KNOWLEDGE, ATTITUDES AND MANAGEMENT PRACTICES ON VIRAL INFLUENZA INFECTIONS AMONG STUDENTS AND TEACHERS IN SECONDARY SCHOOLS, NAIROBI WEST DISTRICTS, KENYA.

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A RESEARCH DISSERTATION SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER IN PUBLIC HEALTH OF THE UNIVERSITY OF NAIROBI

JULY 2012

DECLARATION

I Dr. Phillip M. Muthoka do hereby declare that this dissertation is my original work and has not been presented to any institution for the purpose of obtaining a degree, to the best of my knowledge.

Signature…….Date……..

This dissertation has been submitted for examination with our approval as School of public health, University of Nairobi research supervisors

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DEDICATION

This dissertation is dedicated to my wife, Grace K. Nyambura and our daughters, Magdalene Mwikali, Winfred Wanjiru and Cynthia Wanza for their moral support and encouragement. It is also dedicated to my colleagues, Charles Nzioka, David Mutonga, Rosalia Kalani, Caroline Maina, Esther Kathini and all the DDSRS officers for their valuable support and encouragement

This far the Lord has brought me.

ACKNOWLEDGEMENT

I would like to acknowledge the following:

God, with whom all things are possible

My supervisors, Dr Dismas Ongore and Ms Mary Kinoti for guiding and giving me valuable advise that led to the completion of this work

The Episurveyor team, led by Yusuf Ajack for enabling us to collect data using this program, Gedion Emukule , for giving valuable advice in data analysis, Mr. Lambert Nyabola who gave me “fatherly” encouragement, Charles Njuguna and Zephania Irura for valuable advice in choice of topic, initial proposal development and encouragement all through the process and others whom may not have been mentioned here who prayed for me , or encouraged me in one way or another

This work would not have been possible without each one of you. Thank you all for investing in me.

God bless you always

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ABSTRACT

Influenza is an infection of the human respiratory tract which is caused by influenza viruses type A, B and C. It causes significant morbidity in Kenya, leading to a lot of lost time of productive work and school absenteeism for children. The cause of influenza, its mode of transmission; management, prevention and control are not well understood in Kenya. This study was carried out to describe the knowledge, attitudes and management practices on viral influenza infections among secondary schools in Nairobi West Districts, Kenya.

The overall objective of the study was to determine the knowledge, attitudes and management practices (KAP) about the cause, transmission, management, prevention and control of viral influenza infections among secondary school students and staff in Nairobi West District in Kenya. The design of the study was cross-sectional involving 343 student respondents from 9 secondary schools, 3 district education officers, and 9 school principals. Data was collected using a closed ended questionnaire and KII guide.

Most of the respondents were in the 15-19 year's age-group (89%). Majority of the respondents interviewed did not know that viruses cause influenza and had a lot of misconceptions on the cause(s) of influenza. Respondents got information about influenza from the television (41%), class teacher (40%), newspaper (38%), and radio (27%), in that order. More than a third (36.4 %) of the respondents were aware that a seasonal influenza vaccine was available in Kenya. Higher educational status (superior class in school) in our cohort was a significantly negative predictor of the good management practice of visiting a health care provider when sick with influenza, showing that educational status alone does not determine behavior.

In this study, the girls had significantly better prevention and control practices for influenza infections compared to the boys .Overall, about two thirds (62.4%)t of the respondents did not know the correct prevention and control practices of influenza infections.

Of the respondents who knew the cause of influenza, about 64% did not practice the correct prevention

and control practices. The study found that, age, sex, and level of education (as a proxy of socio-economic status) did not predict knowledge, attitudes or management practices of influenza infections. The majority of the respondents, (81.4%) felt that influenza was an important public health problem in Kenya. There was a statistically significant relationship between attitudes and management practices for influenza infections

The research concluded that most of the respondents in this study were in the 15-19 years age-group. A majority of them did not know that viruses cause influenza infections. Of interest in this study, higher educational status (Superior class in school) was a significant negative predictor of the correct management practice of influenza infections, showing that educational status alone does not determine behaviors.

In this study, the girl respondents had significantly better prevention and control practices for influenza infections compared to the boys. However, most of the respondents did not know the correct prevention and control practices of influenza infections. There was a statistically significant relationship between attitudes and management practices for influenza infections as those who felt influenza was an important public health problem, had better management practices for these infections. Respondents who mentioned that they received current information on influenza from their class teachers had significantly better management practices for influenza compared to those who did not. Similarly, the respondents who received information on influenza through media sources had significantly better management practices for influenza infection compared to those who did not.

The researcher recommends that:

1. There is need to develop appropriate IEC materials or educational materials on the correct management practice for influenza infections and include these in all classes as part of the school health program.

2. There is need to include in the school health program the correct prevention and control practices of influenza infections.

3. Through the school health program, there is need to improve the attitudes on the health impact of influenza infections among the respondents as this is likely going to improve their management practices of these infections.

4. There is need to develop influenza infections information and disseminate it through the various media channels, preferably during increased influenza activity seasons.

LIST OF ABBREVIATION AND ACRONYMS

AI	-	Avian Influenza
AOP	-	Annual Operation Plan
AED	-	American Education Department
CDC	-	Centers for Disease Control and Prevention
DDSR	-	Division of Disease Surveillanmce and Response
FAO	-	Food and Agricultural Association
FGD	-	Focus Group Discussion
HCW	-	Health Care Worker
HPAI	-	Highly pathogenic avian influenza
IEC	-	Information, Education and Communication
IEIP	-	International Emerging Infections Program
ILI	-	Influenza Like Illness
KAP	-	Knowledge, Attitude and Practice
KEMRI	-	Kenya Medical Research Institute
KII	-	Key Informant Interview
LPAI	-	Lowly Pathogenic Avian Influenza
MMWR	-	Morbidity and mortality weekly report-USA
MoH	-	Ministry of Health
MoLD	-	Ministry of Livestock Development
MoMS	-	Ministry of Medical Services
MoPHS	-	Ministry of Public Health and Sanitation
OIE	-	International Organization of Epizootics
SARI	-	Severe Acute Respiratory Illness
SSI	-	Semi-Structured Interview
UN	-	United Nations

UNICEF	-	United Nation Children's Fund
URIs	-	Upper Respiratory Infections
W.H.O	-	World Health Organization

DEFINITION OF OPERATIONAL TERMS

Attitude

Attitude refers to inclinations to react in a certain way to certain situations; to see and interpret events according to certain predispositions; or to organize opinions into coherent and interrelated structures; (Wikipedia, the free encyclopedia. Knowledge, attitude and practice [updated 2010]).

Knowledge

This was the awareness and understanding of facts, truths or information gained in the form of experience or learning. Knowledge was an appreciation of the possession of interconnected details which, in isolation, were of lesser value. It was information that had a purpose or use; (Wikipedia, the free encyclopedia. Knowledge, attitude and practice [updated 2010]).

Practice

By practice we meant the application of rules and knowledge that leads to action. It referred to frequently repeated or customary action; habitual performance; a succession of acts of a similar kind; usage; habit; custom; actual performance; application of knowledge; (Wikipedia, the free encyclopedia. Knowledge, attitude and practice [updated 2010]).

1.0 CHAPTER ONE: INTRODUCTION

1.1 Background information

1.1.1 Viral Influenza

Viral Influenza is an infection of the human respiratory tract. It is caused by influenza viruses type A, B and C (CDC- US, 2005). When influenza is circulating within the community, patients with influenza like illness who have both cough and fever within 48 hours of symptom onset are likely to have influenza (Hak et al, 2001). It is transmitted from one person to another as a droplet infection and contact with contaminated hands, surfaces and equipment.This study looked at how the knowledge and attitudes on the cause, transmission, prevention and control and the management practices influence influenza infections morbidity among secondary school staff and students.

1.1.2 Epidemiology of Influenza

Influenza is a disease caused by members of the Orthomyxoviridae family, (Cannell et al, 2008). It's found all over the world and causes an estimated one million annual deaths worldwide, (WHO, 2004). In the temperate countries it comes in epidemics during the winter seasons, while in tropical countries it has been observed to be present through-out with exacerbations' at some times of the year e.g. during the cold/dry seasons, (Palese et al, 2007).

1.1.3 Cause of Viral Influenza

Influenza is caused by influenza viruses, types A, B and C, (CDC- US, 2005). Viral influenza is a serious human health concern each year.Influenza type A viruses cause disease mainly in birds, but a few subtypes have become part of the arsenal causing seasonal influenza in human .These subtypes are H1, H2 and H3.The subtypes of influenza A viruses are determined by two

surface glycoproteins, the Haemaglutins (HA) and Neuramidase (NA). There are 16 Haemaglutin sub-types and 9-Neuramidase sub types which can combine in any form e.g. H1N1, H1N2, H1N3, H2N1, H2N2, H3N2, H3N1 etc.

The mid-2009 influenza pandemic was caused by new influenza A/H1N1 2009, subtype.

1.1.4 Antigenic Drift

Small, continuous changes happen in type A and type B influenza as the virus makes copies of itself. The process is called antigenic drift. The drifting is frequent enough to make the new strain of virus often unrecognizable to the human immune system. For this reason, a new flu vaccine must be produced each year to combat that year's prevalent strains, (Riddal et al, 2007).

1.1.5 Antigenic Shift

Type A influenza also undergoes infrequent and sudden changes, called antigenic shift. Antigenic shift occurs when two different flu strains infect the same cell and exchange genetic material. The novel assortment of HA or NA proteins in a shifted virus creates a new influenza A subtype. Because people have little or no immunity to such a new subtype, their appearance tends to coincide with a very severe flu epidemic or pandemic, (CDC- US, 2005and Riddal et al, 2007).

Transmission, Signs & Symptoms of Viral Influenza

It is transmitted as a droplet infection and through contact with contaminated hands, surfaces and equipment. Human influenza virus can infect anyone of any age group, but generally has the most impact on those who are very young or very old, (Riel et al, 2010). Common signs and symptoms include; fever, headache, cough, sore throat, muscle ache, and exhaustion. People generally recover anywhere from 2 to 7 days after symptoms appear, (Epperson et al, 2008).

Children are most likely to get sick because their immune systems aren't strong enough to fight off the infection.

1.1.6 Treatment of viral influenza

There is no definitive treatment for influenza, but there are medications which can be used to relieve symptoms. This include, analgesics, anti-pyretic, anti-virals e.g. Tami flu. Taking a lot of warm fluids and having enough rest have also been known to relieve the symptoms.

1.1.7 Prevention and control of viral influenza

The main stay of influenza prevention and control relies on basic personal hygiene and proper cough etiquette, which include:

- Use of tissue or handkerchief to cover the nose and mouth when coughing or sneezing.
- Safely disposing off used tissue immediately in dust-bins or disposal pits (areas).
- Washing handkerchief/s thoroughly after each use
- Covering and sneezing into the arm-sleeve/crook of the arm
- Washing hands frequently with soap and clean water
- Self-isolation at home when one has got influenza infection to avoid transmitting it to others.
- But above all, vaccination using the seasonal influenza vaccine is the best protection against contracting seasonal influenza (the flu).

1.1.8 Health and economic burden of influenza

According to a WHO position paper-2008, the burden of influenza in the USA was estimated to be 25–50 million cases per year, leading to 150 000 hospitalizations and 30,000–40,000 deaths. If these figures are extrapolated to the rest of the world, the average global burden of inter-pandemic influenza may be on the order of ~1 billion cases of flu, ~3–5 million cases of severe illness and 300 000–500 000 deaths annually (WHO, 2008).

Influenza is the leading vaccine preventable cause of death in the USA. An average 10-20 % of the US population develops influenza during the influenza season. In the US, the rates of hospitalization from pneumonia and influenza have been observed to increase during influenza epidemics, (Epperson et al, 2008).

Influenza pandemics can cause a lot of deaths as witnessed in the 20th century outbreaks, i.e.

- 1918-19 Spanish Flu (H1N1) ~ 40 million deaths worldwide
- 1957-58 Asian Flu (H2N2) 1 - 2 million deaths worldwide
- 1968-69 Hong Kong Flu (H3N2) ~ 700,000 deaths worldwide

(CDC-US, 2005) and (WHO-"Preparing for pandemic influenza" guide, 2004)

During influenza outbreaks, the direct cost to patients (and hence the economy) in term of cost for consulting the doctor, purchase of medications, hospitalization and treatment are enormous. The indirect cost on the patients includes but not exclusively, costs due to, lost income through absenteeism from work, reduced productivity at work, (Sanofi Pasteur publication, 2008 and CDC-US, 2005).

Kenya has not been spared this problem and a lot of useful working hours and learning time for students is lost every year due to influenza infections. It has been documented that the overall economic burden of influenza in the United States alone has been estimated at more than 11 billion dollars annually (Billaud, 2007).

1.1.9 Seasonality of influenza in Kenya, [Flu sentinel surveillance in Kenya, CDC/MoPHS, 2012]

From the diagrams below, increased influenza activity (influenza season) in Kenya picks from around June/July, up to December [Figure 1].

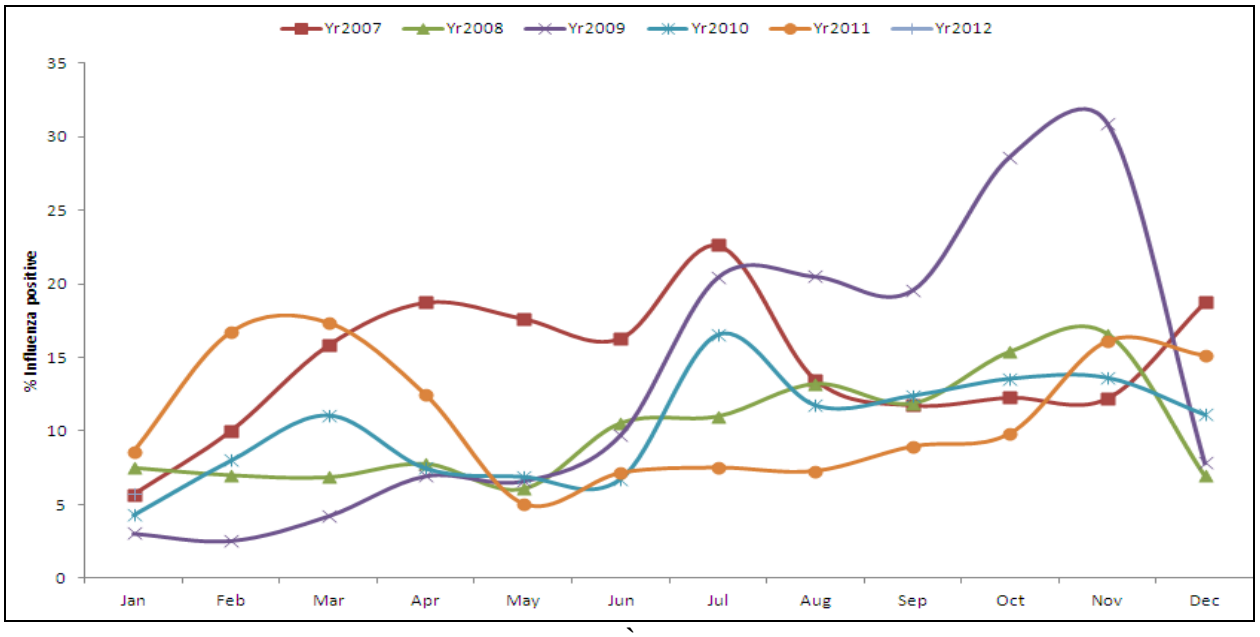

Figure 1: Seasonality of influenza in Kenya, Source: CDC/MoPHS-Kenya, 2007- 2012.

The types and sub-types of influenza isolated in Kenya include: Influenza A/H1N1 pandemic 2009, influenza type B, seasonal A/H1N1 and influenza A/H3N2 [Figure 2].

