FACTORS ASSOCIATED WITH ATTITUDE AND PRACTICE OF RED MEAT CONSUMPTION AND AWARENESS OF LIFESTYLE DISEASES AMONG RESIDENTS OF LAISER HILL LOCATION, KAJIADO NORTH COUNTY

LILIAN NYOMENDA BOSIRE

MASTER OF SCIENCE
(Public Health)

JOMO KENYATTA UNIVERSITY OF AGRICULTURE AND TECHNOLOGY

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Factors associated with attitude and practice of red meat consumption and awareness of lifestyle diseases among residents of Laiser Hill location, Kajiado North County

Lilian Nyomenda Bosire

A thesis submitted in partial fulfillment for a degree of master of science in public health at Jomo Kenyatta University Of Agriculture And Technology

2015
DECLARATION

This thesis is my original work and has not been presented for a degree in any other university.

Signature…………………………… Date………………………………………………..

Lilian .N. Bosire

This thesis has been submitted for examination with our approval as university supervisors

Signature…………………………… Date………………………………………………..

Professor Anselimo .O. Makokha
JKUAT, KENYA

Signature……………………………..Date………………………………………………..

Dr. Charles Mbakaya
KEMRI, KENYA
DEDICATION

I dedicate this thesis to my loving family James, Hellen, David, Emma, Michael and Joseph for their tireless support during this entire period.
ACKNOWLEDGEMENTS

I would like to sincerely and warmly thank all the persons who participated in helping me towards the achievement of this work. First I thank God for his grace and strength throughout this study.

To my supervisors, Professor Anselimo O. Makokha, JKUAT and Dr. Charles Mbakaya, KEMRI, I want to thank you for your support and guidance as I was writing this thesis.

I also thank all the reviewers and other staff of KEMRI and JKUAT for shedding light into the areas that needed further consultations and new perspective.

To the residents of Laiser Hill, Kajiado North County thanks for allowing us into your homes and for your full cooperation.
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<th>Description</th>
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<tbody>
<tr>
<td>AIDS</td>
<td>Acquired Immune Deficiency Syndrome</td>
</tr>
<tr>
<td>AICR</td>
<td>American Institute of Cancer Research</td>
</tr>
<tr>
<td>ANOVA</td>
<td>Analysis of Variance</td>
</tr>
<tr>
<td>BMI</td>
<td>Body Mass Index</td>
</tr>
<tr>
<td>CD</td>
<td>Compact Disk</td>
</tr>
<tr>
<td>CHD</td>
<td>Coronary Heart Disease</td>
</tr>
<tr>
<td>CPHR</td>
<td>Centre for Public Health Research</td>
</tr>
<tr>
<td>CVD</td>
<td>Cardiovascular Disease</td>
</tr>
<tr>
<td>DNA</td>
<td>Deoxyribonucleic Acid</td>
</tr>
<tr>
<td>FAO</td>
<td>Food and Agriculture Organization</td>
</tr>
<tr>
<td>HCAs</td>
<td>Heterocyclic Amines</td>
</tr>
<tr>
<td>IQ</td>
<td>Imidazo-quinolines</td>
</tr>
<tr>
<td>HDL</td>
<td>High Density Lipoprotein</td>
</tr>
<tr>
<td>HIV</td>
<td>Human Immune Virus</td>
</tr>
<tr>
<td>IHD</td>
<td>Ischaemic Heart Disease</td>
</tr>
<tr>
<td>KEMRI</td>
<td>Kenya Medical Research Institute</td>
</tr>
<tr>
<td>LDL</td>
<td>Low Density Lipoprotein</td>
</tr>
<tr>
<td>NCD</td>
<td>Non-Communicable Disease</td>
</tr>
<tr>
<td>NGOs</td>
<td>Non-governmental organizations</td>
</tr>
<tr>
<td>PAHs</td>
<td>Polycyclic Aromatic Hydrocarbons</td>
</tr>
<tr>
<td>PhIP</td>
<td>Phenylimidazo pyridine</td>
</tr>
<tr>
<td>SPSS</td>
<td>Statistical Package for Social Sciences</td>
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### DEFINITION OF TERMINOLOGIES

