocols*, which recommends that sufficient PPE be stockpiled for first responders in advance of a pandemic. Additionally, it recommends the following equipment and supplies be stockpiled prior to a pandemic outbreak:

- Suggested PPE/response items include:
 - N-95 masks for first responders¹²⁸
 - Surgical masks for responders without direct patient care responsibilities.
 - Disposable gloves
 - Alcohol-based hand cleanser/disinfectant
 - Eye shields/safety glasses
 - Disposable gowns
 - Compressed oxygen
 - Prophylaxis (two weeks dosing per person)
- Suggested mission critical items include:
 - Food and water
 - Cleaning/disinfecting supplies
 - Fuel
 - Family or child care considerations ¹²⁹

Several fire departments, both within the NCR and nationally, have begun to address this issue. The *Draft Seattle Fire Department Plan* states in its planning principles section that “parts of the plan depend upon action taken prior to an event. For instance, the use of full PPE during an event depends on acquiring sufficient supplies of

¹²⁸ The IAFF recommend using the P-100 respirator. The IAFF’s P-100 filter efficiency recommendation is consistent with NIOSH recommendations for emergency response to biological agent incidents. <http://www.cdc.gov/niosh/unp-intrecppe.htm>. Additionally the IAFF recommendation is consistent with federal OSHA regulations that state “where workers are exposed to a hazard that would require the use of a respirator with HEPA filtration, the appropriate class of respirator under the 42 CFR Part 84 certification is the Type 100 (N-100, R-100, or P-100).” The IAFF recommendation is also consistent with the specifications contained in the World Health Organization’s *Hospital Infection Control Guidance for SARS* (<http://www.who.int/csr/sars/infectioncontrol/en>). IAFF website, <http://www.iaff.org> (accessed February 9, 2008).

¹²⁹ U.S. Department of Homeland Security, *Pandemic Influenza: Best Practices and Model Protocols* (Washington, DC: Department of Homeland Security, April 2007), 13, http://www.usfa.dhs.gov/downloads/pdf/PI_Best_Practices_Model.pdf (accessed January 12, 2008).

PPE beforehand to account for event-related supply limitations.”¹³⁰ Further in the plan the department recognizes its responsibility to protect its members stating:

The Seattle Fire Department is committed to “maximizing protection against communicable disease for (its) members” as stated in Policy 6005. The proper use of Personal Protective Equipment (PPE) minimizes exposure to infectious disease. Work practices and Dispatch 07-06 dictate: “*Gloves and Eye Protection will be worn for all patient contacts.*” Gowns and fit-tested masks are worn when body fluid splash protection is required or an infectious situation is known or suspected.¹³¹

To ensure adequate protection is available during a pandemic, the Seattle Fire Department has developed cost estimates based on planning assumptions which provide PPE for all employees based on increased EMS responses over a twelve-week period. The following table summarizes the cost estimate.

Table 14. Seattle Fire Department PPE Cost Estimate

Personal Protective Equipment	\$975,000
Waterless Hand Sanitation	\$ 15,000
Decontamination Equipment	\$150,000
Emergency Rations	\$100,000
Information Technology	\$ 50,000
Training	\$ 50,000
Total	\$1,340,000

Fire department leaders recognize that the rank and file expects the department to provide sufficient PPE. The survey of NCR fire fighters suggest they may not. Although a good two-thirds (63.2%) of the fire department employees said that they were “confident” or “very confident” that sufficient PPE would be provided by or

¹³⁰ *The Seattle Fire Department Pandemic/Infectious Disease Plan*, 8.

¹³¹ *Ibid.*, 10.

through their respective fire departments, a significant minority questions their department's preparedness. Fire fighters expect that their departments will provide adequate and sufficient quantities of PPE during a pandemic and departments must realize that to ensure sufficient PPE is available will require that this PPE is stockpiled.

