Knowledge and Awareness about H1N1 Influenza (Swine Flu)
Among University Students

by
Suneel K. Parvathareddy

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This thesis paper has been examined and approved.

Examinining Committee:

______________________________
Dr. John A. Romas, Chairperson

______________________________
Dr. Marlene Tappe, Committee Member

______________________________
Dr. Christine Connolly, Committee Member
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Abstract

Knowledge and Awareness about H1N1 Influenza (Swine Flu) Among University Students

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H1N1 influenza (Swine influenza or Swine flu) is a respiratory disease of pigs caused by type A influenza virus that regularly causes outbreaks of influenza in pigs. Worldwide, as of October 17, 2009, there have been more than 414,000 laboratory confirmed cases of pandemic influenza H1N1 2009 and nearly 5000 deaths. The 2009 flu pandemic is a global outbreak of a new strain of influenza A virus subtype H1N1 and was first identified April 2009 in Mexico. On June 11, 2009, WHO declared the H1N1 outbreak as a pandemic. Worldwide, as of April 11, 2010, more than 214 countries and overseas territories or communities have reported laboratory confirmed cases of pandemic influenza H1N1 2009, including over 17798 deaths.

The purpose of this study was to identify if the students studying at Minnesota State University, Mankato have enough knowledge about H1N1 influenza and whether or not they viewed H1N1 influenza as a threat to their health. This study also investigated knowledge about possible preventive measures that can be taken among the students including vaccination against H1N1 influenza.

A cross-sectional study was conducted by sending out an email message with a link to an electronic survey to students who were enrolled at Minnesota State University, Mankato. Students’ general knowledge and information about H1N1 influenza was assessed. The survey was sent electronically to the students during February, 2010. A total of fifteen days was provided for the students to respond to the questions. Two reminders were sent before the survey was closed on March 12th, 2010. In total, n=700 students participated in the survey.

Data obtained were entered into the Statistical Package for the Social Sciences (SPSS) software. All the questions were recorded on the variable view of the SPSS software. Descriptive statistics and frequencies were used to interpret results of the study. Participants’ responses were coded by giving 1 for a correct answer and a 0 for an incorrect answer. For negative response correct answers, reverse scoring was done in order to properly calculate the knowledge score, by giving 1 for correct answer (response “No”) and a 0 for incorrect answer (response “Yes”). ANOVAs and t-tests were conducted to determine interactions within and between groups and to determine whether or not significant relationships exist.
The results of the study showed that students at Minnesota State University, Mankato have very high knowledge about H1N1 influenza. The majority of students know about symptoms, transmission, treatment and prevention of H1N1 influenza. However, most of them did not find H1N1 as a major threat to their health. All the scores on general knowledge about H1N1 influenza were high, which indicates that the students are well aware of this disease. Students’ self-reported knowledge and computed knowledge from the survey showed a significant correlation. Students with previous experience about H1N1 influenza also demonstrated high knowledge about this disease compared to students without any previous experience. However, students’ knowledge about H1N1 influenza did not vary with their perceived level of threat for contacting H1N1 influenza. Statistically, there was no significant difference in the knowledge of the students between males and females and between the different years in school, but in numbers there were few students who were more knowledgeable than the rest of the students about H1N1 influenza.
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Chapter One: Introduction

The Threat of H1N1 Influenza Pandemic

H1N1 influenza (swine influenza or swine flu) is a respiratory disease of pigs caused by type A influenza virus that regularly causes outbreaks of influenza in pigs. H1N1 virus causes high levels of illness and low death rates in pigs (Centers for Disease Control and Prevention [CDC], 2009a). The classical swine flu virus (influenza type A H1N1 virus) was first isolated from a pig in 1930 (CDC, 2009a). Like all influenza viruses, H1N1 viruses change constantly. Pigs can be infected by avian influenza and human influenza viruses as well as H1N1 viruses (CDC, 2009a). As of June 2009, the CDC has identified that influenza viruses from different species infect pigs, thus the viruses can reassort (i.e. swap genes) and new viruses that are a mix of swine, human and/or avian influenza viruses can emerge. At this time, there are four main influenza type A virus subtypes that have been isolated in pigs: H1N1, H1N2, H3N2, and H3N1. Most of the recently isolated influenza viruses from pigs, however, have been H1N1 viruses (CDC, 2009a). H1N1 viruses do not normally infect humans. But, sporadic human infections with swine flu have occurred. Initially, these cases occur in persons with direct exposure to pigs [e.g. children near pigs at a fair or workers in the swine industry] (World Health Organization [WHO], 2009a).

Seasonal influenza occurs every year and the viruses change each year. Many people have some immunity to the circulating virus that helps limit infections. Some countries also use seasonal influenza vaccines to reduce illness and deaths. But influenza A (H1N1) is a new virus and one to which most people have no or little immunity to,
therefore, this virus could cause more infections than are seen with seasonal flu (WHO, 2009a). By June 2009, the WHO has identified that the new influenza A (H1N1) appears to be as contagious as seasonal influenza, and is spreading fast, particularly among young people (ages ten to 45 years). The severity of the disease ranges from very mild symptoms to severe illnesses that can result in death. Most people who contract the virus experience the milder disease and recover without antiviral treatment or medical care. Of the more serious cases, more than half of hospitalized people had underlying health conditions or weak immune systems (CDC, 2009a).

This virus was originally referred to as “swine flu” because laboratory testing showed that many of the genes in this new virus were very similar to influenza viruses that normally occur in pigs (swine) in North America. Further study (CDC, 2009a) has shown that this new virus is very different from what normally circulates in North American pigs. It has two genes from flu viruses that normally circulate in the pigs of Europe and Asian continents and it has close resemblance with both bird (avian) genes and human genes (WHO, 2009a). Scientists call this a "quadruple reassortant" virus.

Flu viruses are spread mainly from person to person through coughing or sneezing by people with influenza. Sometimes people may become infected by touching something, such as a surface or object with flu viruses on it and then touching their mouth or nose. The symptoms of 2009 H1N1 flu virus in people include fever, cough, sore throat, runny or stuffy nose, body aches, headache, chills and fatigue (WHO, 2009b). Some people may have vomiting and diarrhea (WHO, 2009b). People may be infected with the flu, including 2009 H1N1 and have respiratory symptoms without a fever.
Severe illnesses and death has occurred as a result of illness associated with this virus (WHO, 2009b).

Statement of the Problem

In spite of all the efforts made by some of the epidemiologists, scientists, governments and public health officials around the world, the H1N1 influenza could not be restricted from emerging as a pandemic. In March and April 2009, hundreds of cases of respiratory illness were reported in Mexico that was suspected to be caused by a novel swine influenza virus. The first reported cases in the United States came from San Diego County and Imperial County in California and Guadalupe County in Texas (CDC, 2009a). Reports from other states rapidly followed, and the disease spread rapidly around the globe. The WHO has officially declared the 2009 H1N1 influenza to be a pandemic on June 11th, 2009 (WHO, 2009b). By June 2009, the CDC estimated that more than 1 million Americans were infected with H1N1 influenza. By August 2009, H1N1 influenza cases were reported from more than 170 countries and territories (Nettleman, 2009).

One of the main reasons for the fast spread of the disease across nations was the lack of knowledge about the disease at the individual level. This study assesses the knowledge about Swine Flu among students at Minnesota State University, Mankato. This disease spreads rapidly among the younger generation, especially among college students who are in close contact with each other in residence halls, classrooms, lecture halls, library, shared bathrooms and other gathering places commonly used by the students. As the population of students within the university is significantly high, this disease can affect many students at the same time.
During a pandemic, this virus could spread among students more rapidly and could lead to severe outcomes. If an outbreak occurs among university students, there would be loss of productivity, and academic delay as the university might have to close. There might be a possibility of some human causalities too. If the students become aware of this type of pandemic, they can prepare themselves effectively by taking necessary preventive measures to help reduce the rapid spread of the disease at the university. Thus, this study focuses on assessing knowledge about H1N1 influenza among University students and encourages them to take up the various health education programs to increase awareness about the disease.

**Hypothesis**

Students’ knowledge about H1N1 influenza varies with their perceived level of threat for contracting H1N1 influenza.

**Research Questions**

1. What is the current knowledge of students regarding H1N1 influenza?

2. What kind of general information do students have regarding symptoms of H1N1 influenza?

3. What kind of general information do students have regarding the transmission of H1N1 influenza?

4. What kind of general knowledge do students have regarding the treatment of H1N1 influenza?
5. What kind of general knowledge do students have regarding the prevention of H1N1 influenza?

6. What is the students’ perceived level of threat for contracting H1N1 influenza?

7. Does the students’ knowledge about H1N1 influenza vary with their perceived level of threat for contracting H1N1 influenza?

**Significance of the Problem**

Since the first case of H1N1 influenza was detected in Mexico in March 2009, there has been an ongoing epidemic for months before it was officially recognized as a pandemic in June, 2009 (WHO, 2009b). As of October 11, 2009, the WHO worldwide update stated that 174 countries have officially reported over 399,232 confirmed laboratory cases of the influenza pandemic H1N1 infection, including 4,735 deaths (WHO, 2009b). About 70 percent of people who have been hospitalized with H1N1 flu have had one or more medical conditions that placed them in the high risk category for serious seasonal flu-related complications. These include pregnancy, diabetes, heart disease, asthma and kidney disease (CDC, 2009a). As the H1N1 virus spreads rapidly among the population from different countries in the world, the WHO (2009b) suggested some personal measures to avoid seasonal flu infection:” vaccination when available, thorough and frequent hand-washing, a balanced diet with fresh fruits and vegetables, whole grains, and lean protein, sufficient sleep, regular exercise, and avoiding crowds”. If people have knowledge about the disease, they can protect themselves from infection, avoid unnecessary contacts and stop the disease from spreading further. There is a need
for this study to help prevent the rapid spread of the current pandemic and to encourage people to prepare accordingly.