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
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<tbody>
<tr>
<td><strong>Attitude</strong></td>
<td>In this study it means the mental outlook or position in regards to red meat consumption</td>
</tr>
<tr>
<td><strong>Awareness</strong></td>
<td>In this study this is the respondent’s knowledge and information about lifestyle diseases.</td>
</tr>
<tr>
<td><strong>Household</strong></td>
<td>It means members of a family occupying a housing unit.</td>
</tr>
<tr>
<td><strong>Practice</strong></td>
<td>The habit/custom or regular consumption of red meat.</td>
</tr>
<tr>
<td><strong>Processed meat</strong></td>
<td>Means meat that has undergone a method of preservation other than freezing for example sausages, ham and hamburgers.</td>
</tr>
<tr>
<td><strong>Red meat</strong></td>
<td>Meats that are red when raw and not white when cooked for example lamb and beef.</td>
</tr>
<tr>
<td><strong>Resident</strong></td>
<td>A person who resides in this particular location at the time of study.</td>
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ABSTRACT

Chronic diseases are increasingly becoming a concern in developing nations. The transition from a predominantly plant-based diet to a diet high in meat has been identified as a noteworthy contributor to the rise in chronic disease and the greatest increase of these diseases is in the African and Eastern Mediterranean regions. Common preventable risk factors underlie most of these lifestyle diseases and among them is consumption of large amounts of red meat. The objective of the study was to assess the attitudes and practices of red meat consumption and awareness levels of lifestyle diseases among residents of Laiser hill.

The study design used was descriptive cross-sectional. Cluster sampling was used to select households. Laiser Hill was first divided into 100 clusters of 120 households based on the 2009 census enumeration areas. Four clusters were randomly chosen for data collection using a questionnaire. Data analysis was done using SPSS software. In bivariate analysis Pearson Chi-square test and Fishers exact test were used to measure the association between the dependent and independent variables. For variables with frequencies of less than five observations Fisher Exact Test was used to test the association Multivariate binary regression using the odds ratio was used to model those associations that were significant at p <0.05. Data was presented using tables and charts.

Slightly over half of the respondents (51.7%) were female. 29.7% of the respondents were aged 18-28 and 42.6% had tertiary level of education 42.6%. Half of the respondents (50.1%) were married and those in formal employment were 45%. Majority of the respondents (90.1%) were aware of what lifestyle diseases were with 83.7% being able to correctly define them and 90.7% being in agreement that over-consumption of red meat was a contributor to these diseases. However this awareness had not led to any changes in the consumption patterns of red meat as 44% consumed red meat 4-5 times a week and 7.2% consumed red meat every day. The main factor affecting choice of type of meat was price.

Binary logistic regression was used to model the relationship between demographic characteristics and attitudes, practices and awareness of lifestyle diseases respectively. Relationships between age ($\chi^2 = 12.069$, df (4), p=0.017), education ($\chi^2 = 7.142$, df (2),
p=0.028) and marital status (11.939 (p=0.003) and attitude towards red meat consumption were statistically significant. A cross tabulation of demographics characteristics and practices towards red meat consumption also indicated that there was a significant relationship between education level and practices. This was supported by chi square results ($\chi^2 = 10.262$, df (2), p=0.006). Relationship between marital status and awareness of lifestyle diseases was statistically significant ($\chi^2 = 13.724$, df (3), p=0.003). Age, gender, education and occupation were not statistically significant in explaining awareness of lifestyle diseases.