D. SUMMARY

Unquestionably, the preparedness and coordination required before and during a pandemic are enormous and often overwhelming. With limited resources and personnel, where do fire departments begin? As suggested throughout this chapter, preparation must begin with an emphasis on the core issues affecting fire fighters' ability and willingness to participate in a pandemic. The availability of fire fighters is the foundation for determining the capacity of fire departments, particularly during a pandemic. Initially fire departments should assess their particular situations with regard to each of these core issues by asking: Do we have a family support network? Are our fire fighters covered under worker's compensation? Have we provided any pandemic training or education? Have we stockpiled adequate personal protective equipment? This assessment will assist in narrowing the departmental focus by identifying areas of need. Fire departments can then prioritize focus areas.

Fire departments have a responsibility not only to the citizens they protect and serve, but to their fire fighters who do the protecting and serving. A pandemic will be unlike any previous emergency or event and the unique circumstances of participating in an "unknown" emergency will significantly impact fire fighters. However, through proactively addressing these issues, fire departments can demonstrate their concern for their employees while helping to ensure that services can and will be provided to their communities once the pandemic occurs.

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VI. SOLUTION

This study was initiated to determine the concerns and issues fire fighters have with participating in a pandemic. Collectively, the twelve NCR fire departments were surveyed because a pandemic will likely impact the region simultaneously and equally. Understanding the potential consequences of a pandemic on a regional scale was viewed as critically important to illustrate the potential impact on fire department operations. Specifically, this study identified the variables impacting fire fighters' ability and willingness to participate in a pandemic, in an effort to establish a workforce participation percentage (WPP). The WPP, in turn, can be utilized by fire departments as a planning assumption for development of pandemic response plans.

A number of variables exist which will affect fire fighter participation rates. The core issues affecting fire fighters' *willingness* to participate in a pandemic include: the safety of and concern for family; a sufficient and adequate supply of PPE; fire department plans; worker's compensation coverage, and the availability of pharmaceutical interventions. The core issues affecting fire fighters' *ability* to participate in a pandemic include: the safety of and concern for family and childcare. It is critical that fire departments increase their understanding and awareness of these issues because potentially departments could be faced with workforces reduced by 30-70% over and above the clinical attack rate.

Currently, it is evident that the majority of fire departments within the NCR have not allocated sufficient time, resources, or planning for this potentially catastrophic event based on the lack of training and education, personal protective equipment stockpiling, and fire department plans. Perhaps fire departments don't appreciate the gravity of the situation or perhaps they do, but do not have the resources to address these issues. Regardless of particulars, fire departments must understand that there are many variables which will impact fire fighters' ability and willingness to participate in a pandemic. Departments can choose to address these issues and positively influence fire fighter participation rates or they can choose not to address these issues and hope that a pandemic does not occur.

The variables associated with fire fighters' ability and willingness to work during a pandemic are extensive. Effectively addressing these variables requires a multi-prong approach because, ultimately, a fire fighter's decision is situationally dependent. There is not a single issue or concern that – if effectively addressed by fire departments – will ensure participation of all fire fighters. Rather, there are multiple variables which should be addressed simultaneously, so as to positively affect the greatest range of fire fighters.

It is for this reason that leadership becomes the primary solution. Leaders who appreciate the magnitude of the situation and the criticality of these particular issues can positively influence the WPP and promote pandemic preparedness. If leaders take seriously the findings and viewpoints of the fire fighters in the NCR, supported by studies of other professional groups, they face a major challenge in planning effectively for a pandemic. Strong leadership is required to effectively coordinate the complexities a pandemic does and will generate.

Leadership is the key to all aspects of pandemic awareness, preparedness, response, and recovery. Leadership is critical because an effective pandemic response must start well in advance of a pandemic striking. This requires leadership – to have vision, understand and appreciate the multitude of issues and factors involved, comprehend the consequences, unify and collaborate with the stakeholders, and see the big picture. For a pandemic will not be a battle; it will be a war. A pandemic will affect every sector and segment of society, from schools to healthcare providers, from children to the elderly. The complexity of a pandemic and the variables associated with fire fighter participation rates require leaders to promote leadership throughout their organizations. Leaders at all levels and in all areas will be needed to coordinate, prepare, plan, and respond to minimize the consequence of a pandemic. Leaders can only effectively prepare for a pandemic by encouraging leadership throughout their organizations.