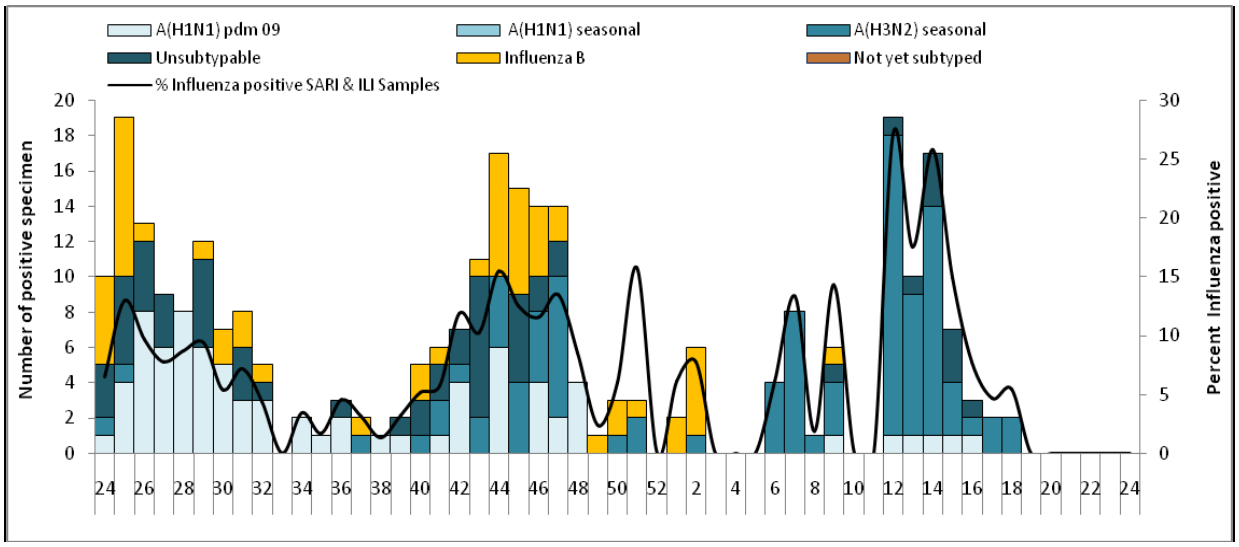

Figure 2: Circulating types and subtypes of influenza in Kenya, Source: CDC/MoPHS-Kenya, 2012.

1.2 Problem statement

Viral influenza causes significant morbidity in Kenya, leading to lost time of productive work and school absenteeism for our children. The country has been undertaking influenza

surveillance at 24 sentinel sites across the country and results from these have confirmed that influenza is circulating in Kenya. For instance in June and July 2009, 714 ILI specimens were tested of which 102 (14.2%) were positive for influenza, (MoPHS-Kenya, 2008/9). It was estimated that the influenza A/H1N1 2009 pandemic cost the Kenya Government about 147 million Kenya shillings in terms of outbreak investigation, coordination, management and control {US $ 1,841,875; (DDSR-MoPHS, 2010)}.The estimated global annual burden of influenza is one billion cases out of which approximately 3 to 5 million will be severe cases resulting in approximately 300,000 to 500,000 deaths (WHO, 2008)

There is limited knowledge on the cause, mode of transmission, management, preventive/control measures and consequences of viral influenza infection in Kenya.

There are a lot of misconceptions about the cause, transmission, management, prevention and control of influenza. A case in point was during the May and June influenza A/H1N1 vaccination campaign across the country, some section of the Kenyan community claimed they were being used as guinea pigs when being offered the influenza A/H1N1 2009 vaccine.

Limited knowledge and poor attitudes on the cause, transmission, treatment, prevention and control and poor management practices of influenza infections may lead to the increase in the incidence of influenza morbidity and mortality in this country. It is not known to what extent this affects the incidence in morbidity and mortality of influenza in this country.

1.3 Justification

There are many misconceptions and bad practices on influenza infections which include: most people believing influenza is not an African problem, they believe it is caused by cold weather, dust, taking cold drinks, some insects, and crowded places. Most people believe that influenza is a mild disease and cannot cause death and generally there is very little information out for the public on influenza in KenyaThe personal hygiene, coughing and sneezing habits of people with influenza or ILI encourages the spread of the disease as when someone coughs on his/her palms

and then handshakes the next person, coughing or sneezing without covering the mouth or nose, blocking one nose and expelling the fluids from the other nostril in to the open space and surfaces where other people can get it e.g. contaminated door handles, tables, utensils, clothing etc. They do this due to limited proper knowledge on influenza infections.

Knowledge has a significant influence on attitudes and practice in an influenza pandemic and personal experience influences practice and behaviors. The lack of the right knowledge and poor attitudes on the cause, transmission, treatment, prevention and control of influenza infections and poor practices employed in its management, prevention and control leads to increased cases of influenza during outbreaks due to poor cough and respiratory etiquette.

Influenza infections have heavy toll on the illness burden in the African continent, and in Kenya and other developing countries already beset with underlying chronic medical conditions, having a more severe impact on economies largely dependent on single income earners and subsistence farmers. Despite this, influenza surveillance and vaccination awareness is woefully lacking here (Schoubb et al, 2002).

From the above evidence, the study is justified in Kenya on the basis of the un-documented yearly burden of influenza infections in Kenya with its resultant economic losses; Kenya is a travel hub with travelers from all over the world. An influenza outbreak in any part of the world will most likely get into Kenya. This became evidently important at the wake of the 2009 new influenza A/H1N1 2009 pandemic in Kenya which caused a lot of panic and stress in the country and especially in the tourist industry and learning institutions.

1.4 Conceptual framework

With the understanding of the background context, the selection of strategies and interventions designed to act up on behavioral determinants which will influence specific behaviors and activities that can affect viral transmission, thus preventing new infections.

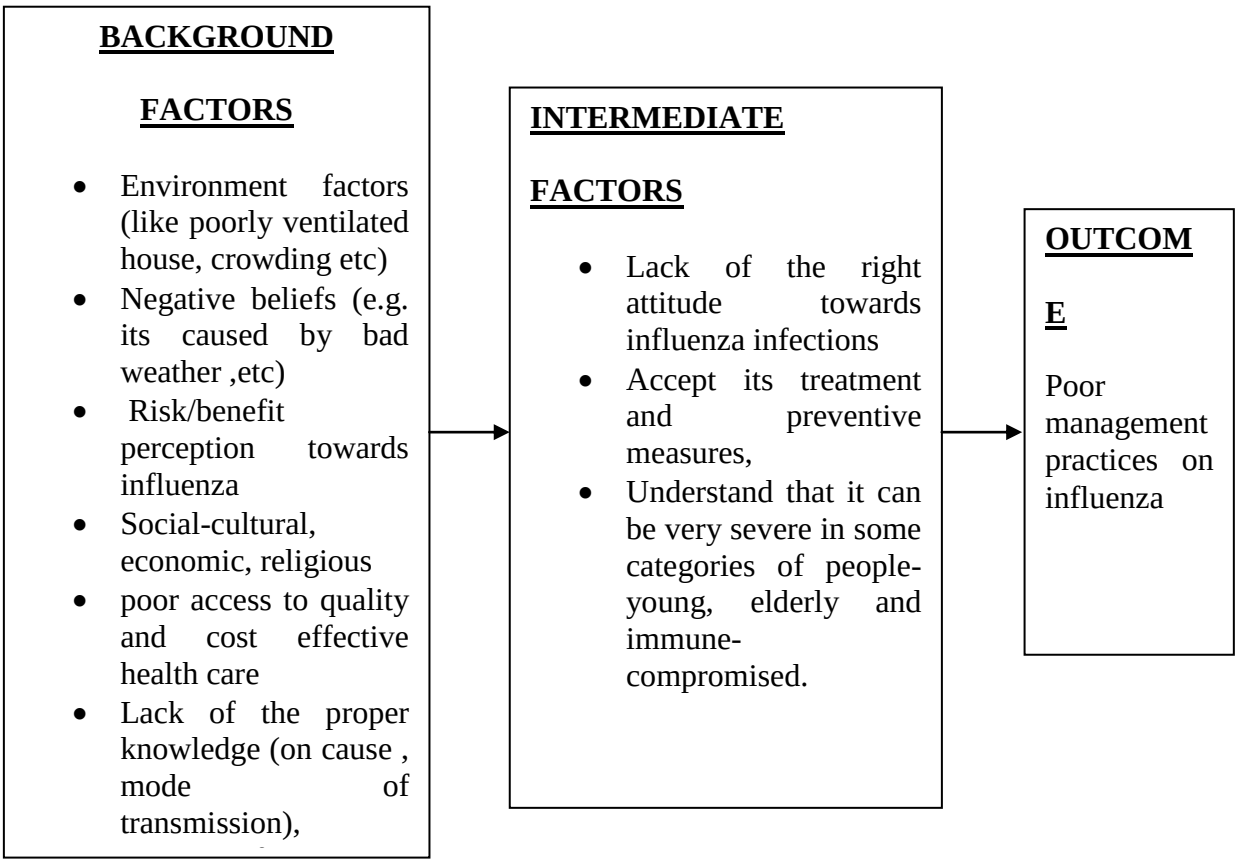

Figure 3: Conceptual framework

1.5 Objectives of the study

1.5.1 Overall Objective:

To determine the knowledge, attitudes and management practices (KAP) about the cause, management, prevention and control of viral influenza infections among secondary school students and staff in Nairobi West Districts in Kenya

1.5.2 Specific objectives:

1. To determine the level of knowledge on the cause, treatment, prevention and control of influenza infections among secondary school students and staff in Nairobi West Districts in Kenya.
2. To determine the attitudes on the cause, treatment, prevention and control of influenza infections among secondary school students and staff in Nairobi West Districts in Kenya

3. To determine the practices employed in the management, prevention and control of influenza infections among secondary school students and staff in Nairobi West Districts Kenya.

4. To determine the relationship between knowledge on the cause, treatment, prevention and control of influenza infections with influenza management practices

5. To determine the relationship between attitudes on the cause, treatment, prevention and control of influenza infections with influenza management practices

1.6 Research hypotheses

"There is no relationship between the Knowledge on the cause, prevention & control of influenza with the management Practices of influenza"

"There is no relationship between the Attitudes on the cause, prevention & control of influenza with the management Practices of influenza"

1.7 Limitations of the Study

The findings may not be wholly generalizable in Kenya as this is an urban setting and the population here may have more access to influenza information compared to a rural setting population.

2.0 CHAPTER TWO: LITERATURE REVIEW

2.1 Knowledge, attitudes and management practices on influenza infections

2.1.1 Knowledge on influenza infections

A study undertaken for one of the influenza infections, (avian influenza) showed that despite being given information, respondents had no detailed understanding of avian influenza, had a great perceived risk of experiencing avian influenza, and had a low compliance with precautionary behaviors. These observations raise concerns about a clear need to find the optimal way of correcting these deficiencies by developing and implementing public health policy regarding priorities for tailored educational and promotion strategies and in particular more attention should be given on using preventive approaches in these population [Giuseppe et al, 2008].

2.1.2 Attitudes on influenza infections

A study by Seale et al [2007], on Attitudes Amongst Australian Hospital Healthcare Workers towards Seasonal Influenza and Vaccination, found out that, although HCWs had an adequate level of knowledge towards influenza vaccination, only 22% of them were vaccinated. This showed that, despite having the correct information on vaccination, the health care workers attitude towards influenza vaccination did not encourage them to get vaccinated.

Another study by Seale et al [2009], on the community's attitude towards Swine flu and pandemic influenza, found that **e**mphasizing the efficacy of recommended actions (such as hand hygiene), risks from the disease and the possible duration of the outbreak may help to promote compliance with the appropriate preventive and control measures of the infection.

2.1.3 Management Practices in influenza infections

A survey by Bethel et al [2006], to find out the practices on influenza prevention, showed high awareness of the influenza vaccine among Hispanics in San Diego County, but relatively low vaccination rates among respondents across all ages. A study by Spaude et al [2007], on the relationship between influenza vaccination and risk of mortality among adults hospitalized with community-acquired pneumonia, found that prior influenza vaccination was associated with improved survival in hospitalized patients with community acquired pneumonia (CAP) during influenza season.Two studies by Nichol et al [Nichol et al 1999 & Nichol et al 2000], on the impact of influenza vaccination on stroke in the elderly, found that vaccination against influenza was associated with reductions in the risk of hospitalization for heart disease, cerebrovascular disease, and pneumonia or influenza as well as the risk of death from all causes during influenza seasons. These findings highlight the benefits of vaccination and support efforts to increase the rates of vaccination among the elderly.

In the year 2002, the US-Department of Health and Human Service developed risk communication guidelines for use during an influenza pandemic, which was further updated in 2006 [www.pandemicflu.gov , 2006]. According to the guideline, simple hygiene habits are important in the prevention and control of influenza infections. Simple steps can help to limit the spread of organisms and the following included the simple hygiene steps; Washing hands frequently with soap and water (use an alcohol-based hand cleaner if soap and water are unavailable), using a tissue to cover ones' mouth and nose when they cough or sneeze, using ones' upper sleeve if they don't have a tissue; and staying at home if one is sick with influenza.

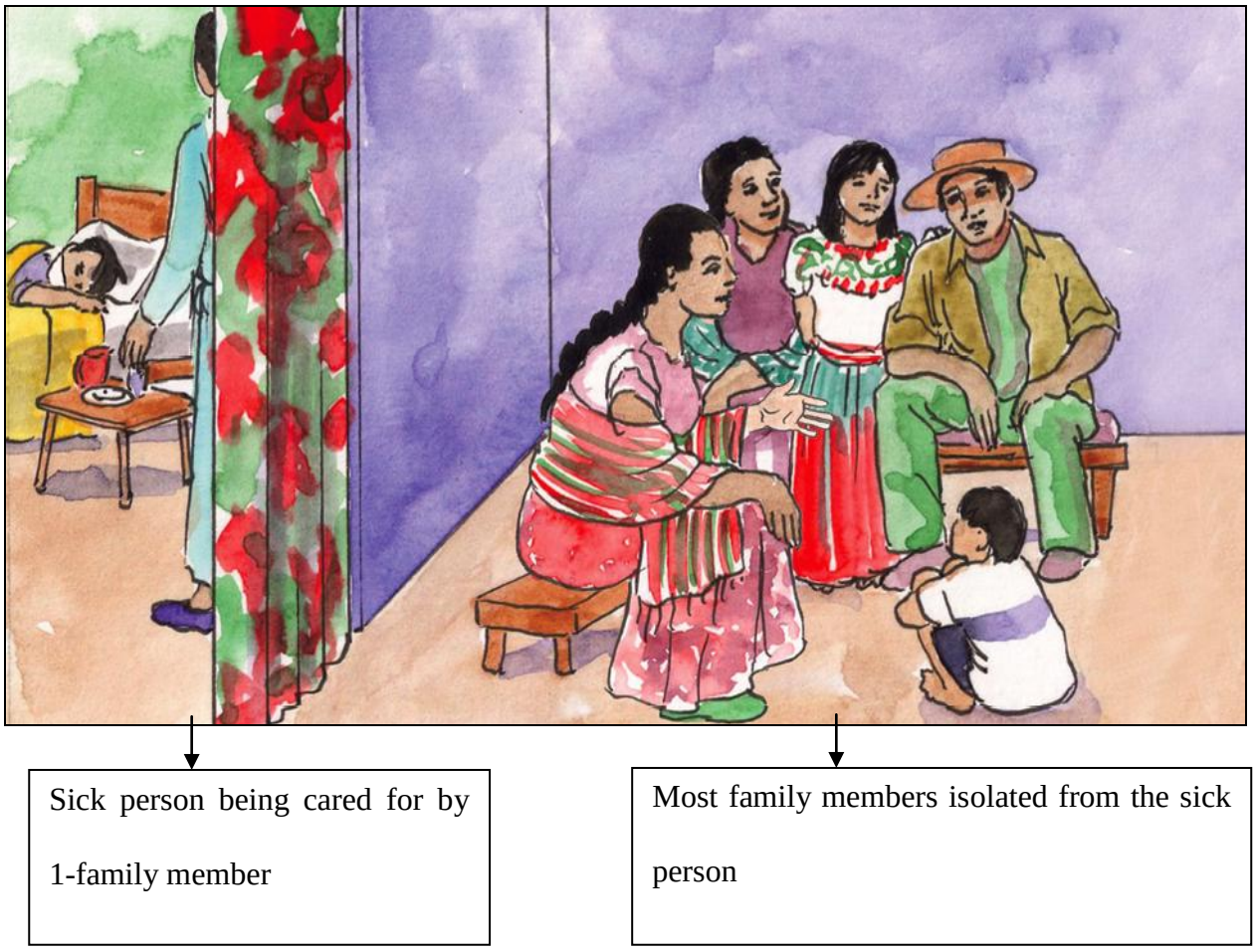

Figure 4: Social distancing in influenza infection, [source; AED-US, 2009]

Assign one person in the family to be a caregiver to the sick family member to avoid exposing all family members to the flu/influenza as shown in picture above.

One of the best ways to prevent and control influenza infections is good personal hygiene. A study by Larson et al [2000], on a one year hand washing trial in Pakistan, found out that children less than 5 yrs in intervention homes had 50% reduction in pneumonia (all causes).

Another study by Roberts [2000], found that hand washing and aseptic nose wiping of the children aged 24 months or less, resulted in to fewer URIs. A study on personal hygiene by Ponka [2000] in Finland found 26% less URI in children less than 3 years old by instituting hand washing, environmental cleaning, washing and wiping toys with linen.