Limitations

The study was limited by the following:

- The participants in this study were selected from a nonrandom sample.
- The survey was conducted at different times and on different days, which leaves the possibility that all the responses may not be uniform.
- As the information about H1N1 influenza continues to change over time, based on the latest studies and research, the current information may no longer be accurate compared to the information mentioned here.
- The survey was completed electronically through an email and the email survey was sent only to 8000 current students at MSU, Mankato.

Delimitations

This study was delimited according to the following parameters:

- Geographical location of the participants of this study considered student respondents at Minnesota State University, Mankato.
- It was not possible to randomly select samples due to time limitations and other resources not being available.
Assumptions

The study was based on the following assumptions:

- Although there were considerable amount of cases of H1N1 infection among University students, the participants of the survey are assumed to be free of the disease.
- The participants of the survey are assumed to have minimum knowledge about pandemics.

Definition of Terms

Endemic. The prevalence of disease in a particular place, field, area or environment (Merriam-Webster, 2009).

Epidemic. The outbreak of a disease in larger population but not crossing international boundaries (WHO, 2008).

Influenza A virus subtype H1N1. Also known as A (H1N1) or H1N1 is a subtype of influenza virus A, that can cause illness in humans and many other animal species (Merriam-Webster, 2009).

Pandemic. An epidemic occurring over a very wide area, crossing international boundaries and usually affecting large number of people (WHO, 2008).

Pneumonia. A disease of the lungs that is characterized especially by inflammation and consolidation of lung tissue followed by resolution with fever, chills, cough, and difficulty in breathing, and is caused chiefly by infection (Medline plus, 2008).

Summary

H1N1 flu is a new influenza virus causing the current pandemic. This new virus was first detected in people in the United States in April 2009. The virus is spreading from person-to-person in the same way that regular seasonal influenza viruses spread. H1N1 flu is not caused by eating pork or pork products. H1N1 flu is not a food borne disease; it is a respiratory disease (CDC, 2009b). Illness with the new H1N1 flu virus has ranged from mild to severe. Although the vast majority of people who have contracted H1N1 flu have recovered without needing medical treatment, hospitalizations and deaths have occurred. The purpose of the study was to find out if students Minnesota State University, Mankato have adequate knowledge of the disease and whether or not the students viewed H1N1 influenza as a threat to their health. This study also investigated knowledge about possible preventive measures that can be taken among the students.
Chapter Two: Review of the Literature

Introduction

The purpose of the study was to determine if students at Minnesota State University, Mankato have adequate knowledge of H1N1 influenza and whether or not the students viewed H1N1 influenza as a threat to their health. This study also investigated the students’ knowledge about possible preventive measures that could be taken to avoid H1N1 influenza. A historical study of H1N1 influenza and what was known by scientists to date is important for understanding the possible impact of the current H1N1 pandemic in the United States. Relevant literature was reviewed to determine the (1) specific nature of H1N1 influenza, (2) history of influenza virus, (3) history of H1N1 influenza, (4) incidence and prevalence of human cases of H1N1 influenza, (5) clinical features, (6) treatment and prevention of H1N1 influenza, (7) preparation during pandemic and (8) socio-economic impact of the 2009 pandemic of H1N1 influenza.

The Specific Nature of H1N1 Influenza

H1N1 influenza is an infectious disease caused by a Type A strain of influenza virus (WHO, 2008). There are three types of influenza viruses: A, B and C depending upon the virus structure. These viruses are negative-sense single-stranded RNA viruses that belong to the family of Orthomyxoviridae (CDC, 2009b). Among these, Type A can cause H1N1 influenza where as types A, B and C can cause seasonal influenza in humans (CDC, 2009c). The classical swine flu virus (influenza type A H1N1 virus) was first isolated from a pig in 1930 (CDC, 2009b). Enveloped virions of H1N1 virus are 80 to 120 nm in diameter, are 200 to 300 nm long, and may be filamentous (CDC, 2009a).
They consist of spike-shaped surface proteins, a partially host-derived lipid-rich envelope, and matrix (M) proteins surrounding a helical segmented nucleocapsid (six to eight segments). Like all influenza viruses, H1N1 viruses change constantly (CDC, 2009a).

Based on the two surface proteins on the surface of influenza viruses, Hemagglutinin (HA) and Neuraminidase (NA), Influenza A viruses are further divided into many subtypes (WHO, 2009b). There are 16 HA (H1-H16) subtypes and 9 NA (N1-N9) subtypes known of influenza A viruses (WHO, 2008). At this time, there are four main influenza type A virus subtypes that have been isolated in pigs: H1N1, H1N2, H3N2, and H3N1 (CDC, 2009b). However, most of the recently isolated influenza viruses from pigs have been H1N1 viruses (CDC, 2009b). H1N1 virus has the property to change and it mainly does so in two ways:

**Antigenic drift:** This is the process during which small alterations occur on the genetic material of the virus. As a result, a new virus is formed with a different strain of NA and HA (CDC, 2009c). Humans do not have immunity to this virus and they cannot protect themselves from infections. Specifically, the seasonal flu vaccine received every year may not provide protection from this new virus strain (CDC, 2009c).

**Antigenic shift:** This results when the influenza A subtypes from bird and human merge and exchange their genes, as a result of which an entirely new virus is formed. This new virus is completely different from its parent viruses (CDC, 2009c). Because no natural immunity to this virus exists; it can spread quickly, causing widespread illness and death (CDC, 2009c).
As mentioned above, the properties of this virus to mutate and change constantly have caused scientists to worry about the development of rapid drug resistance of the H1N1 viruses to various antiviral drugs (WHO, 2009b). WHO has classified six phases of influenza pandemic and H1N1 influenza reached its sixth phase on June 11, 2009.

**History of Influenza Virus**

Influenza pandemic has always been a threat for global infectious disease (Osterholm, 2006). Annual outbreaks of the seasonal flu usually occur during the late fall through early spring. Most people have natural immunity, and a seasonal flu vaccine is available. A flu pandemic occurs when a new influenza A virus emerges for which there is little or no immunity in the human population. The virus causes serious illness and spreads easily from person-to-person worldwide (WHO, 2009a). “In the twentieth century, there were three pandemics of Type A influenza viruses: the Spanish flu of 1918, the Asian flu of 1957, and the Hong Kong flu of 1968, identified by their presumed sites of origin” (Greene & Moline, 2006, p.13). The Spanish flu of 1918 caused approximately twenty million deaths worldwide. The Asian flu, originating in the Far East in 1957, and the Hong Kong flu of 1968 were less severe than the Spanish flu because of earlier inoculation and improved medical care. However, around three million people died worldwide during that time (CDC, 2009b). The most recent pandemic with avian flu occurred in 1997 and recurred in 1999 (CDC, 2009b). The avian flu was spread primarily to children by infected chickens in Hong Kong (CDC, 2009b). Although a mass slaughter of chickens controlled the spread of avian flu, there is concern that the virus will again mutate and be transmitted from person to person, causing a pandemic (CDC, 2009b).
History of H1N1 Influenza

The H1N1 subtype of influenza A virus has caused substantial morbidity and mortality in humans, first documented in the global pandemic of 1918 and continuing to the present day. During the global influenza pandemic of 1918, twenty million people died worldwide and it has become the most severe single disease event in the history of Epidemiology (Johnson & Mueller, 2002). Following the 1918 pandemic, the A/H1N1 influenza virus continued to circulate in humans, causing seasonal epidemics of varying severity and also in swine, as ‘classical’ swine influenza (Logan & MacKay, 1951). In the post-pandemic period, epidemiologically severe outbreaks occurred in 1928–1929, 1932–1933, 1936–1937, and 1943–1944 in the United Kingdom and the United States (Center for Infectious Disease Research and Policy [CIDRAP], 2009). The virus was globally distributed much like a pandemic virus, but mortality was relatively low (CIDRAP, 2009). The virus was renamed ‘A-prime’ based on its antigenic divergence from the previously characterized human A/H1N1 viruses of the early 1940's, although subsequent sequence analysis showed that these 1947 viruses were still of the A/H1N1 subtype, yet with numerous nucleotide and amino acid differences in antigenic regions of the hemagglutinin (HA) (Sartwell & Long, 1948). Another unusually severe A/H1N1 epidemic occurred in 1950–1951, in which mortality levels in the United Kingdom and Canada exceeded those of both the 1957 and 1968 pandemics, again without a change in antigenic subtype (CIDRAP, 2009). In 1957, the A/H1N1 virus disappeared and was replaced by a novel H2N2 virus. The A/H1N1 virus then resurfaced in 1977 after a twenty-year disappearance, causing an epidemic in children who lacked antibodies from prior exposure (CIDRAP, 2009). However, this emergent A/H1N1 did not replace the
dominant H3N2 subtype, so that A/H1N1 and H3N2 have co-circulated to the present day (CIDRAP, 2009). Although H3N2 has caused the majority of influenza A virus infections in recent decades, H1N1 periodically predominates during milder epidemic seasons (WHO, 2009a).

Of the three pandemics that occurred in the 1900s, two involved reassorted viruses, but none were reassortants with swine viruses (CIDRAP, 2009). Recent genetic sequencing of the 1918 H1N1 strain indicates that the strain was of avian origin and that the strain did not reassort with a human strain, but rather gradually adapted to humans until it could be efficiently transmitted person to person (WHO, 2009a). Current evidence indicates that the 1918 virus was an avian-like virus derived totally from an unknown source (WHO, 2009a). The 1957-58 pandemic, referred to as the "Asian flu," was caused by an H2N2 strain and originated in China. The pandemic strain acquired three genes from the avian influenza gene pool in wild ducks by genetic reassortment and obtained five other genes from the then-circulating human strain. The 1968-69 pandemic, referred to as the "Hong Kong flu," was caused by an H3N2 strain. The strain acquired two genes from the duck reservoir by reassortment and kept six genes from the virus circulating at the time in humans (CIDRAP, 2009).