This study recommended a multi-sectorial approach in tackling non-communicable diseases. It encourages working together of health sectors, private and governmental agencies, NGOs, the civil society, political will and above all the involvement of the community at large
CHAPTER ONE

INTRODUCTION

1.1 Background of the study

Developing countries are undergoing a rapid epidemiological transition, from infectious diseases such as diarrhea and pneumonia to chronic ones such as heart disease. A number of factors have led to this growing burden of chronic disease and include urbanization, industrialization and globalization. Africa bears a significant proportion of the global burden of chronic diseases. The World Health Organization (WHO) projects that over the next ten years the continent will experience the largest increase in death rates from cardiovascular disease, cancer, respiratory disease and diabetes (WHO, 2005). Rising morbidity and mortality from chronic diseases co-exist with an even greater burden of infectious disease, which still accounts for at least 69% of deaths on the continent (Young, 2009). Many African health systems are under-funded and under-resourced and struggle to cope with the cumulative burden of infectious and chronic diseases.

Three of the most important risk factors for chronic disease—unhealthy diet, physical inactivity, and tobacco use—are related to lifestyle choices (Barry, 2001). The worldwide transition from a predominantly plant-based diet to a diet high in meat has also been identified as a contributor to the rise in chronic disease (Popkin & Du, 2003). Animal products are the main source of saturated fats that promote cardiovascular disease (Walker et al., 2005) and the sole source of cholesterol intake. Comparative studies reveal that those who follow plant based diets generally have lower weights than those who do not (Melby et al., 1985) even across ethnic groups (Berkow & Banard, 2006). While not conclusive, evidence suggests that the increase in worldwide obesity and diabetes may in part be associated with increased animal-product consumption, in addition to decreased exercise and other factors (Popkin & Du, 2003).
The classic study by Armstrong and Doll (1975) revealed significant association between meat consumption and colon cancer incidence in over 25 countries. Studies in Japan revealed a rising incidence in colorectal cancer with greater adoption of Western dietary habits and consumption of meat, milk, eggs, and fats and oils (Kuriki et al., 2004; Kuriki & Tajima, 2006). Other studies revealed similar associations between rising meat consumption in Asian countries and colon cancer incidence and/or mortality (Tominaga & Kuroishi 1997; Lee et al., 2008) Although confounding factors must also be considered, these and other studies collectively provide strong evidence of the causal link between meat and colorectal cancer (Chao et al., 2001; Cross et al., 2007; WCRF/AICR, 2007).

In 2007, the World Cancer Research Fund and the American Institute for Cancer Research panel report concluded that there was convincing evidence to limit red meat intake, completely avoid processed meat, and follow a plant-based diet to reduce the overall risk for cancer (WCRF/AICR, 2007). Consumption of various animal products is also associated with increased risk for other cancers. Endometrial cancer risk is associated with increased intake of total energy, fat, and protein from animal sources (Xu et al., 2007). A meta-analysis found an increased endometrial cancer risk with increased meat, particularly red meat consumption (Bandera et al., 2007). Dairy-product consumption has been associated with prostate cancer (Mitrou et al., 2007; Chan et al., 2001; Kurahashi et al., 2008). The European Prospective Investigation into Cancer and Nutrition study of 142, 251 men found that high intake of dairy calcium and protein increased the risk of prostate cancer (Allen et al., 2008). Calcium from non-dairy foods was not associated with increased cancer risk.

In recent studies, breast cancer risk has been associated with higher intake of processed meat, total meat, and/or red meat (Boyd et al., 2003; Cho et al., 2006; Taylor et al., 2007; Linos et al., 2008;) and with higher intakes of total and saturated fats (Boyd et al.,
Healthcare costs attributable to meat consumption are substantial, estimated in the U.S. at between $29 billion and $61 billion per year, in 1992 (Barnard et al., 1995).

In contrast, many studies suggest that those who consume plant-based diets have decreased risk, mortality, and/or progression of cardiovascular disease, (Ornish et al., 1998; Kwok et al., 2000; Key et al., 1998) diabetes, (Barnard et al., 2006) certain cancers, (Saxe et al, 2006; Ornish et al., 2005; Cui et al, 2007) and obesity (Key et al., 1999; Ornish et al., 1990). Diets high in legumes, whole grains, fruits, and vegetables appear to be protective against these chronic diseases (Slavin et al., 2001; Slavin, 2003; Everitt et al., 2006).