2.2 Global picture of influenza

According to Dollin [2005], influenza is the leading vaccine –preventable cause of death in the USA. An average 10-20 % of the US population develops influenza during the influenza season. Influenza (or "flu") leads to the hospitalization of more than 200,000 people yearly and results in 36,000 deaths from flu or flu-related complications in the United States, [Dolin et al, 2005], striking both the elderly and infant populations particularly hard [Riel et al , 2010]. In the US, the rates of hospitalization from pneumonia and influenza have been observed to increase during influenza epidemics [Epperson et al, 2008].

Evidence shows that the H5N1 strain of Highly Pathogenic Avian Influenza (HPAI) is now endemic in parts of South-east Asia, where Cambodia, Laos, Thailand and Indonesia are the worst-affected countries. The continuing outbreaks that began in late 2003 and early 2004 have been disastrous for the poultry industry in this south-eastern Asia region whereby by mid-2005 more than 140 million birds had died or been destroyed and losses to the poultry industry are estimated to be in excess of US$10 billion [Worldbank,2005].

Despite control measures, the disease continues to spread and to raise serious public health concerns at the global level. The major world animal and human health authorities (FAO, OIE and WHO) are collaborating closely on a global strategy on controlling HPAI. Through this global effort, regional and country-specific plans have been developed whose overall goal is minimizing the global threat of HPAI to human and domestic poultry and other animal populations through the control and gradual eradication of HPAI [Worldbank, 2005].

2.3 Influenza in Africa

It is important to study influenza in the mostly tropical setting of Africa because this is a different disease in the tropics than it is in the temperate regions. In temperate countries

influenza is a seasonal illness that circulates during the cold months [Palese et al, 2000].According to Palese et al [2007], in the tropics influenza circulates in people all year round with possible increases during the cold/rainy seasons but researchers don't know why influenza is seasonal in the temperate lands.

According to Schoub et al [2002], of the National Institute for Virology in South Africa, for a long time Africa possessed little capacity for influenza surveillance and only Senegal and South Africa used to do it in the WHO African region. But since the 2004-WHO alert on a possible influenza pandemic many other WHO-AFRO countries have set up laboratory capacity to test for influenza and hence started influenza sentinel surveillance. In Kenya there were 24 active sites (by July 2010) run by the government in partnership with CDC-US and Walter Reed Project. This information, together with the isolates themselves is supplied to WHO International Influenza collaborating Centers in London and Melbourne [MOPHS- Kenya 2009].

Influenza exacts a heavy toll of the illness burden in developing countries already beset with underlying chronic medical conditions and has a more severe impact on economies largely dependent on single income

earners and subsistence farmers, influenza surveillance and vaccination awareness is woefully lacking on the African continent and this urgently needs to be remedied [MoPHS- Kenya 2009]. According to

Yazdanbakhsh et al [2010], influenza is circulating in Africa, but virtually no information or attention is evident, due to lack of adequate surveillance. This means that the burden of influenza in Africa is incorrectly believed to be negligible. But sporadic reports from various regions in Africa indicate that influenza is circulating and may be regularly causing epidemics.

According to a meeting of African health ministers and representatives of international agencies held on 3rd June 2010 in Marrakesh Morocco to discuss the impact of influenza on the African continent, it was noted that influenza has a significant impact on morbidity and mortality throughout Africa, but unfortunately very little data exists to show this [Palese et el, 2007]. In this meeting, the Global Influenza

Program observed that influenza viruses are important respiratory pathogens, and acute respiratory tract infections, such as pneumonia, are a major cause of death in Africa, particularly among children. In this meeting it was lamented that the absence of adequate information, lack of awareness of the influenza disease and other competing public health needs has meant that no specific interventions have been developed to reduce the impact of influenza in Africa. It was agreed that there was a need to strengthen surveillance systems to assess the effect of the influenza H1N1 2009 pandemic across the continent [Palese et al, 2010, and WHO, 2010].

2.4 Influenza in Kenya

Influenza in Kenya is just starting to get recognition as a disease of public health concern after the WHO raised the alert for the 2004-pandemic influenza preparedness. Up to the time that WHO raised the alarm on possible pandemic influenza, Influenza was only recognized as a disease in Kenya by the research institutions and the high cost private hospitals that used to offer their clients vaccination against influenza. The common man in Kenya is still naive about influenza as witnessed by the panic caused by the new influenza A/H1N1 2009 pandemic. This may be due to the significant morbidity and mortality caused by other health problems in Kenya like Malaria, Tuberculosis, HIV/Aids, Diarrheal diseases etc [DDSR-MoPHS influenza report 2010]..

But since 2004 when WHO sounded the pandemic alert, sentinel sites were set up and we are starting to realize some pattern of influenza in the country [CDC/MoPHS, 2010]. The new

influenza A/H1N1 2009 pandemic awakened everybody and influenza is attracting a lot of attention among the population of Kenya.

3.0 CHAPTER THREE: METHODOLOGY

3.1. Study Design

This was a cross-sectional descriptive study with a mix of qualitative and quantitative methodologies to facilitate an understanding of the issues associated with influenza infections in secondary schools.

3.2. Study area

The research was undertaken in Nairobi province. Nairobi province is the seat of the capital city of Kenya. Nairobi city has an estimated population of about 2.5 million at night and 4 million during the day. The difference in day and night populations of the city is due to people moving from the larger Nairobi metropolitan to come and work in the city during the day. The city houses the biggest airport in east Africa-Jomo Kenyatta International Airport and has a huge population of people from all over the world who work in the many United Nation bodies in Kenya. Kenya being a country of diverse ethnic composition, the city is cosmopolitan in nature with most ethnic communities being represented. At the time of the study, the province had three administrative districts, namely Nairobi West, Nairobi East and Nairobi North.

It was undertaken in Nairobi province as it reported the highest burden of the influenza A/H1N1 2009 pandemic in the year 2009 as shown in Figure 5.

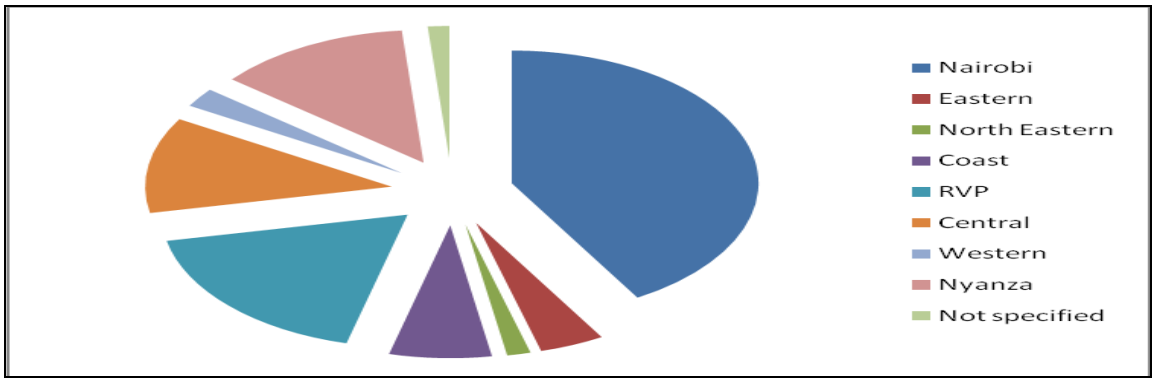

Figure 5: Laboratory confirmed cases of new influenza A/H1N1 2009, outbreak in Kenya by province; Source: DDSR-MoPHS- Kenya, 2010.

Nairobi West District was the study area [Figure 6].

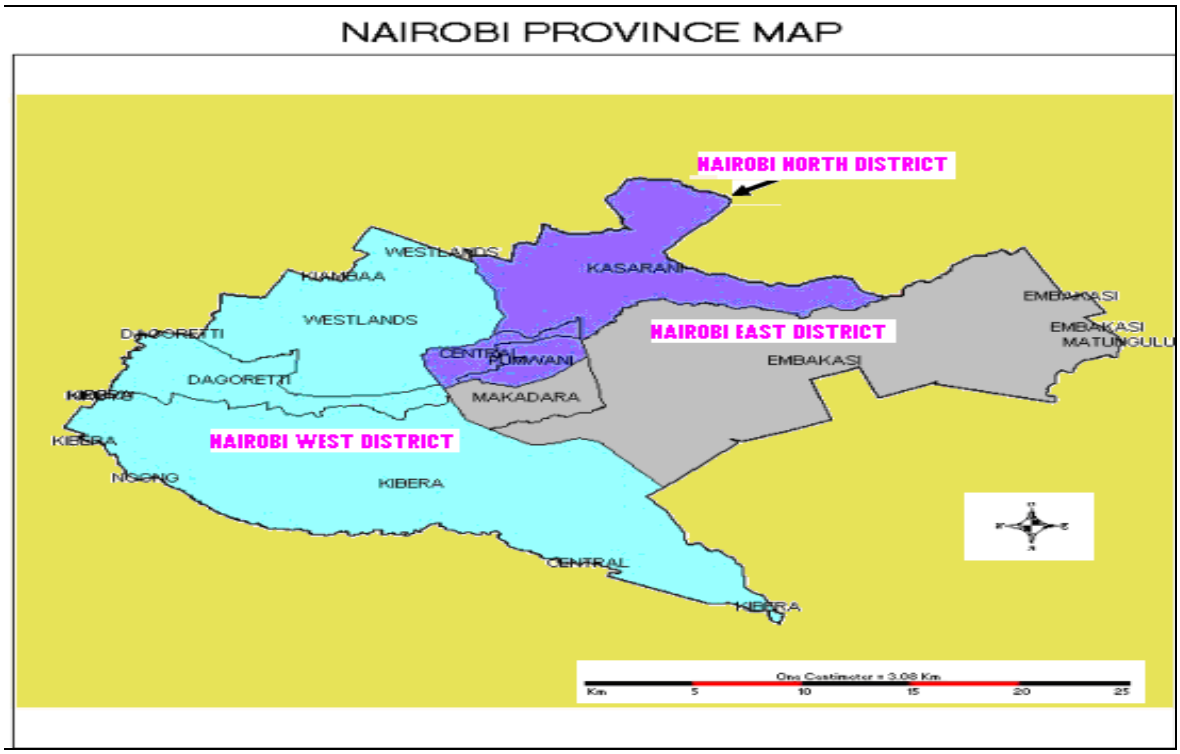

Figure 6: Map of the study area

Source: Ministry of health, Nairobi West AOP 4 plan 2008/2009.

The total student population in the district was 16,320, with 10,643 from boarding secondary schools and 5,677 from day secondary schools as shown in Table 1

Table 1: Summary of schools in the district

School status	Total number	Total number of students
Boarding secondary schools	15	10,643
Day secondary schools	13	5,677
Total	28	16,320

Dagoretti division had the highest number of schools with 8 boarding schools and 5 day schools. Westlands division with a total of 10 schools equally distributed between boarding and day schools and Langata had 3 day and 2 boarding schools.

Total number of schools to sample from was twenty eight (28) as shown in Appendix 1. The schools were divided into boarding secondary and day secondary schools because students who were day scholars are likely to take influenza infection acquired in the school to the community and vice versa.

3.3. Study variables

This was purely a descriptive study, and concentrated on an inventory of knowledge, attitudes, and management practices related to influenza like illness. The study concentrated on variables and gave operational definitions, with indicators where needed; to measure knowledge, attitudes and management practices related to influenza like illness.

a. Correct knowledge of causes of influenza was defined as where a student mentioned that influenza was caused by viruses.

b. Seeking healthcare from a health provider was defined as all cases where the student mentioned that they would visit a health provider if they got influenza.

c. Correct practices in the prevention of influenza was defined as all cases where the student mentioned one or more of the following without also mentioning an incorrect practice: covering the mouth and nose when coughing or sneezing using tissues or hand kerchief; washing the handkerchief thoroughly after each use*; self isolation when infected (staying away from class etc); and washing hands frequently with soap and clean water.

3.3.1. Independent variables

These were:

1. The demographic characteristics such as age, sex and level of education (class in school).

2. Level of Knowledge on the cause, treatment, prevention and control of influenza infections.

3. Attitude towards viral influenza.

3.3.2. Outcome variables (dependent variable)

These were variables related to management, prevention and control practices of viral influenza or ILI.

3.4. Study Population

3.4.1. Quantitative study population

These were students in the secondary schools in the study area. The study focused on schools and not the entire community because during the 2009 influenza pandemic, most cases of influenza A/H1N12009 were reported from schools. Also schools are closed communities and in the event of an influenza outbreak here, the ease of transmission to the well ones is faster.

3.4.2. Qualitative study population

These included senior officials of the Ministry of Public Health and Sanitation, CDC-Kenya, Principals/deputies of visited schools and District education officers in the study area.

3.5. Inclusion and Exclusion Criteria

3.5.1 Inclusion Criteria

- Students or staff in the selected schools.
- Consented to participate in the study.

3.5.2 Exclusion Criteria

- Non-students and non-staff in selected schools.
- Not willing to participate in the study.

3.6. Sampling and Sample size determination

3.6.1 Students

3.6.1.1. Sample size determination

The sample size was determined using the following formula for prevalence studies {Fisher et al (2000)}

$$n = \frac{\{Z_{(1-\acute{\alpha}/2)}\}^2 (p(1-p)}{(\delta)^2}$$

Where;

n = is the required sample size

$Z_{(1-\acute{\alpha}/2)}$ = critical value associated with significance

p = Estimate of proportion (the proportion of the population with knowledge on influenza in a similar study)

δ = Margin of error

There was no data on Knowledge, Attitude and Practice or proportion of the population with knowledge of influenza in Kenya or Africa. But in a study to find out the Knowledge, attitudes and practices towards pandemic influenza among cases, close contacts, and healthcare workers in tropical Singapore, which had closer similarities to Kenya, found out that the proportion of the population with basic general knowledge of pandemic influenza A (H1N1-2009) on average was 24.45%.

This proportion (0.245) was used as the proportion for the study, a margin of error (δ) of 0.05 (level of significance {Alpha ($\acute{\alpha}$)} of 0.05) were used. This gave the study a sample that was representative of the general population and is comparable to the tropical Singapore study.

Therefore, substituting the values of p = 0.245, δ = 0.05, and Z = 1.96), the minimum desired sample size was given by:

$$n = \frac{\{Z_{(1-\acute{\alpha}/2)}\}^2 (p(1-p)}{(\delta)^2}$$

$$n = \frac{\{Z_{(1-0.05/2)}\}^2 \, 0.245(1-0.245)}{0.05^2}$$

$n = 284.2$

Using 10% to cater for non-response, design effects or any defects in the interviews, this gave the study a sample size of 309 students.

3.6.1.2. Sampling of students

A multi-stage sampling technique was applied in the study as follows:-

1. The schools in the three divisions were stratified into two strata.
2. Total sample size in the study was 309 students; therefore using probability proportional to size method, each stratum gave;

i. Boarding secondary schools 10,643/16,320 x 309 = 202 students

ii. Day secondary schools 5,677/16,320 x 309 = 107 students

3. Students interviewed were proportional to the division's student population, (Table 2).

Table 2: Determination of Students interviewed per division

Division	Boarding students	No. Students	Day students	No. Students
Dagoretti	5,535/10,643 x 202	105	1,394/5,677x107	27
West-lands	4,038/10,643 x 202	77	2,411/5,677 x107	45
Langata	1,070/10,158 x 198	20	1,872/5,677 x111	35
Total		202		107

4. For the study population to be representative, 30% of the schools in the district were selected.

5. Out of the 9 schools, number of schools per division to be interviewed was proportional to the number of schools in that division, [Table 3]

Table 3: Number of schools and category interviewed per division

Division	No. schools	Boarding schools	Day schools
Dagoretti	4	2	2
West-lands	3	2	1
Langata	2	1	1
Total	**9**	**5**	**4**

6. Using simple random selection (writing the name of each school on a piece of paper and folding it, and mixing them well in a basket), the schools to be visited in each division were selected. Boarding and day schools were selected separately. The selected schools and number of students interviewed in each, (proportional to school's student population) are shown in Table 6.

7. In each school, the 4-classes were taken as different strata and the number of students interviewed was proportional to the size of the class.

8. In the case of a mixed school, equal chances were given to boys as well as girls using probability proportional to gender number in that class.

9. In each class, simple random selection was used to select the students to be interviewed. The interviewers administered the questionnaire to the selected students individually, in privacy.

3.6.2 Selection of staff

Key Informant Interviews (KII) were undertaken with the principles/deputy principles of the schools. One was recruited from each school, and therefore, the total number was equal to the number of schools visited. The schools visited and the corresponding numbers of students (respondents) in each school are shown in Table 4.