Fire department leaders must take a dual approach, by addressing the issues and concerns fire fighters have regarding participation in a pandemic while simultaneously developing or enhancing regional fire department preparedness. Not only will a pandemic affect the region equally and simultaneously, but many of the concerns fire fighters have can and should be approach on a regional level. For example, worker's compensation

laws are developed on the state level, but can be influenced through regional collaboration between departments and or unions through lobbying the state legislature. Departmental leadership should encourage this cross-jurisdictional partnership, as greater success is more likely when coalitions combine. Likewise, the stockpiling of PPE could be accomplished through regional cooperation; fire departments can apply for federal grants through the COG to stockpile and house required PPE. Again, greater achievements can be obtained when forces combine.

Perhaps most importantly, the development of a fire department regional response plan should be pursued. The development of a regional plan would help to ensure that departments are consistent in their pandemic preparedness and response efforts across the entire region. Although mutual aid is extended everyday within the NCR, it is sure to become an issue during a pandemic, particularly if one department is less prepared than the next. Development of a regional response plan can address this issue, prior to it becoming an issue during a pandemic. The complexity a pandemic will create will be overwhelming. Fire departments should strive to address many of these concerns and potential problems now, before a pandemic strikes. The development of a regional fire department plan is the perfect venue to discuss and address these issues.

Are the NCR fire departments prepared and ready for a pandemic? To date, has sufficient cross-discipline, agency, department, and jurisdictional dialogue and planning been accomplished to best prepare the NCR for the catastrophic consequences of a pandemic? The answer is no. There are several reasons why sufficient progress has not been made within the NCR: lack of understanding or acceptance of the threat, perception of a limited scope of pandemic planning, the silo effect on jurisdictions, and ineffective leadership.

A pandemic is a real threat and is certain to occur at some point in time. However, pandemic preparedness efforts have not been given the same weight as other fire department imperatives. Perhaps, because only three pandemics occurred last century (with the last occurring nearly forty years ago), the threat is not truly considered high. Regardless of the reason, one would think that an imminent event would garner greater attention, particularly because of the potential consequences.

The seemingly narrow focus of a pandemic plan may lessen the appeal for fire service and governmental leadership. To dedicate a significant amount of time, money, and effort to developing a plan for a relatively remote, albeit distinct, event that has limited applications within the fire service, is unpractical. However, a pandemic plan can be utilized in a variety of different incidents, emergencies, or scenarios. A pandemic plan could be utilized for any infectious disease or epidemic (staph infection, SARS, AIDs); it could be utilized for any situation which may cause a reduction in the workforce; or any significant incident impacting the region. According to the WHO, “since the 1970s... new threats have been identified at an ‘unprecedented rate’ of one or more every year, meaning that nearly 40 diseases exist today which were unknown just over a generation ago.”¹³² Additionally, “disasters are increasingly common. Worldwide, a major disaster occurs almost daily. In the United States, a disaster has occurred, on average, every week for the past 10 years, according to the Federal Emergency Management Agency. Every region of the country is at risk for some type of disaster.”¹³³ Planning for a pandemic could only enhance preparedness and response capabilities for any event, whether it be an epidemic, terrorist attack, or regional natural disaster. It is unfathomable, considering the potential consequences that these events pose, that the threat is not taken more seriously by our local governmental leaders. “It would be extremely naïve and complacent to assume that there will not be another disease like AIDS, another Ebola, or another SARS, sooner or later.”¹³⁴

Perhaps a reason that more preparedness has not occurred within the NCR is the silo effect which occurs at all government levels. The silo effect of distinct cultures, budgets, and narrowly focused career ascendancy compels government agencies toward self-protectiveness, insularity, and allegiance to their own agency-based advocacy and independence. There are also deeply ingrained traditions of rivalry and palpable struggles for control, especially among organizations with similar or overlapping missions and

¹³² Don Philpott, "Pandemic Update," *Homeland Defense Journal* 5, no. 10 (October, 2007), 16.