Concerns for red meat have always focused on the fact that it is high in fat, saturated fat, and cholesterol. While fat content of different cuts of meat varies markedly, there is little doubt that the commonly consumed types are high in total fat averaging about 50 percent of calories. Several hypotheses have been proposed for the observed relationship between red meat and cancer risk. First, the high iron content of red meat may promote the generation of free radicals, molecules that lead to oxidation of DNA. Oxidized DNA has been linked to cancer. One study at Wayne State University in Detroit showed that both beef and pork intake were linked to DNA damage and, therefore, possibly to cancer risks (Collins et al., 1998).

Another theory focuses on the changes that occur when red meat is cooked, especially at high temperatures under moist conditions. This leads to the production of compounds in meat called heterocyclic amines (HCAs). These are mutagen compounds that can cause changes in DNA and raise risk for cancer. The way meat is prepared affects production of HCAs. Those who eat meat that is fried or well done have a greater risk for cancer than those who eat meat cooked in other ways. Furthermore, certain individuals are fast metabolizers of HCAs. They metabolize the compounds more quickly, putting them at greater risk for cancer. One study found that fast metabolizers who consumed well done meat were three times more likely to develop colon cancer than slower metabolizers.
The relationship held when the two groups consumed meat that was prepared to the rare or medium stage. And when fast metabolizers consumed meat that was well-done, their cancer risk was six times greater than slow metabolizers who ate rare or medium-cooked beef (Lang et al., 1994). The rate at which a person metabolizes HCAs is genetically determined. Heterocyclic amines may also raise risk for heart disease, since there is some evidence that they damage heart muscle cells.

Toxic compounds, called nitroso compounds, are produced in the colon when red meat is consumed. These mutation-causing compounds increase dramatically in proportion to increased red meat consumption. One hypothesis is that the unabsorbed iron from meat is responsible for this effect (Bingham et al., 1996).

1.2 Problem statement

There has been an increasing trend of meat consumption in the developing countries, Kenya included, in the recent past. Delgado, (2003) called this trend a Livestock Revolution. This Revolution has been driven by population growth, urbanization and income change. While consumption patterns for dairy and other livestock products have recently been studied, meat had continued to receive very little attention.

Food and agricultural organization estimated that the most common form of livestock products consumed by households in Kenya related to meat and red meat in particular was the most widely consumed compared to other types of meat. Although excessive consumption of red meat according to Popkin and Du (2003) elicited health concerns, it was also recognized that it was the preferred source of proteins for most households who were particularly inclined towards meat. Despite the concerns about red meat, there is limited documented information about meat consumption patterns and the level of awareness of the risks associated with consumption of red meat in Kenya.
1.3 Justification

Today, chronic diseases are a major public health problem worldwide. The World Health Organization in 2005 estimated that 61% of all deaths (35 million) and 49% of the global burden of disease were attributable to chronic diseases. By 2030, the proportion of total global deaths due to chronic diseases was expected to increase to 70 per cent and the global burden of disease to 56 per cent. The greatest increase of these diseases was anticipated to be in the African and Eastern Mediterranean regions (WHO, 2007).

Common preventable risk factors underlined most of these lifestyle diseases and among them was consumption of large amounts of red meat. This study provided further insights into attitudes and perception of red meat consumption among residents of Laiser hill location. It also helped to establish red meat consumption patterns among residents of Laiser hill and understand the awareness level of lifestyle diseases among red meat consumers. In light of the findings appropriate strategies that focus on prevention would help ease the burden that these diseases have on the health sector as a whole as they pose great threat not only to public health but also economic growth at local, national and global levels.