Table 4: Schools visited and corresponding number of students in each

Division	Selected School	Type of School (B boarding/D-day)	School enrolment	No. o students selected
Dagorreti,(4 schools)	Upper hill boys	B	1002	53
	Moi Nairobi girls	B	995	52
	Ruthimitu girls high school	D	315	16
	River side secondary school	D	215	11
	Sub-total			**132**
West-lands (3)	Kenya high school	B	880	33
	Nairobi school	B	1161	44
	Nairobi Milimani high school	D	1280	45
	Sub-total			**122**
Langata (2)	Sun shine sec schoo	B	950	20
	Olympic secondary school	D	662	35
	Sub-total			**55**
	Total			**309**

3.7. Data collection and processing

3.7.1. Data collection

The data collection tools included designed closed-ended questionnaire and key informant interview guides. They were pre-tested in Nairobi west secondary schools which were not taking part in the study while the KII tool was pre-tested with senior officers in the Ministry of Public Health and Sanitation, principals of secondary schools and Centers for Disease Control-US in Kenya. Research assistants (Interviewers) were recruited from employees of the Ministry of Public Health and Sanitation. They were trained before the data collection. A Survey Questionnaire with close-ended questions was administered to the students by the research assistants, under the close supervision of the principal investigator. The questionnaire forms were re-created on line and entered into data-compatible mobile phones. The research assistants used these to collect the data and upload the filled in forms back to the Epi-surveyor website.

Key Informant Interviews (KII) were undertaken with key persons in the Ministry of Public Health and Sanitation, partners involved in influenza activities in Kenya and Principals/Deputies in each school to be visited. The purpose of this was to provide in-depth information on influenza, clarify ideas and information needs on influenza and get information on influenza from different viewpoints, for an all inclusive information base.

3.7.2. Data Processing and Analysis

A structured questionnaire was developed and programmed onto a smartphone for data collection using the *Epi-Surveyor* software. Data was exported to MS Access for data cleaning and analysed using *Stata 9.0* (Stata Corp, College Station, Texas) and Epi Info 3.2.2.

Data on causes of influenza, management practices and practices for prevention of influenza were initially collected as multiple response questions but were later recoded for analysis as follows:

a. Correct knowledge of causes of influenza was defined as where a student mentioned that influenza was caused by viruses.

b. Seeking healthcare from a health provider was defined as all cases where the student mentioned that they would visit a health provider if they got influenza.

c. Correct practices in the prevention of influenza was defined as all cases where the student mentioned one or more of the following without also mentioning an incorrect practice: covering the mouth and nose

when coughing or sneezing using tissues or hand kerchief; washing the handkerchief thoroughly after each use*; self isolation when infected (staying away from class etc); and washing hands frequently with soap and clean water, always.

The data was presented in tables, pie charts and bar charts for ease of appreciating the relationships between variables. Univariate analysis was done using proportions for categorical variables and means were used for continuous variables to describe the socio-demographic characteristics, knowledge, attitudes and management practices for influenza. Chi square (Pearson) and corresponding p-values for single response variables and Rao Scott corrected chi square (see Annex VII) and its corresponding p-value for multiple response questions were used. Findings were considered statistically significant if the p-value was less than 0.05.

3.7.3. Presentation of results:

3.7.3.1. Validation of quantitative data:

The results of the Key Informant Interviews were used to validate results of the quantitative data. Here, the qualitative data obtained was transcribed, coded and summarized according to emerging themes and analysis was done manually according to the study objectives.

3.7.4. Minimization of error and biases:

Bias was minimized by;

1. Use of standard tool for all respondents.
2. Training of the research assistants
3. The principal investigator technically supported the research assistants during the investigation
4. Regular review supervision by principal investigator

3.8. Ethical Considerations

The research was non invasive. Research approval was sought from the government of Kenya through

the Ministry of Higher Education, Kenyatta National Hospital and the University of Nairobi ethical committees. In addition to getting a letter from the Ministry of education to interview students, an assent form was administered to the school principals, as the guardians of the students, for students less than 18 years and consent form administered to students 18 years and above. Respondents were assured of confidentiality as serial numbers and not names were used to mask their identity.

3.9. Key Informant Interviews (KII).

Senior officials in the Ministry of Public Health and Sanitation, partners involved in influenza activities in Kenya and Principals/Deputies in each school visited were the key informants in this study. The purpose of this was to provide in-depth information on influenza, clarify ideas and information needs on influenza and get information on influenza from different viewpoints, for an all inclusive information base. Primary topics explored in the study included perceptions of influenza, experiences with previous possible influenza infections, health seeking behavior once one had Influenza like illness, any concerns raised during the new influenza A/H1N1 2009 outbreak in their school, influenza concerns in general and influenza information needs. Key informant interview guide with probes was used.

4.0 CHAPTER FOUR: RESULTS

This chapter presents the findings of the study in accordance to the study objectives. In this study, 9 secondary schools within Nairobi West District were recruited into the study of which 4 were day schools and 5 were boarding schools. Of these, 2 were mixed schools, 3 girls' schools and 4 boys' schools. The total number of respondents interviewed was 343.

4.1. Socio-demographics characteristics of respondents

Of all the respondents, 60.1% were boys and 39.9% were girls. The mean age of the respondents was 16 years (*SD*=1.4) with a range of 12 to 20 years. Most of the respondents were in the 15-19 year age-group (89%).The socio-demographic characteristics of respondents are presented in Table 5 and Figure 7.

Table 5 Age and Sex distribution of respondents

Characteristic (N=343)	n	%
Age		
10-14 years	34	9.9
15-19 years	305	88.9
20-24 years	3	0.87
Mean(SD)	16.3(1.4)	
Median	16	
Range	12- 20	
Sex		
Male	206	60.1
Female	137	39.9

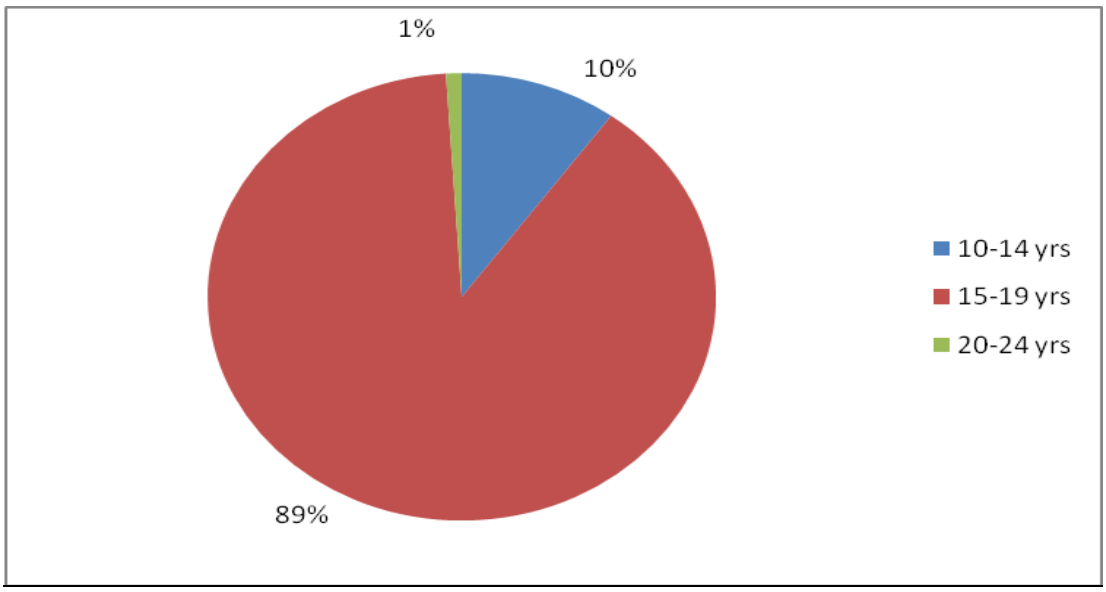

Figure 7: Distribution of respondents by Age-group

4.2. Knowledge on the Cause of Influenza

The respondents were asked about what causes influenza. Only 75 (21.9%) of the respondents knew viruses to be the correct cause of influenza. The remaining 268 (78.1%) respondents did not know the cause of influenza or had a mixture of causes [figure 8]. This finding slightly contrasts the Singapore study where the proportion of correct knowledge on influenza was 24.45% against Kenya's 21.9%. This may be because of better realization of influenza as a disease in Singapore in contrast to Kenya. Singapore being a country in South East Asia where we have had several countries affected by the avian influenza outbreak in poultry, it is likely to have the people in that country well sensitized on influenza. Influenza is not taught as health topic in the school health program.

According to CDC-US during the key informant interview, the Kenyan public does not understand what influenza as a disease is because Influenza outbreaks rarely make headlines in Kenya and clinicians in Kenya are not so much aware of influenza, so little attention is given to it.

4.2.1: Relationships between Socio-demographic variables and knowledge on cause Of influenza

The socio-demographic variables considered included sex and class. Among the two sexes, 32 (23%) and 43(20.9%) of the female and male respondents, respectively, knew the cause of influenza. The difference was not statistically significant (p= 0.59).

The knowledge on the correct cause of influenza increased as we went to a higher form. However the difference was not statistically significant (p= 0.055) [Table 6].

Table 6: Socio-demographic characteristics in relation to correct cause of influenza

Attribute	Know right cause of influenza				
	Total	Yes (n, %)	No (n, %)	Pearson's Chi-square	P-value
Sex					
Female	137	32(23.4)	105(76.6)		
Male	206	43(20.9)	163(79.1)	**0.2971**	**0.59**
Total	**343**	**75(21.9)**	**268(78.1)**		
Form/Class					
Form 1	61	13(18.8)	56(81.2)		
Form 2	84	17(20.2)	67(79.8)		
Form 3	107	18(16.8)	89(83.2)		
Form 4	83	27(32.5)	56(67.5)		
Total	**343**	**75(21.9)**	**268(78.1)**	**7.6179**	**0.055**

Among the frequently mentioned misconceptions on the cause of influenza included cold weather, dusty places and crowded places [Figure 8]. Most of the principals interviewed did not know the correct cause of influenza and had misconceptions that it's caused by cold weather.

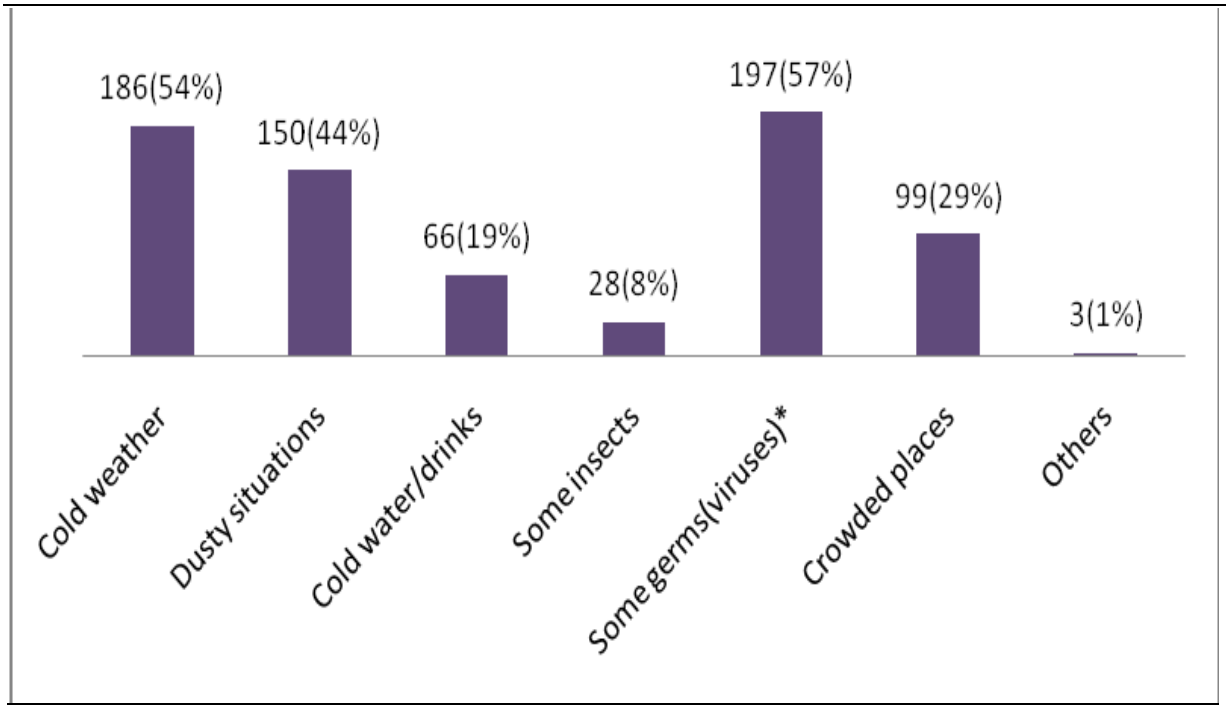

Figure 8: Causes of influenza as mentioned by respondents

4.2.2. Knowledge on seasonal and pandemic influenza (A/H1N1 2009) in Kenya

A majority of the respondents, 307(89.5%) were aware that there had been cases of pandemic influenza (A/H1N1 2009) in Kenya. However the difference was not statistically significant, p= 0.6. Nearly half of the respondents, 161(46.9%) reported to have ever missed class due to influenza, however the difference was not statistically significant (p= 0.213).

Slightly more than a third of the respondents, 126 (36.4%) were aware that a seasonal influenza vaccine was available in Kenya. The difference between those who knew about the vaccine and those who did not was not statistically significant (p= 0.55). About two-thirds of the respondents, 227(66.2%) did not know the correct combination of signs and symptoms of influenza, [Table 7].

Cough 270 (79%), runny nose 266 (78%) and fever 246 (72%) were the top most frequently mentioned signs and symptoms of influenza. The others were sore throat 185 (54%) and shortness of breath 115 (34%), The difference between those who knew the correct combination

of signs and symptoms of influenza and those who did not was not statistically significant, p=0.7909 (Rao Scott corrected chi-squared, F- statistic =0.4269), [Figure 9].

Table 7: Knowledge on seasonal and pandemic H1N1 2009 influenza in Kenya

Attribute (Within the last 12-months preceding the study), chi square assessed against sex, **(N=343)**	Yes; n (%)	No; n (%)	Chi-Square statistic	P-value
Respondents who had relative or family member suffer from influenza.	187(54.5)	156(45.5)	2.5039	0.114
Respondents who missed class/work/church due to influenza.	161(46.9)	182(53.1)	1.5486	0.213
Respondents who were aware that there was a vaccine to prevent influenza.	126(36.4)	217(63.6)	0.3590	0.55
Respondents who were aware that there had been cases of pH1N1 in Kenya in the last 2-3 years.	307(89.5)	36(10.5)	0.2748	0.6
Respondents who had been taught about influenza in school.	167(48.7)	176(51.3)	0.5968	0.44
Respondents who did not know the correct influenza signs and symptoms (i.e. cough, sore throat, fever, runny nose)	227(66.2)	116(33.8)	-----	----

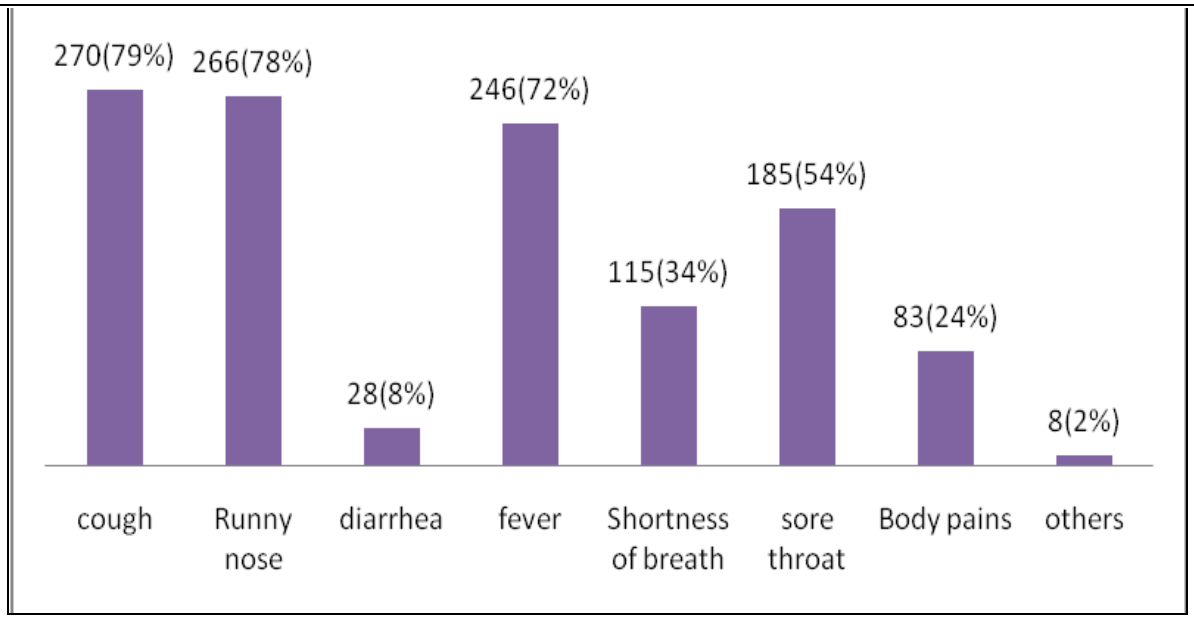

Figure 9: Signs and Symptoms of influenza as mentioned by respondents

4.2.3. Sources of influenza information among respondents

Sources of information on symptoms and signs of influenza varied. The most frequently mentioned sources of information were the television 139 (41%), class teacher 138 (40%), newspaper 126 (38%), respondents/relatives suffered from influenza 97 (28%) and radio 94 (27%). On correcting for multiple responses (Rao Scott corrected chi square), the differences observed between the various categories were not statistically significant (p= 0.4165) [Figure 10]

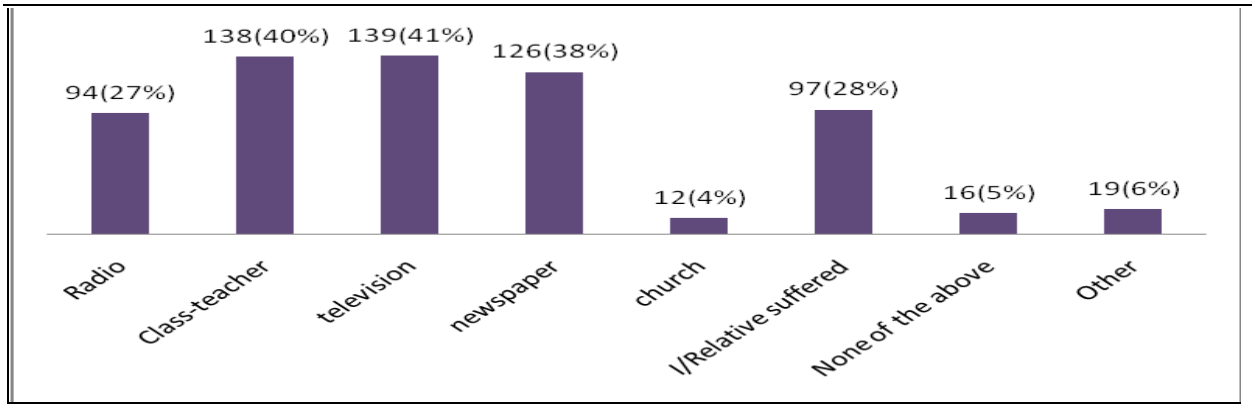

Figure 10: Sources of information on influenza as mentioned by respondents

4.3: Attitudes on influenza as an important public health problem in Kenya.