¹³³ *Closing the Seams*, 6.

¹³⁴ Philpott, "Pandemic Update," 16.

scope of responsibility (Susskind & Cruikshank, 1987).¹³⁵ The silo effect equates to self protection. Fundamentally, jurisdictions and agencies, on all governmental levels, are concerned – first and foremost – with their individual wants, needs, and desires. This condition does not create an atmosphere conducive to any type of collaboration or planning on a grand scale.

A fundamental change is necessary whereby a more holistic, regional approach is encouraged by jurisdictional leadership and management. Counties, cities, towns, and communities must begin to think about how their decisions affect and impact surrounding jurisdictions. Local governments, particularly in the NCR, must begin to see themselves not as individual jurisdictions, but as a “mega-community.” “A mega-community is a public sphere in which organizations – public, private, and civil – join together to address a compelling issue of mutual importance.”¹³⁶ The concept of a mega-community can occur on different scales and for different purposes; whether it is battling global warming or traffic congestion, the issue is so complex that no single agency can unilaterally address the issue. Local government leaders must themselves lead this change in focus through their actions and vision.

Particularly in the case of a pandemic, the NCR should view itself as a literal mega-community. Instead of being individual jurisdictions, we need to plan and prepare as though we are one. Unquestionably, this is a challenging and lofty proposal, considering the multitude of governmental departments, jurisdictions, agencies, and interests at hand. None the less, such an approach is necessary to ensure effective preparedness. To do this, however, requires a particular type of leader.

Although there are many strong fire service leaders within the NCR, a focused shift of leadership perspective must be encouraged and promoted. If we are to consider the NCR as one community, it will require a new type of leader.

¹³⁵ Leonard J. Marcus, Barry A. Dorn and Joseph M. Henderson, "Meta-Leadership and National Emergency Preparedness: A Model to Build Government Connectivity," *Biosecurity and Bioterrorism: Biodefense Strategy, Practice, and Science* 4, no. 2 (2006), 42, <http://www.liebertonline.com/> (accessed January 12, 2008).

¹³⁶ Douglas Himberger, David Sulek and Steven Krill, Jr., "When there is no Cavalry," *Strategy+business*, no. 48 (Autumn, 2007), 3, http://www.strategy-business.com/media/file/sb48_07309.pdf (accessed January 12, 2008).

‘Meta-leadership’ refers to guidance, direction, and momentum across organizational lines that develops into a shared course of action and commonality of purpose among people and agencies that are doing what appears to be very different work. Achieving quick and effective national preparedness requires an array of government and non-government organizations to coordinate their planning, collaboration, and response to anticipated terrorists acts (Carter, 2003). Leaders who are able to influence and accomplish such collaboration of efforts across organizations—multi-jurisdictional, multi-agency, and public-private—are termed “meta-leaders.¹³⁷ Meta-leadership needs to be encouraged throughout the NCR, not only because the impact of a pandemic will be unilateral, but because of the enormity of agencies and departments at the local, state, and federal levels. An effective response to a pandemic requires a collaborative process between and among these stakeholders to produce, develop, and implement an effective plan. Preparedness is the key to an effective response and meta-leaders are needed to facilitate and ensure that this is accomplished.