The 2009 flu pandemic is a global outbreak of a new strain of influenza A virus subtype H1N1, termed Pandemic H1N1/09 virus by the WHO, was first identified in April 2009 (CIDRAP, 2009). The outbreak was first observed in Mexico - with evidence that there had been an ongoing epidemic for months before it was officially recognized as such. On June 11, 2009, WHO declared the outbreak to be a pandemic.
Incidence of Human Cases of H1N1 Influenza

A 2007 report identified 37 civilian swine-origin influenza cases reported in the medical literature between 1958 and 2005 (Myers, Olsen and Gray, 2007). Of these cases, nineteen occurred in the United States, six in Czechoslovakia, four in the Netherlands, three in Russia, three in Switzerland, one in Canada, and one in Hong Kong. Twenty-two (61%) reported recent exposure to pigs (Myers et al., 2007). The overall case fatality rate was 17%. Possible or probably limited human-to-human transmission was reported in several situations (Myers et al., 2007). Between December 2005 and February 2009, 11 sporadic cases of infection in humans with triple-reassortant swine influenza A H1 viruses were reported to the CDC (CDC, 2009b). Ten of the infections were caused by triple reassortant H1N1 viruses and one by triple reassortant H1N2 virus. Seven cases involved either direct exposure to pigs or close proximity to pigs (i.e., within 6 feet) shortly before illness onset (CDC, 2009b). In two other cases the patients were in the general vicinity of pigs before illness onset, one was epidemiologically linked to a possible case, and one had no pig exposure (CDC, 2009b). All patients survived the illness, although four were hospitalized and two required mechanical ventilation. Among the 10 patients with known clinical symptoms, nine reported fever, all had cough, six had a headache, and three reported diarrhea (CDC, 2009b).

As of October 23, 2009 WHO continues to report laboratory-confirmed 2009 H1N1 flu cases and deaths on its Web page. As of October 17, 2009, worldwide there have been more than 414,000 laboratory confirmed cases of pandemic influenza H1N1 2009 and nearly 5000 deaths (WHO, 2009b). These laboratory-confirmed cases represent
a substantial underestimation of the total cases in the world, as many countries focus surveillance and laboratory testing only on people with severe illness. The 2009 H1N1 influenza virus continues to be the dominant influenza virus in circulation in the world. Since April 19, 2009, over half of all influenza positive specimens reported to WHO were 2009 H1N1. In temperate regions of the Southern Hemisphere, disease due to 2009 H1N1 has returned to below baseline. In tropical regions of Americas and Asia, influenza activity due to 2009 H1N1 remains variable. In temperate regions of the Northern Hemisphere, influenza-like illness (ILI) activity due to 2009 H1N1 is above baseline in many areas, including parts of Western Europe, most of the United States, and parts of Mexico and Canada (CDC, 2009b). As of April 11, 2010, worldwide more than 214 countries and overseas territories or communities have reported laboratory confirmed cases of pandemic influenza H1N1 2009, including over 17798 deaths (WHO, 2010).

**H1N1 Influenza Transmission**

Influenza A viruses can be directly transmitted from pigs to people and from people to pigs (CDC, 2009a). Human infection with flu viruses from pigs are most likely to occur when people are in close proximity to infected pigs, such as in pig barns and livestock exhibits housing pigs at fairs (CDC, 2009a). But, H1N1 influenza viruses are not transmitted from eating pork or pork products (CDC, 2009a). Eating properly handled and cooked pork and pork products is safe (CDC, 2009a). Cooking pork to an internal temperature of 160°F kills the swine flu virus as it does other bacteria and viruses (CDC, 2009a). Human-to-human transmission of swine flu can also occur (CDC, 2009a). This is thought to occur in the same way as seasonal flu occurs in people, which is mainly person-to-person transmission through coughing or sneezing of people infected with the
influenza virus (CDC, 2009a). People may become infected by touching something with flu viruses on it and then touching their mouth or nose (CDC, 2009a).

Transmission of Influenza by contact can be direct or indirect. Direct contact occurs when people come in contact with the secretions of a sick person and touch their eyes, mouth or nose with their contaminated hands. Indirect contact occurs when people come in contact with contaminated surfaces and objects and infect themselves (CIDRAP, 2009). Influenza virus is present in respiratory secretions of infected persons (WHO, 2009b). As a result, influenza virus can be transmitted through sneezing and coughing via large-particle droplets (WHO, 2009b). Transmission via contact with surfaces that have been contaminated with respiratory droplets or by aerosolized small-particle droplets may also occur, although these modes of transmission have not been proven (CIDRAP, 2009).

In addition to respiratory secretions, certain other bodily fluids (e.g. diarrheal stool) should also be considered potentially infectious (CDC, 2009a). Pandemics occur when influenza mutates into a new strain that is easily transmitted between the target species. New influenza mutations are able to spread to a pandemic level because nobody has immunity to the virus from previous exposure (Mackenzie, 2009).

**Clinical Features of H1N1 Influenza**

Although the precise incubation period has not been established for pandemic H1N1 influenza A infection, it could range from one to seven days, and most likely from one to four days (CDC, 2009a). The signs and symptoms of influenza caused by pandemic H1N1 influenza A virus are similar to those of seasonal influenza, although gastrointestinal manifestations appear to be more common with pandemic H1N1
influenza A (CDC, 2009a). The severity appears to be less than what was observed during the influenza pandemic of 1918 to 1919 (CDC, 2009a). The most common clinical findings of the 2009 H1N1 influenza A pandemic have been fever, cough, sore throat, malaise, and headache; vomiting and diarrhea have also been common, both of which are unusual features of seasonal influenza (CDC, 2009a). Other frequent findings have included chills, myalgias and arthralgias (CDC, 2009a). Certain groups, such as infants, elderly individuals, and immunocompromised hosts, may have atypical presentations (WHO, 2009b). Although elderly patients are considered to be at an increased risk for complications of influenza, pandemic H1N1 influenza A infections in such individuals have been uncommon to date possibly as a result of preexisting immunity against antigenically similar influenza viruses that circulated prior to 1957 (CIDRAP, 2009).

According to the CDC, at this time, the same age and risk groups who are at higher risk for seasonal influenza complications should also be considered at higher risk for novel H1N1 influenza complications (CDC, 2009a). These include the following groups:

- Pregnant women
- Persons who live with or care for infants under the age of six months
- Health care and emergency medical services personnel who have direct contact with patients or infectious material
- Children ages six months through nine years
- Children and adolescents ages five through 24 years who have medical conditions that put them at higher risk for influenza-related complications
Among 268 patients in the United States requiring hospitalization for pandemic H1N1 influenza A infection, clinical findings included fever (93 percent), cough (83 percent), shortness of breath (54 percent), fatigue or weakness (40 percent), chills (37 percent), myalgias (36 percent), rhinorrhea (36 percent), sore throat (31 percent), headache (31 percent), vomiting (29 percent), wheezing (24 percent), and diarrhea (24 percent) (CDC, 2009a).

**Preventive Measures**

General precautionary measures have to be followed to avoid getting any type of infection (WHO, 2009b). Simple measures have been shown to reduce the risk of transmission of influenza (WHO, 2009b). These include frequent hand washing with soap and water or disinfection with alcohol (WHO, 2009b). People should try to avoid touching their face or mucous membranes (WHO, 2009b). The influenza virus can live about two hours on surfaces that become contaminated (CDC, 2009a). During coughs and sneezes, the mouth should be covered with a tissue or a sleeve (WHO, 2009b). In areas with large numbers of cases, it is best to minimize nonessential exposure to crowds (WHO, 2009). Sick people should stay home whenever possible (CDC, 2009a). To reduce the risk of spreading the flu to other family members, everyone in the household should wash their hands frequently (CDC, 2009b). Alcohol-based sanitizing gels are available in stores and may be used instead of soap and water when hands are not visibly soiled (Nettleman, 2009).

A vaccine against H1N1 influenza is available, although supplies were limited initially (WHO, 2009b). There are two types of vaccine available currently in 5
compositions: the nasal vaccine, 0.25 ml shot, 0.5 ml shot and prefilled 0.5 ml syringe without additive and multilevel latex-free shot (WHO, 2009b). The nasal vaccine has a weakened ("attenuated") virus and is administered by sniffing (WHO, 2009b). The nasal vaccine is used for people two to 49 years of age (WHO, 2009b). People over the age of nine years should receive a single dose, whereas children aged six months to nine years will receive two doses one month apart with a lower dose of 0.25 ml instead of 0.5ml (WHO, 2009b). Because vaccine is in short supply, the CDC recommends that the following groups be vaccinated first: pregnant women, caregivers for infants less than six months of age, health-care workers, people aged six months to eighteen years of age, and people up to 24 years of age, who have chronic health conditions. When the shortage resolves, the vaccine will be recommended for all people over 6 months of age (CDC, 2009a).

Treatment

Treatment, when indicated, should be initiated as early as possible because the benefits are greatest when started within the first two days of illness (CDC, 2009c). However, some studies of hospitalized patients with seasonal and 2009 H1N1 influenza have suggested benefit of antiviral treatment even when treatment was started more than 48 hours after illness onset (CDC, 2009c) Influenza antiviral medications can reduce the severity and duration of influenza illness and can reduce the risk of influenza-related complications, including severe illness and death (WHO, 2009b). Most healthy persons who develop an illness consistent with uncomplicated influenza, or persons who appear to be recovering from influenza, do not need antiviral medications for treatment or prophylaxis (WHO, 2009b). However, persons presenting with suspected influenza and
more severe symptoms such as evidence of lower respiratory tract infection or clinical
deterioration should receive prompt empiric antiviral therapy, regardless of previous
health or age (WHO, 2009b).

Treatment with oseltamivir or zanamivir is recommended for all persons with
suspected or confirmed influenza requiring hospitalization (CDC, 2009c). Currently
circulating 2009 H1N1 viruses are susceptible to oseltamivir and zanamivir, but resistant
to amantadine and rimantadine (CDC, 2009c); however, antiviral treatment regimens
might change according to new antiviral resistance or viral surveillance information
(CDC, 2009c). Early empiric treatment with oseltamivir or zanamivir should be
considered for persons with suspected or confirmed influenza who are at higher risk for
complications including (CDC, 2009c):

- children younger than two years old;
- persons aged 65 years or older;
- pregnant women and women up to two weeks postpartum (including following
  pregnancy loss);
- persons of any age with certain chronic medical or immunosuppressive
  conditions; and
- persons younger than nineteen years of age who are receiving long-term aspirin
  therapy.