Respondents were asked if they felt/thought influenza was an important public health problem in Kenya. The majority of the respondents, 275(81.2%), felt that influenza was an important public health problem in Kenya. According to the Principals of Schools, influenza was not an important public health problem in Kenya, as with or without any attention/treatment, it will resolve. CDC-US felt that not enough was being done about influenza in Kenya as the training institutions in the country put very little emphasize on viral influenza infections in their curriculum.

4.3.1: Socio-demographic characteristics in relation to influenza as an importance public health problem in Kenya.

Among the sexes, the proportion of girls who felt that influenza was an important public health problem in Kenya was higher than the proportion of boys (83.2% verses 79.9%). However, the difference was not statistically significant (p= 0.44). The lower classes rated influenza as an important public health problem in Kenya higher than the higher classes. The difference was not statistically significant, p=0.35 [Table 8].

Table 8: Socio-demographic characteristics in relation to influenza as an importance public health problem in Kenya

Attribute	**Influenza as an important health problem in Kenya**				
	Total	Yes; n, (%)	No; n, (%)	Chi-square	P-value
Sex					
Female	137	114(83.2)	23(16.8)		
Male	204	163(79.9)	41(20.1)	**0.5889**	**0.44**
Total	**341**	**277(81.2)**	**64(18.8)**		
Form/Class					
Form 1	69	60(87.0)	9(13.0)		
Form 2	83	69(83.1)	14(16.9)		
Form 3	106	81(76.4)	25(23.6)	**3.3071**	**0.35**
Form 4	83	67(80.7)	16(19.3)		
Total	**341**	**277(81.2)**	**64(18.8)**		

4.3.2: Reasons why respondents thought influenza was an important public health problem in Kenya

This was a multiple response question where the respondents gave various reasons with the majority, 235(85%) saying it may affect our economy in various ways, 138(50%) felt it makes students fail to go school or class, 131(47.0%) said it makes people very sick [Figure 11].

On influenza as an important public health problem in Kenya, a senior officer from the Ministry of Public Health and Sanitation, rated influenza as highly important as compared to the other common morbidity problems (i.e. malaria, pneumonia, diarrheal and skin diseases) in Kenya.

The officer observed that influenza should be given more attention by the health care system in Kenya in its diagnosis and care because it causes the loss of many hours of work and effective learning and it has the potential of causing severe disease in some groups e.g. diabetics, asthmatics, elderly etc.

4.3.3: Reasons why respondents think influenza is not an important public health problem in Kenya

The respondents who felt/thought that influenza was not an important health problem in Kenya were 64(19%). The reasons they gave for this included the feeling that influenza does not kill (44%) influenza did not prevent students from going to school 39%, among other reasons. On applying Rao Scott corrected chi square, there was no statistically significant difference between the various reasons given ($0.90<p<0.95$), [Table 9]. CDC-US felt that influenza was being given the attention it deserved in the health care system in Kenya because the government had given it more focus in the last 4-years through setting up a multi-sectoral national influenza task force to deal with influenza matters, it set up sentinel influenza surveillance across the country, it identified and set-up influenza focal points to deal with viral influenza issues at the Ministries of health and livestock development (MOPHS & MOLD).

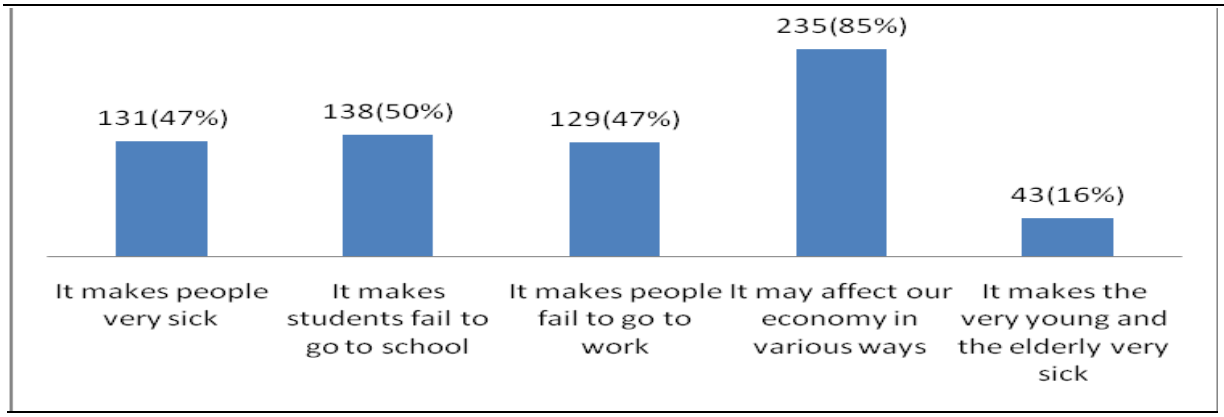

Figure 11: Reasons why respondents felt influenza was an important public health problem in Kenya

Table 9: Reasons why respondents felt influenza was not an important health problem in Kenya.

Attribute	N	%
Why respondents think influenza is not an important health problem in Kenya (n=64)		
It doesn't make people very sick	20	31.3
It doesn't kill people	28	43.8
It doesn't make students fail to go to school/class	25	39.1
It doesn't make people fail to go to work	22	34.4
It doesn't affect our economy in any way	20	31.3

4.3.4: Influenza infections information that respondents felt should be given to the general public in Kenya

Most of the respondents 312 (91%) felt that the general public needed to be given information on how to protect themselves and others from influenza infections. The other frequently identified aspects of influenza infections that respondents felt need to be availed to the public were, signs and symptoms 271 (79 %) and how to prepare for possible influenza outbreaks 231 (67%). On applying the Rao Scott corrected chi square, the difference between the categories was not statistically significant, $p = 0.448$, [Figure 12].

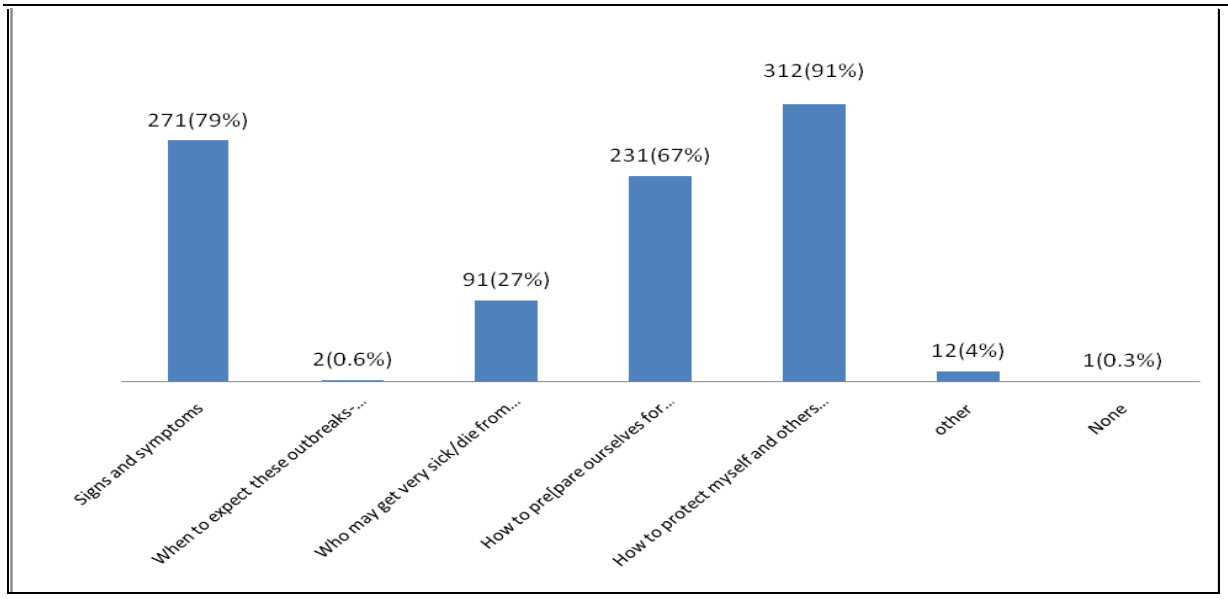

Figure 12: Information that respondents feel should be given to the general public on influenza

4.3.5: Preferred channels for passing influenza information to the general public in Kenya

The preferred channels for receiving influenza information varied but the most commonly identified ones were radio 276 (81%), television 259 (76%), newspapers 217 (63%) and through class teachers 213 (62%). Using The Rao Scott corrected chi square, the difference between the preferred channels was not statistically significant, (p = 0.525), [Figure: 13]

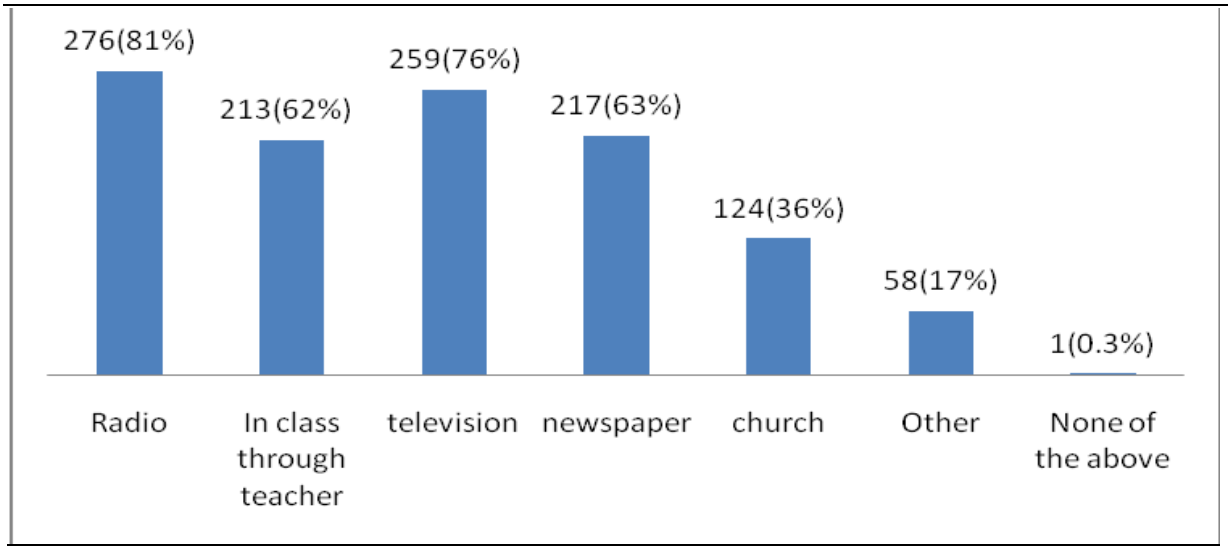

Figure 13: Preferred channels for receiving influenza information

4.4: Practices employed in the management, prevention and control of influenza infections among respondents

Correct management practice (health seeking behavior) for influenza infection was defined as those who were attended by the health care provider when they had influenza infections. Over half of all the respondents (57.4%), had good management practice for influenza infections. The difference between the management practices was not statistically significant ($p = 0.195$) [Table 12].

The options for prevention and control of influenza infections were multiple, and those who mentioned the combination of covering the mouth and nose when coughing or sneezing using tissues or hand kerchief, washing the handkerchief thoroughly after each use, self isolation when infected (staying away from class etc) and always washing hands frequently with soap and clean water were considered as knowing the correct prevention and control practices of influenza infections. Those who mentioned other practices or various combinations of this were considered as not knowing the correct prevention and control practices of influenza infections. Slightly less than two-thirds of the respondents, 214 (62.4%) in this study did not know the correct control practices of influenza infections.

4.4.1: Socio-demographic characteristics in relation to the correct prevention and control practices of influenza infections.

In this study, most of the males 147 (71.4%) did not know the correct control practices for influenza infection, but the females were almost equally distributed in the two groups with 70 (51.1%) knowing and 67 (48.9%) not knowing the correct control practices for influenza infection. The difference was statistically significant ($p < 0.05$). The application of the correct practices was best among the form two respondents, 37 (44%). The difference was not

statistically significant (p = 0.38). Overall, the difference between the categories was statistically significant, p<0.001, (Rao Scott corrected chi square), [Table 10].

Table 10: Socio-demographic characteristics in relation to the correct prevention and control practices of influenza infections

Attribute	Correct influenza infections prevention and control practice(2 or more correc practices)				
	Total	Yes; n, (%)	No; n, (%)	Chi-square	P-value
Sex					
Female	137	70(51.1)	67(48.9)		
Male	206	59(28.6)	147(71.4)	**17.6795**	**0.000027***
Total	**343**	**129(37.6)**	**214(62.4)**		
Form/Class					
Form 1	69	28(40.6)	41(59.4)		
Form 2	84	37(44.0)	47(56.0)		
Form 3	107	37(34.6)	70(65.4)	**3.0745**	**0.38**
Form 4	83	27(32.5)	56(67.5)		
Total	**343**	**129(37.6)**	**214(62.4)**		

* Significant findings

4.4.2: Socio-demographic characteristics in relation to correct Influenza infections management practices.

Among the 137 girl respondents, 83(60.6%) had good management practices as compared to 114 (55.3%) of the boy respondents. The difference was not statistically significant (p=0.34).

The application of the correct influenza infections management practices decreased as the level of education increased from 72.5% in the form ones to 49.4% in the form fours. The difference

was statistically significant, ($p<0.05$), [Table 11]. Most of the School Principles normally send their students to the sanatorium when sick with influenza. Most of them did not allow their students with influenza some few days off from class for rest and recovery.

Table 11: Socio-demographic characteristics in relation to correct Influenza management practices

Attribute	Correct management practices of influenza infections				
	Total	Yes (n, %)	No (n, %)	Chi-square	P-value
Sex					
Female	137	83(60.6)	54(39.4)		
Male	206	114(55.3)	92(44.7)	**0.9256**	**0.34**
Total	**343**	**197(57.4)**	**146(42.6)**		
Form/Class					
Form 1	69	50(72.5)	19(27.5)		
Form 2	84	47(56.0)	37(44.0)		
Form 3	107	59(55.1)	48(44.9)	**8.8740**	**0.031***
Form 4	83	41(49.4)	42(50.6)		
Total	**343**	**197(57.4)**	**146(42.6)**		

*Statistically significant

4.4.3: Practices employed in the management of influenza infections among respondents

Respondents were asked to say what they normally do when they get an influenza infection. The majority, 197(57.4%) would visit a health care provider, 167(48.7%) would buy drugs from the shop, and 123(35.9%) would use local remedies. As this was a multiple response question, the

Rao Scott chi square was applied and the difference between the categories was not statistically significant, (p =0.3034), [Figure 14].