1.4 Research questions

1. What is the attitude and perception of red meat consumption among residents of Laiser hill in Kajiado North County?
2. What is the red meat consumption pattern among residents of Laiser Hill in Kajiado North County?
3. What is the awareness level of lifestyle diseases among red meat consumers in Laiser Hill in Kajiado North County?
4. What is the association between attitude, practices of red meat consumption and awareness of lifestyle diseases with socio-demographic characteristics?
1.5 Objectives

1.5.1 General objective

To determine factors associated with attitude and practices of red meat consumption and awareness levels of lifestyle diseases among residents of Laiser hill.

1.5.2 Specific objectives

1. To establish the attitude and perception of red meat consumption among residents of Laiser hill.
2. To determine red meat consumption patterns among adult residents of Laiser hill.
3. To establish awareness levels of lifestyle diseases among red meat consumers.
4. To determine the association between attitude, practices of red meat consumption and awareness of lifestyle diseases with socio-demographic characteristics?
CHAPTER TWO
LITERATURE REVIEW

2.1 The global burden of chronic diseases

The burden of chronic diseases is rapidly increasing worldwide. It has been calculated that, in 2001, chronic diseases contributed approximately 60% of the 56.5 million total reported deaths in the world and approximately 46% of the global burden of disease (WHO, 2002). The proportion of the burden of non-communicable diseases is expected to increase to 57% by 2020. Almost half of the total chronic disease deaths are attributable to cardiovascular diseases; obesity and diabetes are also showing worrying trends, not only because they already affect a large proportion of the population, but also because they have started to appear earlier in life.

The chronic disease problem is far from being limited to the developed regions of the world. Contrary to widely held beliefs, developing countries are increasingly suffering from high levels of public health problems related to chronic diseases. In five out of the six regions of WHO, deaths caused by chronic diseases dominate the mortality statistics (WHO, 2002). Although human immunodeficiency virus/acquired immunodeficiency syndrome (HIV and AIDS), malaria and tuberculosis, along with other infectious diseases, still predominate in sub-Saharan Africa and will do so for the foreseeable future, 79% of all deaths worldwide that are attributable to chronic diseases are already occurring in developing countries (WHO, 2002).

It is clear that the earlier labeling of chronic diseases as “diseases of affluence” is increasingly a misnomer, as they emerge both in poorer countries and in the poorer population groups in richer countries. This shift in the pattern of disease is taking place at an accelerating rate. Furthermore, it is occurring at a faster rate in developing countries than it did in the industrialized regions of the world half a century ago (Popkin, 2002).
This rapid rate of change, together with the increasing burden of disease, is creating a major public health threat which demands immediate and effective action. It has been projected that, by 2020, chronic diseases will account for almost three-quarters of all deaths worldwide, and that 71% of deaths due to Ischaemic Heart Disease (IHD), 75% of deaths due to stroke, and 70% of deaths due to diabetes will occur in developing countries (WHO, 2010). The number of people in the developing world with diabetes will increase by more than 2.5-fold, from 84 million in 1995 to 228 million in 2025 (Aboderin et al., 2001).

On a global basis, 60% of the burden of chronic diseases will occur in developing countries. Indeed, cardiovascular diseases are even now more numerous in India and China than in the economically developed countries in the world put together (WHO, 2002). As for overweight and obesity, not only has the current prevalence reached unprecedented levels, but the rate at which it is annually increasing in most developing regions is substantial (Popkin., 2002) The public health implications of this phenomenon are staggering, and are already becoming apparent.

The rapidity of the changes in developing countries is such that a double burden of disease may often exist. India, for example, at present faces a combination of communicable diseases and chronic diseases, with the burden of chronic diseases just exceeding that of communicable diseases. Projections nevertheless indicate that communicable diseases will still occupy a critically important position up to 2020 (Murray & Lopez, 1996). Another example is that of obesity, which is becoming a serious problem throughout Asia, Latin America and parts of Africa, despite the widespread presence of under nutrition. In some countries, the prevalence of obesity has doubled or tripled over the past decade.