**Situation of H1N1 Influenza in the United States**

Each year an average of 36,000 people die and over 200,000 people are
hospitalized in the United States due to flu-related complications (CDC, 2009b). During
the year 2009, in addition to seasonal flu, an outbreak of H1N1 influenza has greatly increased the number of people at risk this flu season (CDC, 2009b). The new strain was first identified by the CDC in two children, neither of whom had been in contact with pigs. The first case, from San Diego County, California, was confirmed from clinical specimens (nasopharyngeal swab) examined by the CDC on April 14, 2009. A second case, from nearby Imperial County, California, was confirmed on April 17. The patient in the first confirmed case had flu symptoms including fever and cough on clinical exam on March 30, and the second on March 28 (CDC, 2009b). The virus was identified as a novel strain of influenza, and existing vaccines against seasonal flu provide no protection. A study at the CDC, published in May 2009, found that children had no preexisting immunity to the new strain but that adults, particularly those over 60, had some degree of immunity (CDC, 2009b).

In early October of 2009, the CDC announced that H1N1 influenza was widespread across the entire country. It also informed that there was significant flu activity in virtually all states of the US, which was considered to be quite unusual for this time of year. As of October 28th, 2009, the CDC declared that forty six states in the United States were affected with H1N1 influenza virus (CDC, 2009b). As the total H1N1 cases increased to 43,700 with total deaths of 300 (H1N1-flu statistics.org), on October 24, 2009 President of the United States of America Mr. Barak Obama declared the 2009 H1N1 influenza a national emergency (CDC, 2009b). The declaration will make it easier for U.S. medical facilities to handle a surge in flu patients by allowing the waiver of some requirements of Medicare, Medicaid and other federal health insurance programs as needed (CDC, 2009b).
Socio-economic Impact of H1N1 Influenza

The H1N1 virus has spread from the American continent to other world regions, including Europe, the Middle East, Asia, the Pacific and Africa (WHO, 2009b). Since the first case of the current 2009 pandemic reported to WHO on April 24th, 2009 on the American continent, as pandemic preparedness is not advanced in most developing countries the virus has spread in 170 countries and territories (WHO, 2009b). Developed countries are better prepared to mitigate the effect of the pandemic than developing countries. Developing countries are characterized by limited access to medical care, undeveloped public health infrastructure, low socio-economic conditions, increased population density, insufficient public awareness and a high prevalence of existing infectious diseases (e.g. gastrointestinal and respiratory infections, HIV, tuberculosis, malaria, dengue fever and hepatitis). Various host-related factors, such as poor nutritional status, may also influence morbidity and mortality. The currently useful antiviral drugs (oseltamivir and zanamavir) are most available in developed countries such as the USA, Japan and the other countries of the European Union. Vaccines for the current virus are under development in developed countries, where they will be first available. Therefore, additional effort must be made to assist those in developing countries to combat the current pandemic (WHO, 2009b).

During a pandemic, social life of the people will be completely disrupted. Apart from the increased number of infections and human causalities, there will be panic among people due to loss of their family and relatives. During the current 2009 H1N1 pandemic, though the studies clearly confirmed that eating pork and other pig meat do not cause the
disease, the terror among the people led to huge economic losses to the pig industry worldwide. Other areas that might be affected during a pandemic are - International tourism, industries, healthcare systems, educational institutions, entertainment industry, etc. Finally, the cost of prevention and control of a pandemic along with the compensations paid by the governments worldwide during a pandemic is also very high.

**Summary**

The literature review showed the worldwide spread of the pandemic that began in March 2009 that was caused by H1N1 influenza A virus. As of October 11, 2009, over 399,000 laboratory-confirmed cases had been reported in numerous countries (WHO, 2009b). Since early July 2009, the World Health Organization has ceased closely tracking the number of cases, since it has become extremely difficult for countries to continue such monitoring in the setting of widespread community transmission. Furthermore, even with close tracking, the true numbers of cases are many times higher than the numbers of confirmed cases. The focus has shifted to following trends of illness rather than individual cases in countries with widespread disease, and to close monitoring of cases only in newly affected countries (Up-to-date, 2009).

On June 11, 2009, the World Health Organization raised its pandemic alert level to the highest level, phase 6, indicating widespread community transmission on at least two continents (CDC, 2009a). With increasing world population, the exact severity of the current pandemic is still not clear. The nature of the virus, migration of the world population, unavailability of proper vaccine has made this virus a threat to public health (Osterholm, 2006). Most of the countries are not prepared for this pandemic and the developed countries that are aware of the situation do not have enough resources
(vaccines and antiviral drugs) to tackle this situation. In this context, massive public awareness and knowledge about the disease may help reduce the number of causalities during a pandemic (CDC, 2009a).
Chapter Three: Methodology

Introduction

The purpose of the study was to find out if students at Minnesota State University, Mankato have adequate knowledge of H1N1 influenza and whether or not students viewed the disease as a threat to their health. This study also investigated the students’ knowledge about possible preventive measures they can take to avoid H1N1 influenza. The research technique used included an electronic survey sent through emails. The email with the link to the survey was sent to the students who are currently enrolled at Minnesota State University, Mankato in order to find out information about H1N1 influenza. This study involved with human participants, thus formal approval was sought, approved by and conducted in accordance with the guidelines of the Institutional Review Board (IRB) at Minnesota State University, Mankato. The research was designed to answer the following questions:

- What is the current knowledge of students regarding H1N1 influenza?
- What kind of general information do students have regarding symptoms of H1N1 influenza?
- What kind of general information do students have regarding the transmission of H1N1 influenza?
- What kind of general knowledge do students have regarding the treatment of H1N1 influenza?
- What kind of general knowledge do students have regarding the prevention of H1N1 influenza?
- What is the students’ perceived level of threat for contacting H1N1 influenza?
• Does the students’ knowledge about H1N1 influenza vary with their perceived level of threat for contacting H1N1 influenza?

This chapter includes information on the research design, human participants, instrumentation, procedures and data analysis.

**Research Design**

In order to obtain students’ general knowledge and awareness levels about H1N1 influenza, the cross-sectional survey method was used. An email message with a link to an electronic survey was administered to the students who are enrolled at Minnesota State University, Mankato. Students’ general knowledge and information about H1N1 influenza was assessed. The advantages of this method are that a large amount of data can be collected within a relatively short period of time and is comparatively inexpensive as a method for data collection. A copy of the questionnaire can be found in Appendix A. The time needed to respond to the questionnaire was expected to be less than five minutes.

**Procedure**

For each individual category, descriptive statistics were used to find out the percentages of respondents for “Yes” or “No” responses. This method of analysis limits the possibility that the participant could choose correct answers simply by chance. By encouraging participants to correctly identify true statement and reject misconceptions regarding H1N1 influenza, it was easier to determine whether or not the individual truly
possessed knowledge regarding H1N1 influenza. Questions 8, 10, 12, 13, 14, 15, 17, 19 and 20 assessed general knowledge about H1N1 influenza and were all true statements. Questions 7, 9, 11, 16 and 18 were false statements that identified the ability of the participants to correctly reject the misconceptions about H1N1 influenza. False statements were reverse scored to find out the total correct responses from participants. A total of n= 700 students participated in the survey and all these data were included in the final analysis.

During data analysis, demographic information was tabulated using simple descriptive statistics, which included frequencies and percentages. A perceived level of threat of H1N1 influenza was determined by asking the participants to identify to what extent they believed H1N1 influenza as a threat to their health on a 1-5 Likert scale. General knowledge questions were analyzed by finding out the current response of the participants on the questions regarding symptoms, contract and transmission, treatment and prevention about H1N1 influenza. The level of current knowledge and source of that knowledge was analyzed by calculating frequencies and percentages.

Information about the research study, confidentiality and amount of time anticipated for the completion of the questionnaire was explained to the students before requesting them to fill in the survey. The researcher informed students that if they receive the email with the survey more than once, they do not need to participate (in the survey) twice. The participation in this survey was voluntary and the students could withdraw at any point if they did not want to participate. There was no potential risk or danger for the students in filling out this survey. Informed consent was inferred by the completion of this survey.
Participants

The participants used for this study were students enrolled in different general education classes of Minnesota State University, Mankato. These general classes represented students with different majors from almost all departments at the university. Students that participated in the survey were both undergraduate and graduate students from different years of study: freshmen, sophomores, juniors, seniors and graduate students. There were no prerequisites or minimum criteria needed for students to participate in this survey. After the thesis proposal was approved by the Institutional Review Board (IRB), Minnesota State University, Mankato, data were collected through the emails from the students of the Minnesota State University, Mankato during Spring semester 2010. All of the participants received an explanation about the purpose of the study. To ensure participant confidentiality, the survey did not include name and addresses. It was explained to the student respondents that participation on the survey was voluntary and that no credit would be given for completion. It would take about ten minutes of time to complete the survey. Most students completed the survey and submitted it back electronically. Some students did not participate in the survey for different reasons. Survey data was collected in the Zoomerang portal immediately after participants finished submitting them.

Instrumentation

A copy of the questionnaire for data collection is included in Appendix A. The instrument developed for this project was an electronic questionnaire. A questionnaire is an instrument used in survey research that contains questions participants were to
respond to. The survey questions were developed with information collected from the Center for Disease Control and Prevention (CDC), World Health Organization (WHO), Center for Infectious Disease Research and Policy (CIDRAP), Flu Government website and Minnesota Department of Health. Frequently asked questions about H1N1 influenza on these websites were included in the survey (CDC, 2009c). Some information about the survey questions was obtained from previous research on Hantavirus Pulmonary Syndrome (Visker & Nandy, 2006) and on avian influenza (Gautam, 2007).