Of the 123 respondents who mentioned using local remedies, most of them mentioned using hot lemon or lime (68%), inhaling garlic steam (27%) and using warm water (25%).The difference between these management options was not statistically significant, P>0.995, (Rao Scott corrected chi squared). Of the 167 respondents who said they would buy drugs to manage influenza, most of them, (56.3%) would buy flu-cold capsules, piriton or its resemblance (48.5%), cold-cap capsules (45.5%), and buy antibiotics (29.3%). Using the Rao Scott corrected chi square, the difference between the treatment options was not statistically significant, (0.995<p<0.975), [Table 12].

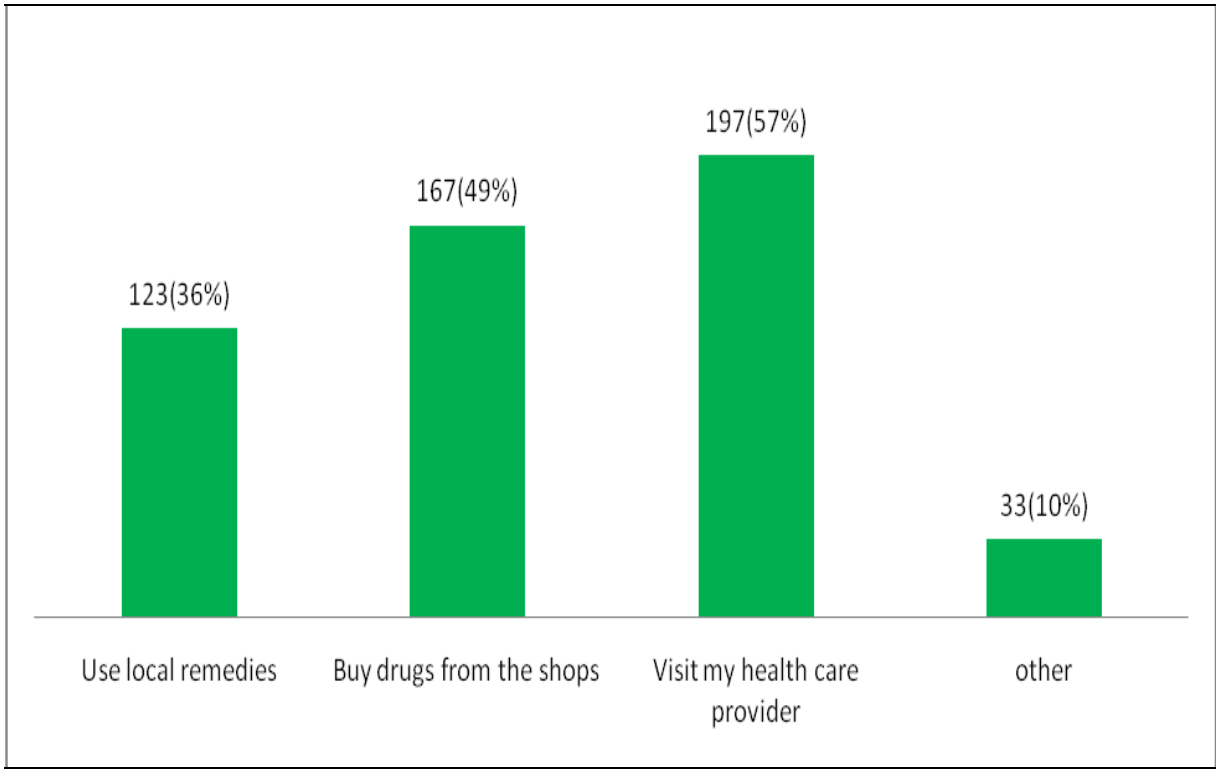

Figure 14: Influenza management practices by respondents

Table 12: Practices employed in the management, prevention and control of influenza infections among respondents

Attribute **(N=343)**	n	%	Rao Scott ch square (X^2_C).	p-value
Local remedies used/applied t manage influenza	123	35.9	0.0012	>0.995
Hot lemon/lime	83	67.5		
Use warm water only	31	25.2		
Mixture of warm water and honey	12	9.8		
Chew local roots/herbs	16	13.0		
Inhale steam of garlic	33	26.8		
Other local mixtures	10	8.1		
Drugs used from the shops t manage influenza	167	48.7	0.117	0.995<p<0.975
Paracetamol/its resemblance	41	24.6		
Aspirin/its resemblance	37	22.2		
Cold-capsules	76	45.5		
Flu-cold capsules	94	56.3		
Piriton/its resemblance	81	48.5		
Antibiotics	49	29.3		

4.4.4. Relationship between correct knowledge on the cause of influenza and correct prevention and control practice of influenza infections

On comparing the respondents who knew the correct cause of influenza with the correct prevention and control practices, most of the respondents who knew the cause of influenza did not practice the correct prevention and control practices 126(64.0%), and among the respondents who did not know the cause of influenza, 58(39.7%) practiced the correct prevention and control practices of influenza infections. The difference between those who knew the cause of influenza and applied correct prevention and control practices for influenza and those who did not know the cause of influenza and applied correct prevention and control practices for influenza was not statistically significant, ($p = 0.4854$), [Table 13].

4.5. Knowledge on cause of influenza in relation to its management practices

In this section, the study considered those who knew the correct cause of influenza only, against those who did not and their influenza infections management practices

Table 13: Relationship between correct knowledge on the cause of influenza and correct prevention and control practice of influenza infections

Attribute	Correct prevention and control practice of influenza infections (N=343)				
Cause of influenza	Total	Yes; n, (%)	No; n, (%)	Chi-square	P-value
Know	197	71(36.0)	126(64)	**0.4854**	**0.4854**
Don’t know	146	58(39.7)	88(60.3)		
Total	**343**	**129(37.6)**	**214(62.4)**		

4.5.1. Relationship between knowledge on the cause of influenza and its management practices

Among those who knew the correct cause of influenza only, against those who didn't know, and their influenza management practices, 42(56%) of those who knew the correct cause of influenza visited the health care provider while 33 (44%) of them used other influenza management practices. Respondents who mentioned that they received current information on influenza from their class teachers had, significantly, better management practices for influenza compared to those who did not, ($p< 0.05$).

Similarly, the respondents who received information on influenza through media sources had better management practices for influenza infection compared to those who did not,($p<0.05$). Overall, irrespective of whether one knew or did not know the correct cause of influenza, over half, 197(57.4%) of the respondents undertook the correct influenza management practice. The difference was not statistically significant, $p = 0.7762$, [Table 15].

4.5.2. Interpretation of research hypothesis

"There is no relationship between the Knowledge on the cause of influenza with the management Practices of influenza".

As Table 14 shows, there was no statistically significant relationship between correct knowldge of the cause of influenza and its management practices,($p = 0.7762$).

We therefore are not able to reject the null hypothesis that "There is no relationship between the Knowledge on the cause of influenza with the management Practices of influenza"

Table 14: Knowledge on the cause of influenza in relation to correct management practice of influenza

Attribute	Correct management practices for influenza infections				
Correct cause of influenza(only)	Total	Yes; n, (%)	No; n, (%)	Chi-square	P-value
Yes	75	42(56)	33(44)	**0.0808**	**0.7762**
No	268	155(57.8)	113(72.9)		
Total	**343**	**197(57.4)**	**146(42.6)**		

4.6. Attitude on influenza and its management practices

In this section, the study considered those who felt/thought influenza was an important public health problem, against those who did not and their influenza infections management practices

4.6.1: Relationship between influenza as an important public health problem and its management practices

Of the respondents who said influenza was an important public health problem in Kenya, slightly less than two-thirds 169(61.0%) had good management practices (visited health care provider), against 108(39%) who did not visit the health care provider. The difference was statistically significant ($p < 0.05$), [Table 16].

4.6.2. Interpretation of research hypothesis

"There is no relationship between the Attitudes on the cause, transmission, prevention & control of influenza with the management Practices of influenza".

The statistics presented in Table 15 show there is a statistically significant relationship between attitudes and management practices for influenza, ($p<0.05$). We therefore reject the null hypothesis that "There is no relationship between the Attitudes on the cause, transmission, prevention & control of influenza with the management Practices of influenza".

Table 15: Influenza an important public health problem in relation to correct management practices

Attribute	Correct management practices for influenza infections(Visit health care provider {N=341}				
Influenza an important public health problem in Kenya	Total	Yes; n, (%)	No; n, (%)	Chi-square	P-value
Yes	277	169(61.0)	108(39.0)		
No	64	27(42.2)	37(57.8)	**7.5367**	**0.00605***
Total	**341**	**196(57.5)**	**145(42.5)**		

*Statistically significant

5.0 CHAPTER FIVE: DISCUSSION

One of the objectives of this study was to determine the knowledge on the cause of influenza. Most of the respondents interviewed did not know that viruses cause influenza and they had a lot of misconceptions on the cause of influenza. Among the misconceptions being cold weather, dusty situations, crowded places and cold water or drinks. The key informant interviews with the school principals brought out the same picture as they did not know the correct cause of influenza and had misconceptions that influenza is caused by cold weather. This had similarities to a study conducted on knowledge and misconceptions regarding upper respiratory infections and influenza among urban Hispanic households, where among the possible causes of influenza mentioned by respondents included weather-related conditions. A small proportion reported that they may be caused by evil eye (‘mal de ojo’, 7.1%) or sudden fright (‘susto’, 3.3%), [Larson et al, 2008]. This implies that a lot needs to be done to correct these misconceptions as its only through knowing the correct cause of influenza and its transmission that effective preventive measures can be put in place.

A majority of the respondents were aware that there had been cases of pandemic H1N1 2009 influenza in Kenya, this may be a pointer to the significant social impact the influenza A/H1N1 2009 pandemic had in Kenya. With nearly half of the respondents reporting to have ever missed class due to influenza infection and majority saying influenza is an important public health problem in Kenya as it may affect our economy in various way, shows that the health and economic impact of influenza infections in Kenya is great. This concurs with two separate study reports by Sanofi Pasteur (2008) and CDC-US (2005), which stated that during influenza outbreaks, the direct cost to patients in term of cost for consulting the doctor, purchase of medications, hospitalization and treatment and that the indirect cost on the patients including

costs due to lost income through absenteeism from work, psychosocial stress and reduced productivity are enormous and have a big toll on the country's economy, respectively (Sanofi Pasteur publication, 2008 & CDC-US, 2005).

Kenya has not been spared this problem and a lot of useful working hours and learning time for students may be lost every year due to influenza infections. It has been documented that the overall economic burden of influenza in the United States alone has been estimated at more than 11 billion dollars annually (Billaud, 2007). This concurs well with the findings of a similar study undertaken at the Washington University-USA, which found that total illness episodes, febrile illness episodes, analgesic use, school absenteeism, parental industrial absenteeism, and secondary illness among family members were significantly higher during an influenza season compared with the non-influenza season [Neuzil et al, 2002].

About a third of the respondents were aware that a seasonal influenza vaccine was available in Kenya, which may imply it's because of its inaccessibility that it's not widely used in this country. Vaccination with the seasonal influenza vaccine is the best preventive measure for influenza infection, but knowledge on this is lacking in secondary schools in Kenya. This may be partly because influenza is not viewed as a serious health problem in Kenya and also because very little educational materials are available on influenza as a disease and its dangers in general.

The study confirms the findings of another study undertaken in Milan Italy on Influenza vaccination among healthcare workers which found that the limited knowledge regarding the severity of influenza in relation to age and subjects at high risk when infected by influenza viruses, led to poor vaccination rates [Esposito et al; 2008]. In that study a number of methods had been suggested to improve influenza vaccination rates, but they could only be fully

successful if health care system and the public are convinced that getting vaccinated against influenza is important for both medical and economic reasons. Another study showed that most household members were well versed about influenza vaccination and reported that a recommendation from a healthcare provider would definitely influence them to get vaccinated (Larson et al, 2008).In this study, respondents who mentioned that they received current information on influenza from their class teachers had significantly better management practices for influenza compared to those who did not; this shows the need to include influenza education in the school curriculum. This is given more credence by a KAP study on avian influenza in Afghanistan which showed that teachers remain the most trusted source of information for children, together with health personnel. The study went further to emphasize that these networks should be used in order to sensitize children during future IEC campaigns and ensure they are provided with essential prevention messages [Leslie et al, 2008]. Clear communication and provision of updated information also helped improve vigilance and preparedness during the 2009 influenza A/H1N1 pandemic **[**Lau et al, 2009].

Of interest in this study, higher educational status (Superior class in school) in our cohort was a significant negative predictor of the good practice of visiting a health care provider when sick with influenza, showing that educational status alone does not determine behaviors. This may be because the younger respondents still had a lot of parental care when it comes to health matters with their parents taking them to the health care provider, as compared to the older ones, and also may be because the older ones didn't get severe influenza disease as their immune status is better compared to the younger ones. This finding reflects the facts observed in two previous studies, one on influenza **[**Rubin et al, 2009**]** and the other on SARS **[**Tang et al, 2003**]** which also showed that education level did not have any effect on uptake of recommended behavioral patterns.

In the prevention or control influenza infections, the girls had significantly better prevention and control practices for influenza compared to the boys. This may be good as these are the future mothers of the nation and their interactions with the children will teach them the correct practices. But overall, most of the respondents did not know the correct prevention and control practices for influenza infections. Contrary outcome was observed in a KAP study on influenza among Hispanics in Santiago in 2006 & 2009, where the survey showed high awareness of the influenza vaccine and other preventive measures, notably hand hygiene and cough covering [Bethel et al; 2006]

In this study, knowing the correct cause of influenza did not influence the application of good prevention and control practices for influenza. Most of the respondents who knew the cause of influenza did not practice the correct prevention and control practices. This is contrary to normal expectations whereby correct knowledge leads to better practices. But this may be explained on the basis that there is little information to the students on influenza infections. In a study on knowledge, attitudes and practices towards pandemic influenza in tropical Singapore, it was shown that good knowledge on influenza transmission, management, prevention and control is important to enable individuals to have better attitudes and practices in influenza risk reduction [Yap et al, 2010]. Despite the fact that influenza may not be viewed as an important health problem in Kenya, over a half of the respondents in our study visited a health care provider when they got influenza infection. This shows that with better understanding of what influenza actually is, and its effects on persons with chronic illnesses, influenza care would become better. But over half of the respondents' did not know the correct influenza prevention and control practices. This is an area which needs a lot of attention and development of educational materials and using the preferred media to educate the respondents will be necessary.

The study found that age, sex, and level of education (as a proxy of socio-economic status) did not predict knowledge, attitudes or management practices of influenza infections. This implies socio-economic status is not a good determinant to the practices of influenza prevention and control. In a study conducted to look for the predictors of the uptake of A /H1N1 influenza vaccine in Tokyo, some of the predictors noted included mistrust of information provided by public health or government authorities, which led to low acceptance rate, some believed that A /H1N1 influenza was as mild as seasonal influenza, and its vaccine may be necessary only for people in high risk groups. More than two thirds of the study subjects were anxious about adverse effects and others felt that the vaccine had not been thoroughly tested for efficacy and safety and that A /H1N1 influenza was a relatively mild disease and they urged that it was not worth the risk to get vaccinated, [Yi et al, 2011].

The possible lack of representativeness of a secondary school cohort to the general population is an inherent limitation of this study, especially for the overall age structure. However, it does represent the behaviors of an important age group of the population for the sake of influenza prevention and control, which affects mostly children, those with chronic illnesses and the elderly.

Another objective of the study was to determine the respondent's attitudes towards influenza infections. The majority of the respondents in this study felt that influenza was an important public health problem in Kenya. Most of these had good influenza management practices (visited health care provider). Hence this may mean if we can change the attitude of our people to take up the public health impact of influenza infections seriously, then they will undertake good influenza management and control practices. But this is not invariably so as shown in a study conducted on "attitudes amongst Australian hospital healthcare workers towards seasonal influenza and vaccination" which showed that although health care workers felt that the influenza vaccine was safe or effective (75%), only 22% had been vaccinated. This implies that

attitude alone may not influence the proper practices on influenza prevention [Seale et al, 2007]. Most of the respondents felt that the general public needed to be given information on how to protect themselves and others from influenza infections. The other aspects of influenza information identified for the public included signs and symptoms of influenza and how to prepare for possible influenza outbreaks.

This compares quite well with a study conducted in China on "needs on information related to influenza pandemic by the Public", they found that during the time period of relative influenza inactivity, the respondents viewed the basic knowledge of human infection with avian influenza (H5N1) as their top priority, while in the influenza virus-active period, the feasible preventive measures was their top priority [Hao et al, 2009]. The views from this study will form a basis for developing messages and communication agenda on influenza to the respondents (secondary school students).