The NCR fire departments have done a good job of collaboration on many levels; however, for pandemic preparedness, this progress has been slow and the urgency seems to have diminished. “The country does not at present have the luxury to patiently wait while agencies take their time to adjust operating procedures and protocols: progress in achieving a protected homeland needs to be quicker and deeper than what would occur in the normal course of governmental change and response.”¹³⁸ If these departments, agencies, and business continue to operate within their respective “silos,” coordination and effective responses will never occur. Fire department leadership must realize that time may not be on our side. The concept of meta-leadership in a mega-community should be utilized to address the concerns and issues fire fighters have with participating in a pandemic, all the while promoting effective pandemic preparedness through regional collaboration.

¹³⁷ Marcus, Dorn and Henderson, *Meta-Leadership and National Emergency Preparedness*, 44.

¹³⁸ *Ibid.*, 43.

LIST OF REFERENCES

- American Public Health Association. *APHA's Prescription for Pandemic Flu*. Washington, DC: American Public Health Association, 2007. <http://www.apha.org/NR/rdonlyres/D5017DB9-F400-4399-A656-939C4C8DF259/0/FLUpolicycomplete.pdf> Accessed March 18, 2007.
- Balicer, Ran D., Saad B. Omar, Daniel J. Barnett, and George S. Everly, Jr. "Local Public Health Workers' Perceptions Toward Responding to an Influenza Pandemic." *BMC Public Health* 6 (2006): 99-106. http://www.hopkins-cespar.org/downloads/publications/Local_Pub_Health.pdf Accessed January 30, 2008.
- Barry, John M. *The Great Influenza: The Epic Story of the Deadliest Plague in History*. New York, NY: Penguin Group, 2004.
- Centers for Disease Control. *Antiviral Drugs: Summary of Side Effects*. Atlanta, GA: Centers for Disease Control and Prevention, 2007. <http://www.cdc.gov/flu/protect/antiviral/sideeffects.htm> Accessed February 9, 2008.
- Center for the Study of Traumatic Stress. *Mental Health and Behavioral Guidelines for Response to Pandemic Flu Outbreak*. Bethesda MD: Center for the Study of Traumatic Stress, n.d. <http://www.usuhs.mil/psy/CSTSPandemicAvianInfluenza.pdf> Accessed January 12, 2008.
- Code of Virginia. "*Occupational Disease*" Defined. [Title 65.2]. Vol. 65.2-400a, <http://leg1.state.va.us/cgi-bin/legp504.exe?000+cod+65.2-400> Accessed December 7, 2007.
- . *Presumption as to Death Or Disability from Respiratory Disease, Hypertension Or Heart Disease, Cancer* [Title 65.2]. Vol. 65.2-402b. <http://leg1.state.va.us/cgi-bin/legp504.exe?000+cod+65.2-402> Accessed December 7, 2007.
- Congressional Budget Office. *A Potential Influenza Pandemic: Possible Macroeconomic Effects and Policy Issues*. Washington, DC: Congressional Budget Office, 2006. <http://www.cbo.gov/ftpdocs/69xx/doc6946/12-08-BirdFlu.pdf> Accessed January 30, 2008.
- Council of Governments. *Council of Governments Fire UASI Funded Projects*. Powerpoint Presentation, September 7, 2007.
- Council of Governments Health Officials Committee. "*Recommendations on Stockpiling and Use of Tamiflu*." Received via email from a member of the Council of Governments, January 13, 2008.