Most of the questions in the survey contained “Yes” or “No” responses. This was a simple format used for participants and takes less time to complete. The initial three questions focused on demographic indicators such as age, gender and year of study. A question was asked about students’ current knowledge about H1N1 influenza. Another question was framed on a Likert scale to find out students’ perceived level of threat about H1N1 influenza. Other general knowledge questions were about transmission, symptoms, treatment and prevention about H1N1 influenza.

The survey questions developed were discussed with professionals within the health science department in order to determine the final draft of the research questions. A pilot test was not conducted but internal consistency of the responses was determined. Most responses among participants were similar. The reported knowledge and the computed responses among participants had a significant correlation that determined the validity and reliability of the data collected. The thesis committee chair and committee members indicated that questions were suitable both in content and for analysis. Survey questions were focused on the research questions previously discussed in Chapter One.
and were designed to determine knowledge about H1N1 influenza among University students.

**Data Analysis**

Data obtained were entered into the Statistical Package for the Social Sciences (SPSS) software (Howell, 1997). All the questions were recorded on the variable view of the SPSS software. All variables were given nominal numbers ranging from 0-5 and all numbers were described individually. For example, 0 means “No” and 1 means “Yes”. Statistical tests to measure the reliability of the data included Kuder Richardson (KR) 20. ANOVA was conducted to test the research question of whether the students’ knowledge about H1N1 influenza varies with their perceived level of threat for contracting H1N1 influenza or not.

**Summary**

This chapter described the research methods used in the study to find out general knowledge about H1N1 influenza among university students. A survey method was used to obtain information from the student participants. Electronic administration of the questionnaire through emails was completed at different times among the current students within the university. In total, n=700 students participated in the survey. Data was analyzed by using SPSS software. Descriptive statistics and frequencies were used to interpret results of the study. Some comparative statistics were also used to determine a co-relationship between responses provided by the participants.
Chapter Four: Results

The purpose of this study was to determine whether Minnesota State University, Mankato students have general knowledge about H1N1 influenza. The researcher tried to investigate whether the students viewed H1N1 influenza as a threat to their health. This study also investigated the general knowledge of students about preventive measures for H1N1 influenza. Finally, the researcher tried to examine whether students received any information about H1N1 influenza from their general experiences. The results of the study are presented in this chapter.

A formal request was submitted to the Institutional Review Board (IRB) in the first week of February and after getting approval from the IRB, data were collected through the emails sent to about 8000 students who were enrolled at the Minnesota State University, Mankato during spring semester 2010. A Username and Password for the Zoomerang Survey website was obtained from the Department of Health Sciences. The survey questions were entered in to the electronic format. After obtaining the list of the student email account information from the Information Technology Services department, the survey was sent to them through an email with a link to the survey. A period of fifteen days was provided. The survey results were collected in the Zoomerang portal immediately after the participants finished submitting them. The data obtained was entered in to SPSS software and the data was analyzed by running descriptive statistics and frequencies. Initially, demographics of the sample were described and then the H1N1 influenza knowledge survey results were analyzed.
Demographic Characteristics of Participants

The survey was sent electronically to the students in February, 2010 and a total of fifteen days were provided for the students to respond to the questions. Two reminders were sent before the survey was closed on March 12th, 2010. A total of \( n=700 \) students replied the survey. The demographic characteristics of the students participating in the survey are presented in Table 1. Statistical analysis was performed using SPSS 14.0 student version program (2005). Tests for frequencies and means of responses were performed to identify similarities and variances between sample groups. ANOVA and t-tests were performed to determine interactions within and between groups and to determine where significant relationships exist.

Table 1

*Demographic Characteristics of the Sample*

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>212</td>
<td>30</td>
</tr>
<tr>
<td>Female</td>
<td>488</td>
<td>69.7</td>
</tr>
<tr>
<td><strong>Year in School</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Freshman</td>
<td>80</td>
<td>11.4</td>
</tr>
<tr>
<td>Sophomore</td>
<td>100</td>
<td>14.3</td>
</tr>
<tr>
<td>Junior</td>
<td>127</td>
<td>18.1</td>
</tr>
<tr>
<td>Senior</td>
<td>196</td>
<td>28.0</td>
</tr>
<tr>
<td>Graduate</td>
<td>197</td>
<td>28.1</td>
</tr>
</tbody>
</table>

*Source: Survey Results.*
The demographics data for n included 700 students where the age range of the participants was from 18-71 years, out of which the majority were from 19-24 years. The mean age of the participants was 25.23 with a standard deviation of 8.34. The majority of the participants were female (69.7 %), with males making up the remaining 30.3 percent. The participant’s year of study in the university was also determined. The majority of the students were graduates with 28.1%; second largest were seniors with 28%, followed by juniors with 18.1%, sophomores with 14.3% and freshmen with 11.4 %.

Results of the H1N1 Influenza Knowledge Survey

There were seventeen different questions in the survey that tried to identify the general knowledge of students regarding H1N1 influenza. Out of these, fifteen questions were binary questions requiring either “Yes” or “No” response; one was current knowledge and one was about the perception of threat of H1N1 influenza. SPSS software (Howell, 2006) was used to analyze all these responses. Participants’ responses were coded by giving 1 for correct answer and 0 for an incorrect answer. For the negative response correct answers, reverse scoring was done in order to properly calculate the knowledge score, by giving 1 for correct answer (response “No”) and 0 for incorrect answer (response “Yes”). All the correct and incorrect responses were identified and analyzed. A total knowledge score was calculated based on the responses to the given questions by the participants. A high total score indicated good knowledge about H1N1 influenza, while a low score indicated little knowledge. Scores could range from 6-14 as there were none between the knowledge scores of 0 to 6. The mean score of students’ knowledge was 12.69 with a standard deviation of 1.30. Three knowledge groups were
created with knowledge scores between 6-9 as Group 1, 10-12 as Group 2, and 13-14 as Group 3. Results of each research question and the responses are presented below.

Table 2

*Determination of Groups Based on H1N1 Knowledge Scores*

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>%</th>
<th>Cum.%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.00</td>
<td>2</td>
<td>.3</td>
<td>.3</td>
</tr>
<tr>
<td>7.00</td>
<td>1</td>
<td>.1</td>
<td>.5</td>
</tr>
<tr>
<td>8.00</td>
<td>3</td>
<td>.4</td>
<td>.9</td>
</tr>
<tr>
<td>9.00</td>
<td>13</td>
<td>1.9</td>
<td>2.9</td>
</tr>
<tr>
<td>Group 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10.00</td>
<td>19</td>
<td>2.7</td>
<td>5.8</td>
</tr>
<tr>
<td>11.00</td>
<td>60</td>
<td>8.6</td>
<td>15.1</td>
</tr>
<tr>
<td>12.00</td>
<td>138</td>
<td>19.7</td>
<td>36.3</td>
</tr>
<tr>
<td>Group 3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13.00</td>
<td>213</td>
<td>30.4</td>
<td>69.0</td>
</tr>
<tr>
<td>14.00</td>
<td>202</td>
<td>28.9</td>
<td></td>
</tr>
<tr>
<td>Sub total</td>
<td>651</td>
<td>93.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Missg 49 7.0
Total 700 100.0

*Source: Survey Results.*

**Research Question 1**

What is the current knowledge of students regarding H1N1 influenza? This research question of the survey (Question No. 4) asked students about their current knowledge about H1N1 influenza. To determine the answer to this question, four choices were given and the participants chose the best option. The choices were: 1 = I have no knowledge about H1N1 influenza; 2 = I have very little knowledge about H1N1
influenza; 3 = I know something about H1N1 influenza; and 4 = I know a lot about H1N1 influenza. The majority of the students responded that they know something about H1N1 influenza. The results obtained were: 67% have some knowledge, 17% have a lot of knowledge, 15% have very little knowledge and 1% has no knowledge about H1N1 influenza. Self reported knowledge was obtained from this question in the influenza survey and computed knowledge was calculated by total score from the questions from 7 through 20.

Table 3

*Perceptions of H1N1 Knowledge Scores*

<table>
<thead>
<tr>
<th>Knowledge</th>
<th>N</th>
<th>%</th>
<th>Cum. %</th>
</tr>
</thead>
<tbody>
<tr>
<td>I have no knowledge about H1N1 influenza</td>
<td>5</td>
<td>.7</td>
<td>.7</td>
</tr>
<tr>
<td>I know very little about H1N1 influenza</td>
<td>107</td>
<td>15.3</td>
<td>16.0</td>
</tr>
<tr>
<td>I know something about H1N1 influenza</td>
<td>470</td>
<td>67.1</td>
<td>83.1</td>
</tr>
<tr>
<td>I know a lot about H1N1 influenza</td>
<td>118</td>
<td>16.9</td>
<td>100.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>700</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

Source: Survey Results.

In order to further investigate this research question, a total score for all items was computed by using the questions from seven through twenty. Participants’ responses were coded by giving 1 for correct answer and 0 for an incorrect answer. For the negative response correct answers, reverse scoring was done in order to properly calculate the
knowledge score, by giving 1 for correct answer (response “No”) and 0 for incorrect answer (response “Yes”). The mean score of students’ knowledge was 12.69 and standard deviation was 1.30, with scores ranging from 6-14. To analyze the variance of the knowledge levels between different groups, a 1*3 ANOVA was done between the self reported knowledge and the computed knowledge perception as given from Table 5, which indicated that there is significant difference (p≤ .01) in the level of knowledge perception between the different groups. For convenience, students who answered ‘no knowledge’ and ‘very little knowledge’ were combined in to group 1, students who answered ‘know something’ as group 2 and who answered ‘know a lot’ as group 3. Post hoc test (Student- Newman- Keuls) was used in conjunction with one way ANOVA to determine which specific group was statistically different from the other two.