Chronic diseases are largely preventable diseases. Although more basic research may be needed on some aspects of the mechanisms that link diet to health, the currently
available scientific evidence provides a sufficiently strong and plausible basis to justify taking action now. Beyond the appropriate medical treatment for those already affected, the public health approach of primary prevention is considered to be the most cost-effective, affordable and sustainable course of action to cope with the chronic disease epidemic worldwide. The adoption of a common risk-factor approach to chronic disease prevention is a major development in the thinking behind an integrated health policy. Sometimes chronic diseases are considered communicable at the risk factor level (Choi, 2001). Modern dietary patterns and physical activity patterns are risk behaviors that travel across countries and are transferable from one population to another like an infectious disease, affecting disease patterns globally. While age, sex and genetic susceptibility are non-modifiable, many of the risks associated with age and sex are modifiable. Such risks include behavioral factors for example diet, physical inactivity, tobacco use, alcohol consumption; biological factors for example dyslipidemia, hypertension, overweight, hyperinsulinaemia and finally societal factors, which include a complex mixture of interacting socioeconomic, cultural and other environmental parameters.

Diet has been known for many years to play a key role as a risk factor for chronic diseases. Interestingly the traditional Masai are known for a culture where the men exclusively consume meat, milk, and blood and yet lifestyle diseases are uncommon. Early studies by George Mann and collaborating researchers published a paper in the Journal of Atherosclerosis Research documenting a lack of heart disease in Masai men, at least as assessed by risk factors, physical exams, and ECG’s (Mann, et al 1964). Cholesterol levels were low high blood pressure was uncommon, and they were very slim. The average BMI was about 20, which is the lower limit of the “healthy range” by current US standards. The population they studied was limited by age. About 60% of the men were under 44 and only three out of 400 men were over 55 years old. They were further limited by their ability to detect heart disease by using just physical exam and ECG.
Furthermore, Dr. Mann, who published some of the early research, did an autopsy study of 50 Masai men and found that they had extensive atherosclerosis. They had coronary intimal thickening on par with older American men. Over 80% of the men over age 40 had severe fibrosis in their aorta yet there were no heart attacks shown on autopsy and these men still had functional heart vessels without blockages because their vessels had become larger. Researchers thought this might have been related to their rather extreme daily physical activity. Typically the Masai walk a lot, getting much more exercise per day than the typical Westerner (Mann, et al 1964).

Perhaps the best dietary survey done on Masai people is from the early 1980s, done by the International Livestock Centre of Africa. This was at a time there had already been a dietary transition occurring among the Masai. Nonetheless, Masai women and children were found to consume large amounts of milk from their herd animals. Interestingly, they only consumed meat about 1-5 times per month. Again, the men’s intake was too difficult to accurately track but it seemed that they had more access to meat (Nestle, 1986). The myth that the Masai ate nothing but milk, blood and meat was derived from the idealized diet of young warriors called moran, a diet that men only ate for 15 years of their life. A study by Merker showed that even the supposed exclusivity of the warrior diet was a gross exaggeration and ignored their extensive use of herbs and tree barks, as well as the fact that necessity often drove them to consume honey, roots, tubers and fruit as sources of water and calories while on the march (Merker, 1971).

According to another study by Johns, Maasai usually consumed meat with or as soup, using 28 different herbs to make the soups, using the herbs in levels that made the food bitter. They also added a dozen plants to milk to prepare a tea-like beverage called orkiowa. Screening of 12 of the Masai food additives found that 82 percent contained potentially hypocholesterolemic saponins and/or phenolics. The Masai, when questioned, stated that a person would not maintain health without using these additives. They recognized the most widely used of additives, okiloriti (*Acacia nilotica*) was a
digestive aid, flavoring, and nervous system stimulant (in high doses). The Masai’s appreciation of the digestive effects of these herbs likely related to their ability to stimulate bile flow to emulsify fats in their high fat diet, lack of which would lead to diarrhea. Scientifically “Acacia nilotica is a herb that has strong free radical scavenging compounds, and displays anticancer, antimitogenic, anti-inflammatory, antimicrobial, antifungal, anthelmintic (kills worms), antidiarrheal, and antiplatelet-aggregation activities (Johns, 1996). Therefore the noteworthy factors to be considered in the Masai immunity to lifestyle diseases despite their high fat diet were fitness, which was remarkable and the wide use of herbal additives,