- Demme, Nancy. *Government Expectations and the Role of Law Enforcement in a Biological Incident*. Monterey, CA: Naval Postgraduate School, March 2007. <http://bosun.nps.edu/uhtbin/hyperion-image.exe/07Mar%5FDemme.pdf> Accessed January 30, 2008.
- "Fire Department overall Run Profile." *Topical Fire Report Series* 7, no. 4 (December, 2007): 1-8. <http://www.usfa.dhs.gov/downloads/pdf/tfrs/v7i4.pdf> Accessed February 9, 2008.
- Graber, Trish G. "Sweeney Pushes Disaster Workers' Comp." *Gloucester County Times*, December 4, 2007. www.nj.com Accessed December 7, 2007.
- Himberger, Douglas, David Sulek, and Steven Krill Jr. "When there is no Cavalry." *Strategy+business* no. 48 (Autumn 2007): 1-10. http://www.strategy-business.com/media/file/sb48_07309.pdf Accessed January 12, 2008.
- Lanzilotti, Salvatore S., Dan Galanis, Nora Leoni, and Blaire Craig. "Hawaii Medical Professionals Assessment: A Study of the Availability of Doctors and Nurses to Staff Non-Hospital, Field Medical Facilities of Mass Casualty Incidents Resulting from the use of Weapons of Mass Destruction and the Level of Knowledge and Skills of these Medical Professionals as Related to the Treatment of Victims of such Incidents." *Hawaii Medical Journal* 61, no. 8 (August, 2002): 162-173.
- Last, John M. and J. H. Abramson. *A Dictionary of Epidemiology*, 3rd ed. Edited by J. H. Abramson, Gary Friedman, Miquel Porta, Robert A. Spasoff and Michel Thuriak. New York: Oxford University Press, 1995.
- Leon, Gloria R. "Overview of the Psychosocial Impact of Disasters." *Prehospital and Disaster Medicine* 19, no. 1 (January-March, 2004): 4-9 <http://pdm.medicine.wisc.edu/19-1%20pdfs/Leon%20Overview.pdf> Accessed January 8, 2008.
- Lister, Sarah A. *Pandemic Influenza: Domestic Preparedness Efforts*. Washington, DC: Congressional Research Service, November 10, 2005.
- Marcus, Leonard J., Barry A. Dorn, and Joseph M. Henderson. "Meta-Leadership and National Emergency Preparedness: A Model to Build Government Connectivity." *Biosecurity and Bioterrorism: Biodefense Strategy, Practice, and Science* 4, no. 2 (2006): 128-134. <http://www.liebertonline.com/> Accessed January 12, 2008.
- Metropolitan Washington Council of Governments. *Metropolitan Washington Council of Governments: Serving the National Capital Region: About COG*. <http://www.mwcog.org/about/> Accessed October 5, 2007.
- National Commission on Terrorist Attacks Upon the United States. *The 9/11 Commission Report: Final Report of the National Commission on Terrorist Attacks upon the United States*. New York, NY: W.W. Norton & Company, Inc., 2004.

- National Infrastructure Advisory Council. *The Prioritization of Critical Infrastructure for a Pandemic Outbreak in the United States Working Group: Final Report and Recommendations by the Council*. Washington, DC: National Infrastructure Advisory Council, 2007. http://www.dhs.gov/xlibrary/assets/niac/niac-pandemic-wg_v8-011707.pdf Accessed January 12, 2008.
- O'Toole, Tara, "Protecting the Homeland: Fighting Pandemic Flu from the Front Lines," Testimony before the House Committee on Homeland Security, Subcommittee on Emergency Preparedness, Science and Technology, February 8, 2006 p.5 http://www.upmcbiosecurity.org/website/resources/hearings/content/Hearings_2006/20060208protecthtmlnd.pdf Accessed November 13, 2006.
- Pangi, Robyn. "After the Attack: The Psychological Consequences of Terrorism." *Perspectives on Preparedness* no. 7 (August 2002): 1-21. http://www.mipt.org/pdf/ksg_popno7.pdf Accessed January 12, 2008.
- Petterson, John S. "Perception vs. Reality of Radiological Impact: The Goiania Model." *Nuclear News* 31, no. 14 (November, 1988): 84-90.
- Philpott, Don. "Pandemic Update." *Homeland Defense Journal* 5, no. 10 (October, 2007): 14-16.
- PriceWaterhouseCoopers. *Closing the Seams: Developing an Integrated Approach to Health System Disaster Preparedness*. PriceWaterhouseCoopers, 2007. <http://www.pwc.com/extweb/pwcpublishings.nsf/docid/9CEC1E9BD3BCAC478525737F005C80A9> Accessed November 25, 2007.
- Qureshi, Gershon K. *Health Care Workers' Ability and Willingness to Report to Duty during Catastrophic Disasters*. New York, NY: Oxford University Press, 2005.
- Qureshi, Gershon K., Jacqueline Merrill, Robyn Gershon, and Ayxa Calero-Breckheimer. "Emergency Preparedness Training for Public Health Nurses: A Pilot Study." *Journal of Urban Health* 79, no. 3 (September 2002): 413-416.
- Reynolds, Mary, Bach Anh, Vu Thu, Joel Montgomery, Daniel Bausch, Jina Shah, Susan Maloney et al. "Factors Associated with Nosocomial SARS-CoV Transmission among Healthcare Workers in Hanoi, Vietnam, 2003." *BMC Public Health* 6, (August 14, 2006): 1-9 <http://www.biomedcentral.com/content/pdf/1471-2458-6-207.pdf> Accessed February 6, 2008.
- Sapsin, Jason W., Lawrence O. Gostin, Jon S. Vernick, Scott Burris, and Stephen P. Teret. "SARS and International Legal Preparedness." *Temple Law Review* 77, (2004): 155-174. <http://www.temple.edu/iilpp/Docs/Sapsin,%20Final%20to%20Publisher,%2012-08-04.pdf> Accessed January 12, 2008.