Table 4

*Perception of Knowledge of H1N1 by Group*

<table>
<thead>
<tr>
<th>Grps</th>
<th>N</th>
<th>Mean</th>
<th>S. D.</th>
<th>95% CI Lower</th>
<th>95% CI Upper</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.00</td>
<td>101</td>
<td>12.23</td>
<td>1.48</td>
<td>11.94</td>
<td>12.53</td>
<td>7.00</td>
<td>14.00</td>
</tr>
<tr>
<td>2.00</td>
<td>438</td>
<td>12.72</td>
<td>1.2</td>
<td>12.60</td>
<td>12.84</td>
<td>6.00</td>
<td>14.00</td>
</tr>
<tr>
<td>3.00</td>
<td>112</td>
<td>12.99</td>
<td>1.09</td>
<td>12.78</td>
<td>13.19</td>
<td>9.00</td>
<td>14.00</td>
</tr>
<tr>
<td>Total</td>
<td>651</td>
<td>12.69</td>
<td>1.30</td>
<td>12.59</td>
<td>12.79</td>
<td>6.00</td>
<td>14.00</td>
</tr>
</tbody>
</table>

Source: Survey Results.
Table 5

*Analysis of Variance (ANOVA) of Knowledge Perception of H1N1 by Group*

<table>
<thead>
<tr>
<th>ANOVA</th>
<th>SS</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>31.250</td>
<td>2</td>
<td>15.63</td>
<td>9.416</td>
<td>.000</td>
</tr>
<tr>
<td>Within Groups</td>
<td>1075.306</td>
<td>648</td>
<td>1.66</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>1106.556</td>
<td>650</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Survey Results.

Table 6

*Post-Hoc Analysis of Knowledge Perception of H1N1 by Group*

<table>
<thead>
<tr>
<th>Knowledge Perception</th>
<th>N</th>
<th>Subset for alpha = .05</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>1.00</td>
<td>101</td>
<td>12.237</td>
</tr>
<tr>
<td>2.00</td>
<td>438</td>
<td></td>
</tr>
<tr>
<td>3.00</td>
<td>112</td>
<td></td>
</tr>
<tr>
<td>Sig.</td>
<td></td>
<td>1.000</td>
</tr>
</tbody>
</table>

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 142.095.
b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

Source: Survey Results.

There were significant levels of relationship between knowledge and other factors in the study. There was a significant relationship between gender and the knowledge about H1N1 influenza. An analysis of means for the knowledge levels of H1N1 showed that females with a mean of 12.81 and a standard deviation of 1.23 has significantly (p<.01) high knowledge compared to the males with knowledge mean of 12.41 with a
standard deviation of 1.43. Though the independent t-test done between the knowledge levels and the independent variable, gender was significant according to the survey data, there was no practical significance of difference between the two, outside this survey.

To analyze the variance of the knowledge levels between the students in different school years a one way ANOVA was done between the knowledge levels and the year in school and the results are given in Table 8 which indicated that there is significant difference (p< .01) in the level of knowledge perception between the different groups of the students who were in different years in school.

**Table 7**

*Knowledge of H1N1 by Year in School*

<table>
<thead>
<tr>
<th>Yr in School</th>
<th>N</th>
<th>Mean</th>
<th>S. D.</th>
<th>95% CI</th>
<th>Lower</th>
<th>Upper</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Freshman</td>
<td>78</td>
<td>12.39</td>
<td>1.32</td>
<td>12.07</td>
<td>12.70</td>
<td></td>
</tr>
<tr>
<td>Sophomore</td>
<td>93</td>
<td>12.47</td>
<td>1.49</td>
<td>12.16</td>
<td>12.78</td>
<td></td>
</tr>
<tr>
<td>Junior</td>
<td>119</td>
<td>12.60</td>
<td>1.42</td>
<td>12.34</td>
<td>12.86</td>
<td></td>
</tr>
<tr>
<td>Senior</td>
<td>180</td>
<td>12.91</td>
<td>1.10</td>
<td>12.74</td>
<td>13.07</td>
<td></td>
</tr>
<tr>
<td>Graduate</td>
<td>181</td>
<td>12.77</td>
<td>1.27</td>
<td>12.58</td>
<td>12.96</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>651</td>
<td>12.70</td>
<td>1.30</td>
<td>12.59</td>
<td>12.80</td>
<td></td>
</tr>
</tbody>
</table>

Source: Survey Results
<table>
<thead>
<tr>
<th>Knowledge</th>
<th>SS</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>21.96</td>
<td>4</td>
<td>5.49</td>
<td>3.271</td>
<td>.011</td>
</tr>
<tr>
<td>Within Groups</td>
<td>1084.59</td>
<td>646</td>
<td>1.68</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>1106.55</td>
<td>650</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Survey Results.

In the survey, a question was asked to test the experience of the students regarding H1N1 influenza by asking whether they knew anyone in the United States who was infected with H1N1. An independent t-test was done between the knowledge levels of H1N1 and the data obtained from this experience question. An analysis of means for the knowledge levels of H1N1 showed that experienced students with a mean of 12.82 and a standard deviation of 1.17 has significantly ($p \leq .01$) high knowledge compared to the students with no prior experience, with knowledge mean of 12.38 with a standard deviation of 1.54.

**Research Questions 2, 3, 4 and 5**

What kind of general information do students have regarding symptoms, transmission, treatment and prevention of H1N1 influenza? In order to get an answer for these research questions, several general knowledge questions were asked in the survey. Questions from 7 to 20 on H1N1 influenza knowledge reflected these research questions. All these questions were binary questions with either “Yes” or “No” responses. These
questions were constructed to find out students’ knowledge about how H1N1 influenza is contracted and transmitted. The researcher also tried to identify students’ knowledge about symptoms, treatment and prevention of H1N1 influenza. The findings of the survey conducted are described in Table 9.

**Table 9**

*Knowledge on H1N1 Transmission, Symptoms, Treatment and Prevention*

<table>
<thead>
<tr>
<th></th>
<th>n</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transmission</td>
<td>698</td>
<td>0.00</td>
<td>5.00</td>
<td>4.55</td>
</tr>
<tr>
<td>Symptoms</td>
<td>695</td>
<td>0.00</td>
<td>3.00</td>
<td>2.72</td>
</tr>
<tr>
<td>Treatment</td>
<td>694</td>
<td>0.00</td>
<td>1.00</td>
<td>0.69</td>
</tr>
<tr>
<td>Prevention</td>
<td>698</td>
<td>0.00</td>
<td>5.00</td>
<td>4.70</td>
</tr>
<tr>
<td>Total Score</td>
<td>694</td>
<td>0.00</td>
<td>14.00</td>
<td>12.66</td>
</tr>
</tbody>
</table>

Source: Survey Results.

In assessing the general knowledge about H1N1 influenza including transmission, symptoms, treatment and prevention, students at Minnesota State, Mankato have demonstrated very high knowledge. While comparing participants’ knowledge among these variables, most of them demonstrated good knowledge about the preventive aspects of H1N1 influenza which is proved by the obtained highest score of 4.70. Statistically, there was no significant difference in the knowledge of the students between males and females, between the different years in school or by their age, but in numbers there were few students who were more knowledgeable than the others about H1N1 influenza.
Research Questions 6 and 7

What is the students’ perceived level of threat for contacting H1N1 influenza? and Does the students’ knowledge about H1N1 influenza vary with their perceived level of threat for contacting H1N1 influenza? These questions determined whether students viewed H1N1 influenza as a threat to their health. Students were asked to answer, on a scale of 1-5, how much they believed H1N1 influenza is a threat to their health. The scores were arranged as follows: 1 = Not a Threat; 2 = Somewhat Threat; 3 = Not Sure; 4 = A Significant Threat; and 5 = A major threat. A majority of the students (48.6%) believed that H1N1 is somewhat threat, 30.6% responded as not a threat, 10.9% viewed H1N1 influenza as a significant threat, 8.6% were not sure about this and 1.3% thought that H1N1 influenza is a major threat. This result indicates that Majority of the students did not find H1N1 influenza as a major threat to their health. Out of total 700 students who participated in the survey, only 1.3%, i.e. 9 students viewed H1N1 influenza as a major threat. This signifies that there is lack of adequate information about H1N1 influenza among university students.
Table 10

*Perceived Level of Threat*

<table>
<thead>
<tr>
<th>Perceived Level of Threat</th>
<th>N</th>
<th>%</th>
<th>Valid %</th>
<th>Cum%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not A Threat</td>
<td>214</td>
<td>30.6</td>
<td>30.6</td>
<td>30.6</td>
</tr>
<tr>
<td>Somewhat Threat</td>
<td>340</td>
<td>48.6</td>
<td>48.6</td>
<td>79.3</td>
</tr>
<tr>
<td>Not Sure</td>
<td>60</td>
<td>8.6</td>
<td>8.6</td>
<td>87.8</td>
</tr>
<tr>
<td>A Significant Threat</td>
<td>76</td>
<td>10.9</td>
<td>10.9</td>
<td>98.7</td>
</tr>
<tr>
<td>A major threat</td>
<td>9</td>
<td>1.3</td>
<td>1.3</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>699</td>
<td>99.9</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

Source: Survey Results.

In order to analyze whether the students’ knowledge about H1N1 influenza vary with their perceived level of threat of contracting the disease, an ANOVA was done between the various groups in the data obtained from the perceived level of threat question and their knowledge levels and the results are given in Table 12 which indicated that there is no significant difference (.477) between the different groups of the students whose levels of threat perception about H1N1 influenza were different. Thus we can conclude that the students’ knowledge about H1N1 influenza did not vary with their perceived level of threat for contacting H1N1 influenza and so the hypothesis- Students’ knowledge about H1N1 influenza varies with their perceived level of threat for contracting H1N1 influenza, mentioned in Chapter one is rejected.
Table 11

Level of Threat of H1N1

<table>
<thead>
<tr>
<th>Threat levels</th>
<th>N</th>
<th>Mean</th>
<th>S. D.</th>
<th>95% CI</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Lower</td>
<td>Upper</td>
<td></td>
</tr>
<tr>
<td>Not a Threat</td>
<td>200</td>
<td>12.81</td>
<td>1.17</td>
<td>12.64</td>
<td>9.00</td>
<td>14.00</td>
</tr>
<tr>
<td>Somewhat Threat</td>
<td>320</td>
<td>12.64</td>
<td>1.36</td>
<td>12.49</td>
<td>6.00</td>
<td>14.00</td>
</tr>
<tr>
<td>Not Sure</td>
<td>54</td>
<td>12.59</td>
<td>1.25</td>
<td>12.25</td>
<td>10.00</td>
<td>14.00</td>
</tr>
<tr>
<td>Sign &amp; Major Threat</td>
<td>76</td>
<td>12.65</td>
<td>1.42</td>
<td>12.33</td>
<td>9.00</td>
<td>14.00</td>
</tr>
<tr>
<td>Total</td>
<td>650</td>
<td>12.69</td>
<td>1.30</td>
<td>12.59</td>
<td>6.00</td>
<td>14.00</td>
</tr>
</tbody>
</table>

Source: SurveyResults.