In this study, respondents got vital information on influenza from the media and they preferred receiving influenza information from the same. The most preferred media were radio, television, newspapers and through class teachers. This gives us a good idea of the preferred channels of communication in the event of developing influenza communication messages as we have an idea on which communication channels to use to effectively transmit this information. Respondents who received information on influenza through media sources had better management practices for influenza infection compared to those who did not. This is in line with a study conducted by FAO in Uganda which found that a significant number of respondents (85 percent) agreed that both electronic and print media channels were good for generating awareness within the community with many saying that radio was better than the other media because of its wide coverage and ability to reach many people in a short time [FAO, 2009].

6.0 CHAPTER SIX: CONCLUSION AND RECOMMEDATIONS

6.1 Conclusion

Most of the respondents in this study were in the 15-19 year's age-group. Majority of them did not know that viruses cause influenza infections. This requires to be corrected if we expect the public to put in place the correct preventive and control practices for influenza infections. Almost half of the students or their relatives had missed class, work or church due to influenza infection. This shows that influenza infections are an important public health problem in Kenya and all efforts should be made to put in place the correct knowledge on the cause, transmission, management, prevention and control measures of influenza infections.

Of interest in this study, higher educational status (Superior class in school) was a significant negative predictor of the correct management practice of influenza infections, showing that educational status alone does not determine behaviors. This clearly shows us that as we target health education on influenza, we should target all groups irrespective of their education level or status in society. Respondents who mentioned that they received current information on influenza from their class teachers had significantly better management practices for influenza compared to those who did not. Similarly, the respondents who received information on influenza through media sources had better management practices for influenza infection compared to those who did not.

In this study, the girl respondents had significantly better prevention and control practices for influenza infections compared to the boys. This knowledge should be built on and disseminated to all the respondents. However, it was significantly determined that most of the respondents did not know the correct prevention and control practices of influenza infections. There was a

statistically significant relationship between attitudes and management practices for influenza infections, as those who felt influenza was an important public health problem, had better management practices for these infections.

Over half of the respondents reported that they or a family member had suffered from influenza in the

preceding twelve months, this shows that influenza is a significant morbidity problem in Kenya. Respondents who mentioned that they received current information on influenza from their class teachers had significantly better management practices for influenza infections compared to those who did not. Similarly, the respondents who received information on influenza through media sources had significantly better management practices for influenza infection compared to those who did not.

6.2. Recommendations

Health Education

1. From the study, most of the respondents didn't know the correct cause of influenza, the correct management practice nor the correct prevention and control practices of influenza infections. Also over half of the respondents reported that they or a family member had suffered from influenza in the preceding twelve months and also those who felt that influenza was an important public health problem had better management practices for these infections. As such, there is need for the Ministry of Health in liaison with the Ministry of Education and the city council of Nairobi, to develop appropriate IEC materials or educational materials on cause, mode of transmission, correct management practices, the appropriate prevention and control methods of influenza infections and efforts made to educate the respondents on the health effects of influenza infections to them and others e.g. the effect to those with chronic infections, on the elderly and the very young. These should be passed over to the students through the

school health program and also disseminated through the various media channels, preferably during increased influenza activity seasons.

Policy

2. In regards to policy, Ministry of Public Health and Sanitation, Ministry of Education and the city council of Nairobi should formulate a policy of creating awareness on influenza infections, their management, prevention and control strategies in secondary schools.

6.3. Need for further study

There is need to do similar studies at the household and community level on KAP on transmission, management, prevention and control of influenza. This is because a lot of learning takes place at the home and community from adults.

It is also important to carry out research on the costs of influenza particularly in terms of economic implications to the health care facilities, the individuals, the households, the community and the nation at large.

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ANNEXES

Annexe I : Study Questionnaire

Viral Influenza KAP-Survey

PART I

IDENTIFICATION

1. Interviewers code (or initial) ____ ____ ___

2. Date of interview: ___ ___ / ___ ___ / ___ ___ (dd/mm/yy)

3. Questionnaire number ____ ____ ____

PART II: SOCIO-DEMOGRAPHICS DATA

4. Name of School_____

5. Interviewee's code (or initials) ----------

6. Age of interviewee (years)? ___

7. Sex/gender? (Circle one) Male Female

8. Form/class? (Tick one)

Form 1 ☐ Form 2 ☐ Form 3 ☐ Form 4 ☐

9. Religion? (Tick one)

a. Catholics b. Protestant ☐ c. Muslim ☐ d. Hindu ☐ e. Evangelism ☐

f. Traditional ☐ g. Other (specify)…….

PART III

Knowledge on influenza

10. Have you ever heard about influenza (Flu)?

1. Yes [1] ☐

2. No [2] ☐

If NO, explain as follows to the interviewee;

(Viral Influenza is an infection of the human respiratory tract. It presents like common cold or flu (Homa!). When influenza is circulating within the community, patients with influenza like illness who have both cough and fever within 48 hours of symptoms onset are likely to have influenza.)

11. In you view, what causes influenza? (Tick all that apply)

- Cold weather [1] ☐
- Dusty situations [2] ☐
- Cold water/drinks [3] ☐
- Some insects [4] ☐
- Some germs (viruses) [5] ☐
- Crowded places [6] ☐
- Others (specify) [7] ☐ ……
- No idea [8] ☐

12. Have you or a family member suffered from influenza (Flu)?

1. Yes [1] ☐
2. No [2] ☐

If NO, go to Q 14

13. Which of the following symptoms of influenza (flu) did you or him/her have? (Tick all that apply) ☐

Cough [1] ☐

Runny Nose [2] ☐

Diarrhea [3] ☐

Fever [4] ☐

Shortness of breath [5] ☐

Sore throat [6] ☐

Body pains [7] ☐

Others, specify [8] ……..

14. Which of the following do you know as symptoms of influenza infection -flu? (Tick all that apply) ☐

Cough [1]

Runny Nose [2] ☐

Diarrhea [3] ☐

Fever [4] ☐

Shortness of breath [5] ☐

Sore throat [6] ☐

Body pains [7] ☐

Others, specify [8] ……

15. Where did you get this information, on symptoms of influenza, from? (Tick all that apply)

1. Radio [1] ☐
2. In class through teacher [2] ☐
3. Television [3] ☐
4. Newspaper [4] ☐
5. Church [5] ☐
6. Suffered influenza [6] ☐
7. None of the above [7] ☐
8. Others (specify) [8]

……

16. Did you/her/him have to miss class, church or some activity due to an influenza infection?

a. Yes [1] ☐

b. No [2] ☐

17. Are you aware if there is a vaccine available to prevent influenza (seasonal)?

1. Yes [1] ☐

2. No [2] ☐

3. Don't know [3] ☐

18. Are you aware if there have been cases of Pandemic A/H1N1 (swine flu) influenza in Kenya in the last 2-3 years?

1. Yes [1] ☐

2. No [2] ☐

3. Don't know [3] ☐

19. In your own opinion/view, what kind of influenza/ILI information do you feel should be given /availed to the general public? (Tick all that apply)

1. Signs and symptoms [1] ☐

2. When to expect these outbreaks-seasonality [2] ☐

3. Who may get very sick/die from influenza infections [3] ☐

4. How to prepare ourselves for possible influenza outbreaks [4] ☐

5. How to protect myself and others from influenza/ILI infections [5] ☐

6. Others (specify) [6]

……

7. None [7]

20. How would you wish this information to be disseminated (passed on)? (Tick all that apply)

- Radio [1] ☐
- In class through teacher [2] ☐
- Television [3] ☐
- Newspaper [4] ☐
- Church [5] ☐
- Others , specify [6]

……

- None of the above [7]

21. In your own view, do you feel/think influenza/flu is an important health problem in Kenya?

1. Yes [1] ☐
2. No [2] ☐

22. If **yes to 21 above**, why? (Tick all that apply)

1. It makes people very sick with blocked nose , headache and sore throat etc [1]
2. It makes students fail to go to school/class [2]
3. It makes people fail to go to work [3]
4. It may affect our economy in various ways e.g. cost of medicines, lost working time etc [4]
5. It makes the very young and the elderly very sick [5]

23. If **no to 21 above,** why? (Tick all that apply)

1. It doesn't make people very sick [1] ☐
2. It doesn't make kill people [2] ☐
3. It doesn't make students fail to go to school/class [3] ☐
4. It doesn't make people fail to go to work [4] ☐
5. It doesn't affect our economy in any way [5] ☐

24. Have you been taught about influenza/flu in school?

1. Yes [1] ☐
2. No [2] ☐

Practice on influenza

25. What do you normally do when you get a flu/influenza/ILI infection? (Tick all that apply)

1. Use local remedies [1] ☐
2. Buy drugs from the chemist [2] ☐
3. Visit my health provider[3] ☐

☐

4. Others, (specify) [4]

…….

26. In response 25 above, specify w**hich ones?** (Tick all that apply)

i) Local remedies;[a]

1. Hot lemon/lime [1] ☐

2. Warm water only [2] ☐

3. Mixture of warm water and honey [3] ☐

4. Chew local roots/herbs [4] ☐

5. Do nothing [5] ☐

6. Inhale steam of garlic [6] ☐

7. Other local mixtures [7], e.g. …….

ii) Drugs from the chemist/shop; [b]

1. Panadols /its resemblance [1] ☐

2. Aspirin/its resemblance [2] ☐

3. Cold-capsules [3] ☐

4. Flu-cold capsules [4] ☐

5. Piriton/its resemblance [5] ☐

6. Antibiotics[6] ☐

7. Antimalarials [7] ☐

8.Others drugs [8], e.g …….

27. What do you normally do so that you can protect yourself from getting or passing over influenza? (Tick all that apply)

1. Covering the nose and mouth when coughing or sneezing using tissue or handkerchief [1] ☐

2. Sneezing/coughing in ones palms and rubbing them together [2] ☐

3. Washing the handkerchief/s thoroughly after each use [3] ☐

4. Self isolation when infected (staying away from class etc) [4] ☐

5. Mixing with people freely when infected [5] ☐

6. Not covering the nose or mouth when coughing or sneezing [6] ☐

7. Washing hands frequently with soap and clean water, always [7] ☐

Thank you very much for your time

Annex II: Key informant interview tool

The information derived from these interviews will be used to complete the picture derived from the closed ended questionnaire.

KII PART I

To the DPHS-MOPHS

Q1.How does the government / you rate influenza as a disease of public health importance in Kenya?

Probes

a. Highly

b. Moderately

c. Some-how important

d. Not an issue

Q2. After the panic which was caused by the recent new influenza A/H1N1 2009 outbreak, do you feel/think the health care system in Kenya should give influenza some more attention in its diagnosis/recognition and care? Why and why not?

Probes

Yes, because…..		No because…..	
1	Causes the loss of many hours of work and effective learning during influenza seasons	1	It's basically not a serious disease in Kenya
2	It has the potential of causing severe disease in some groups e.g. diabetics, asthmatics,	2	With or without any attention/treatment, it will resolve anyway!

	elderly etc		
3	Kenya as a signatory of International health regulation-IHR 2005, pandemic influenza as a PHEIC should be given attention	3	We have other more serious communicable diseases in Kenya, causing more suffering e.g. TB , HIV/AIDS, Malaria etc
4	Avian influenza has a high mortality in humans and devastating effects on the poultry industry	4	This is/are diseases of the temperate lands and are of little significance in Kenya
5	Others…..	5	Others…..

Q3. If yes, what kind of attention

Probes

1. Start immunizing health care workers against seasonal influenza

2. Start immunizing the vulnerable groups and health care workers against seasonal influenza

3. Educate/update the health care workers on its importance, diagnosis and care

4. Together with the international community, prepare for any possible, devastating pandemic like the one of 1918-19 which killed over 40 m people worldwide

5. Other reasons

……

Thank you very much for your time

KII PART II

To CDC

Q4. Do you feel influenza is being given the attention it deserves in the health care system in Kenya? Why and why not?

Probes

Yes, because;…..		No because;…..	
1	The government has set up a multi-sectoral national influenza task force to deal with influenza matters	1	The government doesn't allocate any/enough resources for influenza activities
2	The government has agreed to the setting up of sentinel influenza surveillance sites across the country.	2	The training institutions put very little emphasize on viral influenza.
3	The government has set-up influenza focal points in Kenya to deal with viral influenza issues (MOPHS & MOLD)	3	The government doesn't undertake seasonal influenza vaccination to high risk groups

4	Others……	4	The government doesn't undertake routine reporting of viral influenza.
		5	Others……

Q5. Do you feel/think the public understands what influenza as a disease is?

Yes No

If yes, why?

1. ……

2. …….

3. ……

If not what can be done to improve their perception?

Probes

a. Pass appropriate messages on viral influenza in the media especially during the influenza seasons

b. Undertake health education on viral influenza at all health institutions in Kenya, targeting the patients in outpatients, clinics and in-patients, using varied methods e.g. TV, posters , brochures etc

c. Engage the opinion leaders e.g. politicians, khadhis, priests, pastors etc in educating the public during their public meeting forums.

d. Others**……**

……..

…….

Thank you very much for your time

KII PART III

To DEO/Principle/Deputy principle of visited school

BEFORE YOU PROCEED, EXPLAIN THAT;

Viral Influenza is an infection of the human respiratory tract. It presents like common cold or flu (Homa!). When influenza is circulating within the community, patients with influenza like illness who have both cough and fever within 48 hours of symptoms onset are likely to have influenza.

Q8. When you hear about influenza (flu)/ILI, what comes into your mind?

Probes

i. A disease caused by cold whether
ii. A usual health problem which occurs every year
iii. A type of common cold
iv. A deadly disease which affects mainly whites
v. A disease caused by a virus , which can kill at times
vi. Others, specify…….

Q9.Norrmally what do you do (or expect to be done) when you suspect one of your students has influenza (flu)/ILI?

Probes

1. Sent them to the sanatorium for care
2. Allow them some few days off from class for rest and recovery
3. Advise them on use of local flu remedies
4. Buy for them some drugs from the shops (which ones,……)
5. Allow them home till recovery
6. Do nothing
7. Others, specify……..

Q10. In your view, do you think influenza (flu)/ILI is an important health problem in Kenya? Elaborate

Probes

Yes, because…..		No because…..	
1	Causes the loss of many hours of work and effective learning during influenza seasons	1	It's basically not a serious disease in Kenya
2	It has the potential of causing severe disease in some groups e.g. diabetics, asthmatics, elderly etc	2	With or without any attention/treatment, it will resolve anyway!
3	Kenya as a signatory of International health regulation-IHR 2005, pandemic influenza as a PHEIC should be given attention	3	We have other more serious communicable diseases in Kenya, causing more suffering e.g. TB , HIV/AIDS, Malaria etc
4	Avian influenza has a high mortality in humans and devastating effects on the poultry industry	4	This is/are diseases of the temperate lands and are of little significance in Kenya
5	Others…..	5	Others…..

Q11.Is influenza discussed in school as part of the school health program or the school syllabus?

Yes ☐ No ☐

Thank you very much for your time

Annex III: Informed Consent Explanation / Form

I, **Dr Phillip M. Muthoka**, am a post-graduate student pursuing a degree program in the School of Public Health, university of Nairobi. As part of the program I am supposed to conduct some research. My research study is entitled "**Knowledge, attitude and management practices of influenza (flu) /ILI infections among staff and students in secondary schools in Nairobi**".

Purpose: The purpose of the study is to find out what students and staff in secondary schools, know about the cause, transmission, care, prevention and control of influenza and their needs on information, care, prevention and control of this problem. This study is to be conducted in randomly selected secondary schools in Nairobi and your school is among those selected.
My visit to your school is to request you to allow me conduct my study in this school.

Procedure to be followed: The questionnaire, consisting of several questions, will be interviewer-administered to the participating students. This will be carried out at a private place so that nobody will know their responses. The interviewing or questionnaire filling will take about 30 minutes.

Benefits from the study: There will be no direct benefit from participating in this study. However, the information provided in this study will be used in formulating strategies to improve influenza management, prevention and control programs in this country.

Potential risks: There are no major risks associated with this interview.

Confidentiality: The study will work towards minimizing a breach of confidentiality by not including any name on any notes resulting from the interview or any summary of the interview data. Records relating to their/your participation will remain confidential to the research assistant and the Principle 1nvestigator. The assent/consent forms and the survey forms will be

maintained in a secure location until all data are analyzed. The assent/consent forms will be destroyed upon completion of the study.

Non-participation in the study:

There will be no penalty for non-participation in the study. If you choose your school/you, not to participate, you will not be questioned further. The study participant has the right to withdraw from the study at any time without needing any explanations to the research staff. The decision not to take part in the study will have no impact on your school or you or your participating student.