- Schechter, Shelly. *Medical Reserve Corps Volunteers' Ability and Willingness to Report to Work for the Department of Health during Catastrophic Disasters*. Monterey, CA: Naval Postgraduate School, March 2007. <http://bosun.nps.edu/uhtbin/hyperion-image.exe/07Mar%5FSchechter.pdf> Accessed January 30, 2008.
- Schnirring, Lisa. "Europeans Find Tamiflu Resistance in Seasonal Flu Virus." Minneapolis, MN: University of Minnesota, Center for Infectious Disease Research and Policy, 2008. <http://www.cidrap.umn.edu/cidrap/content/influenza/general/news/jan2908antiviral.html> Accessed February 17, 2008.
- Schoch-Spana, Monica. "Psychosocial Consequences of a Catastrophic Outbreak of Disease: Lessons from the 1918 Pandemic Influenza." In *Bioterrorism: Psychological and Public Health Interventions*, edited by Robert Ursano, Ann Norwood and Carol Fullerton. New York, NY: Cambridge University Press, 2004.
- Seattle Fire Department. *The Seattle Fire Department Pandemic/Infectious Disease Plan*. Seattle, WA: Seattle Fire Department, April 20, 2007.
- Shapira, Yaron, Baruch Marganitt, Ilan Roziner, Tzipora Shochet, Yael Bar, and Joshua Shemer. "Willingness of Staff to Report to their Hospital Duties Following an Unconventional Missile Attack: A State Wide Survey." *Israel Medical Science Journal* 27 (1991): 704-711.
- Titan Systems Corporation. *Arlington County: After-Action Report on the Response to the September 11 Terrorist Attack on the Pentagon*. Arlington, VA: The County, 2002. <http://www.arlingtonva.us/departments/Fire/edu/about/FireEduAboutAfterReport.aspx> Accessed January 30, 2008.
- U. S. Congress, House Committee on Health, Education, Labor, and Pensions, *Twenty-First Century Biological Threats*, 109th Cong. 1st sess., 2005, Committee Print. <https://www.hsdl.org/homesec/docs/legis/nps17-042806-01.pdf&code=914032755131b4e00df3a587fd35357a> Accessed March 3, 2007.
- . House Committee on Homeland Security Subcommittee on Emergency Preparedness, Science and Technology. *Protecting the Homeland: Fighting Pandemic Flu from the Front Lines*, February 8, 2006. http://www.upmc-biosecurity.org/website/resources/hearings/content/Hearings_2006/20060208protecthmlnd.pdf Accessed November 13, 2006.
- . Senate Committee on Homeland Security and Governmental Affairs. *Hurricane Katrina: A Nation Still Unprepared : Special Report of the Senate Committee on Homeland Security and Governmental Affairs*. Washington, DC: US Government Printing Office, 2006.