Table 12

Analysis of Variance (ANOVA) of Level of Threat of H1N1

<table>
<thead>
<tr>
<th></th>
<th>Sum of</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Btwn Groups</td>
<td>4.250</td>
<td>3</td>
<td>1.42</td>
<td>.832</td>
<td>.477</td>
</tr>
<tr>
<td>Within Groups</td>
<td>1100.594</td>
<td>646</td>
<td>1.70</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>1104.845</td>
<td>649</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Survey Results.
Table 13

Tests of Between-Groups Effects of H1N1

<table>
<thead>
<tr>
<th>Source</th>
<th>Dependant Variable</th>
<th>F</th>
<th>p-value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge Perception</td>
<td>Level of Knowledge</td>
<td>9.416</td>
<td>0.000</td>
</tr>
<tr>
<td>Year in School</td>
<td>Level of Knowledge</td>
<td>3.271</td>
<td>0.011</td>
</tr>
<tr>
<td>Level of Threat</td>
<td>Level of Knowledge</td>
<td>0.832</td>
<td>0.477</td>
</tr>
<tr>
<td>Gender</td>
<td>Level of Knowledge</td>
<td>7.071</td>
<td>0.008</td>
</tr>
<tr>
<td>Previous Experience</td>
<td>Level of Knowledge</td>
<td>24.399</td>
<td>0.000</td>
</tr>
</tbody>
</table>

Note: *p<0.05- significant, **p<0.01- highly significant, ***p<0.001- very highly significant

Source: Survey Results.

Summary

The results of the study showed that the students at Minnesota State University, Mankato have very high knowledge about H1N1 influenza. The majority of the students know about symptoms, transmission, treatment and prevention of H1N1 influenza. However, most of them did not find H1N1 as a major threat to their health. All the scores on the general knowledge questions about H1N1 influenza were high, which indicates that the students are highly aware of this disease. Students’ self-reported knowledge and computed knowledge from the survey showed a significant correlation. Students with previous experience about H1N1 influenza also demonstrated high knowledge about this disease compared to the students without any previous experience. But, the students’ knowledge about H1N1 influenza did not vary with their perceived level of threat for contracting H1N1 influenza. Statistically, there was no significant difference in the
knowledge of the students between males and females and between the different years in school, but in numbers there were few students who were more knowledgeable than the rest of the students about H1N1 influenza.
Chapter Five: Summary, Conclusions and Recommendations

Introduction

H1N1 flu is a new influenza virus that caused the pandemic in 2009. This new virus was first detected in people in the United States in April 2009. The virus spreads from person-to-person in the same way as regular seasonal influenza viruses spread. While the vast majority of people who have contracted H1N1 flu have recovered without needing medical treatment, hospitalizations and deaths have occurred. The purpose of the study was to find out if the Minnesota State, Mankato University students have adequate knowledge of the disease and whether or not the students viewed H1N1 influenza as a threat to their health. This study also investigated knowledge about possible preventive measures that can be taken among the students.

Summary

This study on H1N1 influenza showed that H1N1 virus has a high potential to cause another pandemic, in the near future, if proper precautions are not taken. The literature review showed the worldwide spread of the pandemic that began in March 2009 that was caused by H1N1 influenza A virus. As of October 11, 2009, over 399,000 laboratory-confirmed cases had been reported in numerous countries (WHO, 2009b). Since early July 2009, the World Health Organization has ceased tracking the number of cases, since it has become extremely difficult for countries to continue such monitoring in the setting of widespread community transmission. On June 11, 2009, the World Health Organization raised its pandemic alert level to the highest level, phase 6, indicating widespread community transmission on at least two continents (CDC, 2009a). With
increasing world population, the exact severity of the current pandemic is still not clear. The nature of the virus, migration of the world population and limited supply of the vaccine has made this virus a threat to public health (Osterholm, 2006). Most of the countries were not prepared for this pandemic and the developed countries that were aware of the situation did not have enough resources (vaccines and antiviral drugs) to tackle this situation. In this context, massive public awareness and knowledge about the disease may help reduce the number of causalities during a pandemic (CDC, 2009a).

This study attempted to find out how much university students know about H1N1 influenza. The results of the study showed that the students at Minnesota State University, Mankato have a very high level of knowledge about H1N1 influenza. The majority of the students know about symptoms, transmission, treatment and prevention of H1N1 influenza. However, most of them did not find H1N1 as a major threat to their health. All the scores on the general knowledge questions about H1N1 influenza were high, which indicates that the students are quite aware of this disease. Students’ self-reported knowledge and computed knowledge from the survey results showed a significant correlation. Students with previous experience about H1N1 influenza also demonstrated high knowledge about this disease compared to the students without any previous experience. The hypothesis question whether Students’ knowledge about H1N1 influenza varies with their perceived level of threat for contacting H1N1 influenza was also tested. The study showed that the students’ knowledge about H1N1 influenza did not vary with their perceived level of threat for contacting H1N1 influenza. Statistically, there was no significant difference regarding the knowledge of students between males and females and between the different years in school, but in numbers there were few
students who were more knowledgeable than the rest of the students about H1N1 influenza.

Conclusions

The research on H1N1 influenza knowledge among university students showed that students at Minnesota State University, Mankato have very good knowledge about H1N1 influenza. However, most of the students did not feel it as an immediate threat to their health. The information about the mode of transmission, clinical features, preventive measures, vaccination and treatment about H1N1 influenza should be made available to the students, so that they can protect themselves from any future pandemics by the same virus or a different virus from the influenza species.

The research information provided by WHO and CDC showed that H1N1 influenza virus could be a cause for the next pandemic, not necessarily in its current form, but with few mutations in the structure of the virus, in the near future. As university students are among the risk group, thus if a pandemic arises in the future, students have to be well informed about this disease. During the early stages of the 2009 pandemic, even in the developed countries like the United States, not enough preventive measures or effective treatment was available. The shortage of vaccine supplies and enough medicines to effectively treat the disease was clearly evident, if the pandemic have had been rampant for some more time. Hospitals and health care agencies were not ready to tackle the disease during the first few months of the 2009 pandemic. Though university students might have received most of their information about H1N1 influenza from television, newspapers, student health services and emails, there should be some other source of
information within the university, where health officials could approach students directly and provide information available on the WHO, CDC, MDH websites and to students in their classes with the help of their instructors.

**Limitations**

As noted previously, this study was limited by the following:

- The participants in this study were selected from a nonrandom sample.
- The survey was conducted at different times and on different days, which leaves the possibility that all the responses may not be uniform.
- As the information about H1N1 influenza continues to change over time, based on the latest studies and research, the current information may no longer be accurate compared to the information mentioned here.
- The survey was completed electronically through an email and the email survey was sent only to 8000 current students at MSU, Mankato.

In addition to the above limitations, which were identified before the survey, some other factors were also identified as limitations, after the survey was done. The new additional limitations are given below:

**Time of the survey.** The survey was done after the H1N1 2009 pandemic subsided and so there might have been many changes in the knowledge and perception of the students regarding H1N1 by the time, the data was collected. The results of the survey are reflective of only the sample group that participated in the survey and may not have
represented the knowledge levels of all the students at Minnesota State University, Mankato.

**Self-reported data.** One limitation inherent in all survey research is self-reported data. Participants sometimes feel compelled to impress the investigator, by answering the positive responses more than the negative responses. This limitation was compensated in this survey by including six negative response knowledge questions in the survey. Additionally, anonymous data collection technique was followed to limit this limitation to its minimum.

**Overrepresentation of particular group.** Another limitation related to the survey was that the participants were primarily female students and most of them were seniors or graduate students. This was because among the n=700 students who opted to participated in the survey, most of them were from the above mentioned groups.

**Recommendations**

**Education about H1N1 influenza.** The students of Minnesota State University, Mankato need to be educated about H1N1 influenza. This has to be included in their general health education classes. Some random lectures and information programs have to be introduced within the university campus and also for the first few minutes of their regular classes with the help of their instructors. Instructors are encouraged to include couple of health related questions pertaining to the latest infections and pandemics, in their regular classroom or online quizzes and tests. Students should be encouraged to participate and discuss in health debates and competitions that should be conducted at least twice in an academic year. University newspapers and the local newspapers should
publish regular articles and information about the H1N1 pandemic and the latest information as given from the WHO, CDC, MDH, etc websites. There should be regular discussions and special programs about the pandemics and other health related issues on the university radio. Local television network should inform people about this deadly virus on a regular basis. Student Health Services should be given more funds to upgrade itself to a temporary in-patient services hospital, with few beds, to accommodate the severely ill patients during such pandemics.

**Focus on preventive measures.** Basic hand washing is one of the best techniques to prevent diseases of all kinds. Soap and warm water is good to wash hands but proper techniques of hand washing including educating the students to wash their hands for fifteen seconds should be encouraged. It is especially important to encourage the students to wash their hands after likely exposure, before handling food or touching their nose, mouth or eyelids and after working at a public computer station. When there is lack of water during travel, students are encouraged to carry alcohol based hand sanitizers, as these alcohol based sanitizers are better than soap and water in killing the bacteria, viruses and other microorganisms.