Further Communication: If you have any issues regarding the study you can either contact me , Dr Philip M. Muthoka, P.O Box 20781-02002, Nairobi (Tel; 0722331548, 2718292) or The Chairperson, KNH/UoN Ethical Review Committee, P.O Box 20723, Nairobi. (Tel; 726300-9, e-mail KNHplan@ken.Healthnet.org)

Any Questions?

If you have any questions regarding this study, you are free to ask them.

Annex IV: Assent form (For students below 18 years), for Principles/Deputies

I, Code number of school……., having been explained the purpose of this study, risks involved and benefits for participating in the study, I here-by:

Agree / don't agree for my school and students to participate in this study.

Signatures:

Principle/Deputy: ……Date: ……..

Investigator: ……...……Date: ……

Annex V: Consent form (For students above 18 years)

I, Code number of student……, having been explained the purpose of this study, risks involved and benefits for participating in the study, I here-by:

Agree / don't agree for my school and students to participate in this study.

Signatures:

Participant: ……Date: ……..

Investigator: ……...……Date: ……

Annex VI: Distribution of secondary schools in the study district, per divisions

Division/District	Schools	School status	No. o students	Females	Males
Dagoretti (13 schools)	Upper hill boys	Gok -boarding	1002	0	1002
	Moi Nairobi girls	Gok-boarding	995	995	0
	Dagorretti high school	Boys boarding	820	0	820
	Ruthimitu high school	Mixed day	360	170	190
	Ruthimitu girls high school	Day	315	315	0
	Enna girls high school	Private boarding	245	245	0
	Mutuini high school	Boys boarding	408	0	408
	Dagorrete cdf sec schoo	Mixed day	350	170	180
	Nembu high school	Girls boarding	485	485	0
	River side secondary school	Mixed privat ?day	215	95	120
	Precious bloo secondary school	Girls boarding	505	505	0
	Lenana high school	Boys boarding	1075	0	1075
	Jagiet high school	Mixed day	154	54	100
	All Schools		**6929**	**3034**	**3895**
West lands (1 schools)	Kangemi high school	Boys boarding	605	0	605
	Kenya high school	Girls boarding	880	880	0
	State house girls	Girls boarding	943	943	0

	Oswal academy, junior high-nairobi	Mixed day	833	402	431
	Nairobi school	Boys boarding	1161	0	1161
	St georges sec school	Girls day	925	925	0
	Nairobi milimani high school	Boys day	280	0	280
	Lavington high	Mixed day	254	101	153
	High ridge sec school	Mixed day	119	46	73
	Hospital hill high school	Mixed boarding	449	230	219
	All Schools		**6449**	**3527**	**2922**
Langata (5 schools)	Sun shine sec school	Boys boarding	950	0	950
	Olympic secondary school	Mixed day	622	250	372
	Al rasul boys-karen	Boys boarding	120	0	120
	Langata high school	Mixed day	750	254	496
	Hill crest schools	Mixed ?day	500	300	200
	All Schools		**2942**	**804**	**2138**

Source: District Education Office, Nairobi west district-2009/10

Annex VII: RAO CHI SQUARE

"Developments in analysis of multiple response survey data in categorical data analysis: the case of enterprise system implementation in large north American firms1**"**

BY:

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and

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PhD, Professor, Technology & O

Quantitative Methods in Enterprises Behavior Analysis under Risk an Uncertainty

1. Introduction

Analyzing complex data collected from the surveys is one of the challenges facing the researchers. The complexity of the data is a multifaceted issue and has different implications. One of these challenges (facets) comes when researchers working with categorical data are working with multiple response variables. This problem arises when, for a single observation, a variable or some variables may be classified into more than one category. We should note that the cause of this type of complexity is "the multiple-response nature of the data, not from the sampling mechanism" or the design of the questionnaire (Thomas and Decady, 2004). When more than one answer may be selected by the respondents, the response for a single observation can be classified into more than one category. The problem of multiple response variables can be observed and studied in n-way contingency tables. The focus of this study is on the problem of multiple response variables in two-way contingency tables, while the situation of Enterprise System (ES) implementation presents a case of single-by-multiple marginal independence.

The research problem is explained in section two by presenting a generic example. The next section explores the historical developments in identifying and understanding the multiple response variables in categorical data analysis. Section four presents the application of new statistical tools in analyzing data recently collected from a sample of large North American firms; the data is examined to determine the success in implementing ES, the challenges of implementing ES, and the success of utilizing ES. Finally, section five presents the conclusion and gives suggestions for future studies.

2. The Problem with Multiple Response Variables in Categorical Data Analysis

The issue of multiple response variables is becoming more and more visible and, therefore, has attracted the attention of researchers and practitioners, specifically in the past decade. For example, in a recent guideline prepared by the Australian Institute of Health and Welfare for those involved in collecting and presenting the data regarding alcohol and other drug treatment, the issue of multiple response variables as an "indigenous status question" has been identified (Australian Institute of Health and Welfare working paper, 2008).

Although the existence of multiple response variables may be easily identified, the implication of analyzing multiple response variables has received less attention. There are numerous studies dealing with multiple response variables. However, in some cases, the researchers simply ignored the fact that when they are dealing with multiple response variables. Specifically the chi-square test is not a reliable test when multiple response variables are being analyzed. One example is the Stallings and Ferris (1988) study on public administration research where, despite the recognition of multiple response variables, the researchers have used the simple chi-square test to identify the difference between different categories of data. Decady and Thomas (2000) explicitly described two main reasons that the Pearson chi-square test is not appropriate in dealing with multiple response variables. Here we will describe the problem with multiple response variables using a generic example. Consider the 2x2 contingency table (Table 1). First, we assume that there are no multiple response variables.

Table 1. A 2-by-2 table of observations with no multiple response variables

	Y1	Y2	
X1	a11	a12	a11 + a12= N1+
X2	a21	a22	a21 + a22 = N2 +
	a11 + a22= N1+	a12 + a22 = N2 +	=N=a++

In this table, the observed counts are presented in four cells. X is the independent variable and Y presents the response variable. The marginal values are presented by N+1, N+2, N1+, and N2+. In each row and column the marginal values present the summation of that row or column. The Pearson chi-square test is calculated by the following formula:

$$\chi 2 = \text{SUM} \frac{(\text{Observed} - \text{expected})2}{\text{Expected}}$$

We have the observed variables in Table 1. We also need the expected value of each observation, based on the marginal totals, for the ability to calculate the Pearson chi-square. Table 2 presents the way the expected values are calculated.

Table 2. A 2-by-2 table of expected values with no multiple response variables

	y1	y2	
x1	(N1+ *N1+)/N	**(**N1+***** N+2**)**/N	N1+
x2	(N2+*N1+)/N	**(**N2+***** N+2**)**/N	N2+
	N+1	N+2	N

Here the two components of the Pearson chi-square are displayed: observed (Table 1) and expected (Table 2) values. However, this presentation is based on the assumption that none of the independent (e.g., rows) and response (e.g., columns) variables have multiple response variables.

Now if we assume that some variables can receive multiple responses for any row and/or column, then the marginal values of that row or column (there may be more than one of either) would be greater than the total observations of the variables. In this situation, the calculation of expected values using the model proposed above would be problematic.

This is the first reason that Decady and Thomas (2000) gave when they stated that the traditional chi-square test is not appropriate for these circumstances. The second reason is that since one observation in this circumstance may yield multiple responses, the "standard assumption" of independence of rows and columns in he table is violated (Decady and Thomas, 2000). Further to these theoretical explanations, Rao and Scott (1981, 1984, and 1992) empirically showed that "classical chi-squared tests are invalid when applied to data from complex sample survey because the complexities of the survey design violate[s] the assumptions on which these tests are based" (Decady and Thomas, 2000).

3. Historical Developments in Analyzing Multiple Response Variables

Previously, two main reasons were given to explain why the classical Pearson chisquare is not appropriate for analyzing the complex survey data with multiple response variables. In this section of the paper, we explore how the researchers in academia deal with the analysis of the multiple response variables. To explore the evolution of studies in this area, we conducted an extensive literature search. We used a number of academic databases to identify the data on the evolution of studies in this area. The following presents the result of our literature analysis.

The analysis of complex survey data has been of interest to researchers outside the field of mathematics and statistics since the 1970s. For example, Irving Roshwalb (1973) mentioned the "need [to] improvement" of analytical techniques for handling the complex survey data. In the 1980s, advancements were made by statisticians to provide more sophisticated analytical tools.

For example, Fellegi (1980) focused on the tests of independence in complex samples. As mentioned previously, the complexity of sample data has different dimensions and the focus of this study is on the "multiple response variables," which is only one facet of complex survey data. It is not clear when exactly the problem of multiple response variables as a research topic and statistical problem was introduced. Our review of the literature in different domains showed that an early recognition of the attention to the multiple response variables came in 1968 in the work of Murphy and Tanenhaus (1968) in the U.S. Survey Research Center. In another study, Schriesheim et al. (1974) explored the development of response categories in the validity of multiple response alternative questionnaires. However, in these works, Murphy and Tanenhaus (1968) and Schriesheim et al. (1974) have provided no discussion regarding the data analysis; they gave basically a mention of the existence of the multiple responses due to the nature of the data. Not until the early 1980s did some statisticians publish papers specifically addressing this topic as a research issue.

The review of the studies in this area showed that some of the studies have simply ignored the problems with multiple response variables in analyzing categorical data. An example is the study of Stallings and Ferris (1988) on the two categories of policy and management topics in the journal of public administration review, which was mentioned previously. In this study, while Stallings and Ferris (1988) recognized the existence of multiple response variables, they used the classical (Pearson) chi-square in their analysis, which is not an appropriate tool (as explained previously) for analyzing such complex data.

In some other studies where the collected data could lead to the issue of analyzing multiple response variables in some cases, the researchers preferred to change the method of collecting or analyzing the data in order to avoid dealing with multiple response variables in contingency tables. While this approach is effective in avoiding multiple response variables, in some cases it may lead to partial collection of data.

One of the early approaches in providing a tool for dealing with this problem was done by Umesh (1995). In his study, Umesh recommended the use of a modified pseudochi- squared test instead of the classical Pearson chi-square test. Umesh's recommendation was tested by Loughin and Scherer (1998) and the evidence showed that, under some conditions, this method fails to provide a strong control of test levels. In the late 1990s,

Agresti and Liu (1998, 1999) advanced the understanding of the multiple response categorical variables. Furthermore, Loughin and Scherer (1998) proposed the use of the bootstrapping technique for estimating the p-value of their proposed statistic. This method attracted the attention of academia, where it was recommended that the Imhof (1961) methods of evaluating the probability density function (pdf) could also be used to estimate the p-value (Decady and Thomas, 2000). Further, scholars proposed solutions to continue exploring the application of bootstrapping in analyzing contingency tables with multiple response variables. For example, Bali et al. (2006) proposed a bootstrapping technique considering the residuals of cells. While bootstrapping showed good control variables

Decady and Thomas (2000) tried to provide a simpler method that not only required less computation but also was more familiar to the practitioners. For achieving this goal, Decady and Thomas (2000) "cleverly draw the connection between the MMI (multiple marginal independence) testing problem and the Rao and Scott (1981) analyses of complex survey data" (Bilder and Loughin, 2001). They "note[d] the parallel between an application of an adjusted Pearson statistic to multiple-response categorical variables and the use of the pearson statistic in non-multinomial sampling structures as studied by Rao and Scott (1981)" (Bilder and Loughin, 2007).

Although Bilder and Loughin (2001) recognized the contribution of the modified chi-square proposed by Decady and Thomas (2000), they questioned the control of the first order modified Decady-Thomas chi-square. In 2004, Thomas and Decady presented the extension of Rao and

Scott modified chi-square, which was based on the second order Rao and Scott test. This recent procedure showed a good control of the test levels (Type I errors).

More recently, Bilder and Loughin (2003, 2007) helped to further advance this area by exploring the extension to multiple-response categorical variables, which was originally proposed (but not conducted) by Agresti and Liu (1999, 2001).

4. The Case of ES Implementation: First Order

Rao-Scott Corrected Chi-Square

In this paper, the first order Rao-Scott modified chi-square has been employed in a case of multiple response data recently collected from the survey of large North American corporations (V. Kumar et al., 2008; U. Kumar et al., 2008). In this empirical study, the authors measured the following four constructs of implementing ES:

• Process orientation

• Success of ES implementation

• Challenges during implementation of ES

• Successful utilization of ES

Each of these constructs is assessed by several measured constructs that are explicitly explained by the authors. Here is a brief description of the measured constructs.

ES in this survey is defined by the authors as an integrated, customized and packaged software based system that handles the majority of systems requirements in all or any of the functional areas of a firm, such as marketing, finance, human resources, and manufacturing. Almost every medium and large organization has at least a number of Enterprise Systems (ES) modules, such as Company-wide Accounting Software Package, Marketing Software Package or Manufacturing Software Package.

Furthermore, the concept of Process Orientation is described as “the activity of transforming an organization’s structure from one based on a functional paradigm to one based on a process

paradigm. Business process orientation implies that the procedure of doing tasks in firms should be more cooperative and integrated towards satisfying the customers' needs. This view is in contrast with the mechanistic functional view of the firm**,** which emphasizes the division and isolation of functions from each other and from the customers. While the challenges of ES include different dimensions of ES implementation, the concept of success is explored in two contexts: ES implementation and ES utilization. The questionnaire was sent to approximately 3,000 large North American firms. The survey yielded a response rate of approximately 10 percent; 195 of the surveys were found to be complete enough to be used in a contingency table for the purpose of this study. For analyzing these data, a 2x3 way contingency table was constructed (Table 3). For the construct of process orientation, each observation can only have a single response (whether process-oriented or not-process-oriented); for the other three constructs each observation can be multiple responses. In other words, in each observation the firm, whether process oriented or not, is actually process oriented. However, irrespective of its process orientation, a particular firm that was observed may:

• Be successful or unsuccessful in ES implementation,

• Face or not face significant challenges during ES implementation, and

• Be successful or unsuccessful in utilizing ES.

Table 3. Contingency Table of Constructs of ES Implementation

	Success in Implementation	**Faced No Significant Challenge**	**Success in Utilization**	**Total Responses**	**Total Subjects**
PO	88	100	101	**289**	**101**
Not-PO	71	36	77	**184**	**94**
	159	**136**	**178**	**473**	**195**

Marginal values in this contingency table (Table 3) clearly show the existence of multiple response variables in the data. In this case we are facing a single-by-multiple marginal independence.

4.1. First Order Rao-Scott Corrected Chi-Square

As described earlier, the use of traditional chi-square is not appropriate when dealing with multiple response data. Following Decady and Thomas (2000) in this study, a corrected Rao-Scott chi-square test will be applied. The corrected Rao-Scott chi-square test is presented as Equation 2:

$\chi 2\ c = \chi 2 \ / \delta$

Where:

$\chi 2c$ Presents the Corrected Rao-Scott Chi-Square

χ^2

Presents the Traditional (Pearson) Chi-Square

δ = Presents the Correction Factor

The correction factor (δ) was calculated using Equation 3:

$$\delta = 1 - \left(\frac{(m++)}{(n+*C)}\right)$$

Where:

m++ Presents the total count of multiple responses, which here is equal to 473

n+ Presents the total number of subjects, which here is equal to 195

C Presents the number of multiple response variables, which here is 3 (columns)

$\delta = 1-(159+136+178)/(195x3)= 0.1915$

Additionally, the degree of freedom here is calculated as follow:

(R-1)Cd.f.

Where:

R Presents the number of rows related to the single response variable, which here is equal to 2

d.f.= (2-1)*3=3

Now having, d.f, and the (Pearson) chi-square, we can calculate the corrected

Rao-Scott chi-square as follows:

$\chi 2$ = 12.4774.5 , thus $\chi 2$ c = 12.4774/0.1915 = 65 ; *p*-value=0.000

Based on the corrected chi-square test, we have concluded that the process oriented firms, in comparison to the not-process oriented firms:

• Are more successful in implementing ES

• Face fewer challenges in implementing ES, and

• Are more successful in utilizing ES.

It is important to note that the traditional chi-square test also showed almost similar results in the p-value (see footnote 1). This was due to the fact that differences between the two categories of process oriented and not-process oriented firms were significantly wide.

However, it by no means justifies the use of traditional chi-square in this circumstance, as was described earlier.

5. Conclusion and Future Studies

In this study, one dimension of complex survey data – multiple response variables was explicitly explored. The analysis of multiple response variables in contingency tables is a relatively (as compared to some other statistical research topics) new research problem. This study presented the historical developments of the studies in this area. In reviewing the historical developments of the complex research data and, specifically, the multiple response variables, several academic databases were employed.

The first order Rao-Scott chi-square was employed to analyze our data. The findings confirm that process-oriented firms in our sample – in comparison to the not-process oriented firms – were more successful in implementing ES, faced fewer challenges in implementing ES, and were more successful in utilizing ES. Furthermore, the first order Rao Scott corrected chi-square was employed to assess the results of the current survey data.