- National Infrastructure Advisory Council. *The Prioritization of Critical Infrastructure for a Pandemic Outbreak in the United States Working Group: Final Report and Recommendations by the Council*. Washington, DC: National Infrastructure Advisory Council, 2007. http://www.dhs.gov/xlibrary/assets/niac/niac-pandemic-wg_v8-011707.pdf Accessed January 12, 2008.
- O'Toole, Tara, "Protecting the Homeland: Fighting Pandemic Flu from the Front Lines," Testimony before the House Committee on Homeland Security, Subcommittee on Emergency Preparedness, Science and Technology, *February 8, 2006* p.5 http://www.upmcbiosecurity.org/website/resources/hearings/content/Hearings_2006/20060208protecthtmlnd.pdf Accessed November 13, 2006.
- Pangi, Robyn. "After the Attack: The Psychological Consequences of Terrorism." *Perspectives on Preparedness* no. 7 (August 2002): 1-21. http://www.mipt.org/pdf/ksg_popno7.pdf Accessed January 12, 2008.
- Petterson, John S. "Perception vs. Reality of Radiological Impact: The Goiania Model." *Nuclear News* 31, no. 14 (November, 1988): 84-90.
- Philpott, Don. "Pandemic Update." *Homeland Defense Journal* 5, no. 10 (October, 2007): 14-16.
- PriceWaterhouseCoopers. *Closing the Seams: Developing an Integrated Approach to Health System Disaster Preparedness*. PriceWaterhouseCoopers, 2007. <http://www.pwc.com/extweb/pwcpublishings.nsf/docid/9CEC1E9BD3BCAC478525737F005C80A9> Accessed November 25, 2007.
- Qureshi, Gershon K. *Health Care Workers' Ability and Willingness to Report to Duty during Catastrophic Disasters*. New York, NY: Oxford University Press, 2005.
- Qureshi, Gershon K., Jacqueline Merrill, Robyn Gershon, and Ayxa Calero-Breckheimer. "Emergency Preparedness Training for Public Health Nurses: A Pilot Study." *Journal of Urban Health* 79, no. 3 (September 2002): 413-416.
- Reynolds, Mary, Bach Anh, Vu Thu, Joel Montgomery, Daniel Bausch, Jina Shah, Susan Maloney, et al. "Factors Associated with Nosocomial SARS-CoV Transmission among Healthcare Workers in Hanoi, Vietnam, 2003." *BMC Public Health* 6, (August 14, 2006): 1-9 <http://www.biomedcentral.com/content/pdf/1471-2458-6-207.pdf> Accessed February 6, 2008.
- Sapsin, Jason W., Lawrence O. Gostin, Jon S. Vernick, Scott Burris, and Stephen P. Teret. "SARS and International Legal Preparedness." *Temple Law Review* 77, (2004): 155-174. <http://www.temple.edu/iilpp/Docs/Sapsin,%20Final%20to%20Publisher,%2012-08-04.pdf> Accessed January 12, 2008.

Virginia Task Force One Urban Search and Rescue Section. *Family Support Services Team*. Fairfax, VA: Fairfax County Fire & Rescue, Virginia Task Force One, Urban Search and Rescue, 2008.

World Health Organization. "Cumulative Number of Confirmed Human Cases of Avian Influenza A/(H5N1) Reported to WHO." Geneva, Switzerland: World Health Organization, 2005.
http://www.who.int/csr/disease/avian_influenza/country/cases_table_2005_11_07/en/ Accessed February 13, 2008.

———. "Ten Things You Need to Know about Pandemic Influenza." Geneva, Switzerland: World Health Organization, 2008.
<http://www.who.int/csr/disease/influenza/pandemic10things/en/> Accessed February 13, 2008.

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