Personal hygiene is another important step in preventing the transmission of respiratory infections. Covering the nose and mouth while coughing or sneezing with the shirtsleeve or paper towel is an important practice in preventing the spread of respiratory diseases. Used tissues or napkins should be discarded properly in a disposable container. Getting vaccinated for the seasonal flu as well as H1N1 influenza not only protects one from the diseases, but also helps in developing good immunity in the community to fight
against this deadly virus. The immunocompromised individuals are highly benefited with these vaccinations.

During a pandemic, N95 facemasks usage is highly encouraged along with taking other regular preventive measures as they can effectively protect us from inhaling airborne particles from the sneezes and coughs of the infected people and also from the outer environment. These N95 masks are available easily in the market and in the drug stores.

Focus on vaccine and antiviral drugs. During the 2009 N1N1 influenza pandemic, there was a shortage of vaccine during the initial few months, as there were problems with the production of the effective vaccine and in sufficient quantities to be available to all the countries in the world. Hence it was available only in the developed countries first and later to the developing countries. Though the cost of manufacturing vaccine was very high and many developing countries simply could not afford it, WHO and other health organizations stepped in to make the vaccine available to almost all the countries. With this experience, these health organizations and the governments should consider research projects to constantly work on the future infections and pandemics so that we can prepare ourselves to face any new pandemic in future effectively.

Antiviral drugs are very expensive and it would be very difficult to meet the demands of the countries all over the world during a pandemic. More support and commitment is needed from every sector to produce adequate antiviral drugs and store them to be used in the instance of a new pandemic. As the manufacturing process of these antiviral drugs is very complex and might take many years to produce enough drugs to
treat significant world population, all the government agencies and nonprofit organizations should step in to help in storing enough drugs for the future use.

**Prior planning and preparation.** During a pandemic, a valuable amount of time is always lost in thinking, planning and in preparing to face it effectively, during which time the pandemic can spread to significant number of countries. Hence necessary care should be taken by WHO as well as the government agencies to formulate a task force team to effectively deal with such health emergencies and prevent them from spreading to other parts of the world. Health officials and health service teams should be provided with enough resources needed to take care of the infections if any outbreak occurs. Finally, an overall social and political commitment is always needed from all the sectors of the society to fight against this H1N1 virus, to prevent from future pandemics to occur.

**Further Study**

If I were to continue this thesis work further, I would expand it to study the effectiveness of H1N1 vaccination against seasonal influenza besides H1N1 influenza. I would also study the side effects of the vaccine and whether or not it has some of the similar side effects of seasonal influenza vaccine, as it was developed very recently. I would also consider expanding the current knowledge and awareness about H1N1 influenza study to next influenza season in a larger and broader sample to observe the changes in the perceptions and attitudes of the students about H1N1 influenza, if there are any. Finally, I would consider studying the various environmental, genetic, social, immunological, financial and other associated factors that would help us in understanding the emergence of new influenza pandemics.
References


H1N1 influenza (H1N1) Knowledge Survey

This survey is to assess your knowledge about H1N1 influenza. Your participation is voluntary. You may withdraw your participation in the survey at any time. Individual responses will not be identified. Your response will be used only for research purposes. Your grade will not be affected whether you participate or not in the survey. Confidentiality (anonymity) will be maintained. There is no potential risk or danger in completely filling out this survey.

Instructions: Please fill in your responses for the questions provided.

1. Age__________

2. Gender: Male__________Female___________

3. Year in School:
   _______Freshman__________Sophomore________Junior________Senior__________Graduate

4. How would you describe your current knowledge of H1N1 influenza? (Check one)
   _____I have no knowledge about H1N1 influenza
   _____I know very little about H1N1 influenza
   _____I know something about H1N1 influenza
   _____I know a lot about H1N1 influenza
5. on a scale of 1-5, do you see H1N1 influenza as a threat to your health? (Circle one)

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not a Threat</td>
<td>Somewhat Threat</td>
<td>Not sure</td>
<td>A significant Threat</td>
<td>A major Threat</td>
</tr>
</tbody>
</table>

6. Do you know anyone who has been affected by H1N1 influenza in the United States?
   Yes_____    No_____  

7. Can people contract H1N1 influenza from pigs and other animals?
   Yes_____    No_____  

8. Can people contract H1N1 influenza from another person?
   Yes_____    No_____  

9. Can people contract H1N1 influenza by eating pork?
   Yes_____    No_____  

10. Can people contract H1N1 influenza from inhaling particles that contain the H1N1 influenza virus?
    Yes_____    No_____  

11. Are pig farm (hog lot) farmers more likely than other people to have the H1N1 influenza virus?
    Yes_____    No_____  

12. Are symptoms of H1N1 influenza similar to other influenzas?
    Yes_____    No_____
13. Are muscle aches a common symptom of H1N1 influenza?
   Yes_____                    No_____  

14. Is severe cough a common symptom of H1N1 influenza?
   Yes_____                    No_____  

15. Is H1N1 influenza preventable?
   Yes_____                    No_____  

16. Are antibiotics commonly used to treat H1N1 influenza?
   Yes_____                    No_____  

17. Is a vaccine currently available for H1N1 influenza?
   Yes_____                    No_____  

18. Can regular seasonal flu shots protect you from H1N1 influenza?
   Yes_____                    No_____  

19. Can proper hand washing protect you from H1N1 influenza?
   Yes_____                    No_____  

20. Can sneezing properly in a paper towel or tissue paper protect you or others from H1N1 influenza?
   Yes_____                    No_____  

Thank you very much for completing this survey!
Additional comments are welcome.
Appendix B

List of Figures

Figure 1. Emergence of Influenza A (H1N1) Virus from Birds and Swine into Humans

The diagram shows the important events and processes in the emergence of influenza A (H1N1) viruses during the past 91 years. Avian, swine, and human populations are represented in the top, middle, and bottom of the diagram, respectively. Epidemic or zoonotic viruses are shown as wide horizontal arrows (white for avian viruses, light blue or pink for swine viruses, and dark blue for human viruses). Cross-species transmissions are shown as vertical dashed lines, with thick lines for transfers that gave rise to sustained transmission in the new host and thin lines for those that were transient and resulted in a self-limited number of cases. Principal dates are shown along the bottom of the diagram. The disappearance of H1N1 in 1957 most likely represents competition by the emerging pandemic H2N2 strain in the face of population immunity to H1N1. The reemergence in 1977 is unexplained and probably represents reintroduction to humans from a laboratory source.
Graph A shows the cumulative estimated 2009 H1N1 cases by age group (0-17 years old, 18-64 years old, and 65 years and older) in the United States for each of the time periods that CDC provided case estimates and illustrates that people in the 18-64 years age group were most heavily impacted by 2009 H1N1 disease followed by people in the 0-17 years age group. People 65 years of age and older were relatively less affected by 2009 H1N1 illness.
Figure 3. CDC Estimates of 2009 H1N1 Deaths in the U.S. by Age Group (April 2009 - March 13, 2010)

Graph E shows the cumulative estimated 2009 H1N1 deaths by age group (0-17 years old, 18-64 years old, and 65 years and older) in the United States for each of the time periods that CDC provided estimates of deaths and illustrates, again, that people in the 18-64 years age group were relatively more affected by 2009 H1N1 related deaths than people in other age groups.

Data based on CDC estimates of 2009 H1N1 deaths using statistical modeling [http://www.cdc.gov/h1n1flu/estimates_2009_h1n1.htm](http://www.cdc.gov/h1n1flu/estimates_2009_h1n1.htm)
Figure 4. Number of Laboratory Confirmed Cases and Deaths of H1N1 as of May 3rd, 2009

New Human influenza A (H1N1)
Number of laboratory confirmed cases and deaths

Status as of 3 May 2009
16:00 GMT

Total: 898 cases
20 deaths

As reported by National Focal Points

The boundaries and names shown and the designations used on this map do not imply the expression of any opinion whatsoever on the part of the World Health Organization concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted lines on maps represent approximate border lines for which there may be no yet be full agreement.

Map produced: 3 May 2009 18:17 CET

Data Source: World Health Organization
Map Production: Public Health Information and Geographic Information Systems (GIS)
World Health Organization

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Figure 5. Number of Laboratory Confirmed Cases and Deaths of H1N1 as of May 25th, 2009

New Influenza A (H1N1),
Number of laboratory confirmed cases and deaths as reported to WHO
Status as of 25 May 2009
8:00 GMT

The boundaries and names shown and the designations used on this map do not imply the expression of any opinion whatsoever on the part of the World Health Organization concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted lines on maps represent approximate border lines for which there may not yet be full agreement.

Map produced: 25 May 2009 08:20 GMT

Data Source: World Health Organization
Map Production: Public Health Information and Geographic Information Systems (GIS)
World Health Organization

World Health Organization
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Figure 6. Pandemic (H1N1) 2009 Influenza and Avian (H5N1) Influenza as of April 20th, 2010
Appendix C

IRB Approval

John A. Romas, Ph.D.
Department of Health Sciences
213 Highland North
Minnesota State University, Mankato
Mankato MN 56001

Suneel Kumar Parthareddy
250 Centennial Student Union
Minnesota State University, Mankato
Mankato MN 56001

February 16, 2010

Dear John and Suneel:

Re: IRB Proposal. Log entitled "Knowledge and Awareness about H1N1 Influenza (Swine Flu) among University Students"

Your IRB Proposal has been approved as of February 16, 2010. On behalf of the Institutional Review Board I wish you success with your study. Remember that you must seek approval for any changes in your study, its design, funding source, consent process, or any part of the study that may affect participants in the study. Should any of the participants in your study suffer a research-related injury or other harmful outcome, you are required to report them to the IRB as soon as possible.

The approval of your study is for one calendar year from the approval date. When you complete your data collection, or should you discontinue your study, you must notify the IRB. Please include your log number with any correspondence with the IRB.

This approval is considered final when the full IRB approves the monthly decisions and active log. The IRB reserves the right to review each study as part of its continuing review process. Continuing reviews are usually scheduled. However, under some conditions the IRB may choose not to announce a continuing review.

Sincerely,

Patricia Hargrove
Patricia Hargrove, Ph.D.
IRB Coordinator

CC: File