What is apparent at the global level is that great changes have swept the entire world since the second half of the twentieth century, inducing major modifications in diet, first in industrial regions and more recently in developing countries. Traditionally, plant based diets have been swiftly replaced by high-fat, energy-dense diets with a substantial content of animal-based foods. But diet, while critical to prevention, is just one risk factor. Physical inactivity, now recognized as an increasingly important determinant of health, is the result of a progressive shift of lifestyle towards more sedentary patterns, in developing countries as much as in industrialized ones. Recent data from São Paulo, Brazil, for example, indicate that 70-80% of the population are remarkably inactive (Matsudo et al., 2002) The combination of these and other risk factors, such as tobacco use, is likely to have an additive or even a multiplier effect, capable of accelerating the pace at which the chronic disease epidemic is emerging in the developing countries.

The need for action to strengthen control and prevention measures to counter the spread of the chronic disease epidemic is now widely recognized by many countries, but the developing countries are lagging behind in implementing such measures. Encouragingly, however, efforts to counteract the rise in chronic diseases are increasingly being assigned a higher priority. This situation is reflected by the growing interest of Member States, the concerned international and bilateral agencies as well as nongovernmental
organizations in addressing food and nutrition policy, health promotion, and strategy for the control and prevention of chronic diseases, as well as other related topics such as promoting healthy ageing and tobacco control. The 1992 International Conference on Nutrition specifically identified the need to prevent and control the increasing public health problems of chronic diseases by promoting appropriate diets and healthy lifestyles (WHO, 1992) The need to address chronic disease prevention from a broad-based perspective was also recognized by the World Health Assembly in 1998 and again in 1999. In 2000, the World Health Assembly passed a further resolution on the broad basis of the prevention and control of non communicable diseases WHO (2000) and in WHO (2002) adopted a resolution that urged Member States to collaborate with WHO to develop ‘‘...a global strategy on diet, physical activity and health for prevention and control of non communicable diseases, based on evidence and best practices, with special emphasis on an integrated approach...’’ (WHO, 2010).

2.2 Role of red meat as a contributing factor towards lifestyle diseases

2.2.1 Meat consumption and cancer risk

Carcinogenic compounds in cooked meat are responsible for the risk of developing cancer when large amounts of red meat are consumed. They include: Heterocyclic Amines (HCAs), a family of mutagenic compounds, are produced during the cooking process of many animal products, including chicken, beef, pork, and fish. Even meat that is cooked under normal grilling, frying, or oven-boiling may contain significant quantities of these mutagens (Skog et al., 1998; Robbana-Barnat et al., 1996; Thiebaud et al., 1995). The longer and hotter the meat is cooked, the more these compounds form. In some studies, grilled chicken has formed higher concentrations of these cancer-causing substances than other types of cooked meat (Sinha et al., 1995). The major classes of heterocyclic amines include amino-imidazo-quinolines, or amino-imidazo-quinoxalines (collectively called IQ-type compounds), and amino-imidazo-pyridines such as PhIP. IQ-type compounds and PhIP are formed from creatine or creatinine,
specific amino acids, and sugars (Jagerstad et al., 1991). All meats (including fish) are high in creatine, and HCA formation is greatest when cooking meat at high temperatures, as is most common with grilling or frying. Consumption of well-done meat and PhIP has been associated with increased risk of breast cancer and colon cancer. A recent case-control study at the University of Utah that included 952 subjects with rectal cancer and 1205 controls found that men and women with the highest consumption of processed or well-cooked meat had an increased risk of rectal cancer (Murtaugh et al., 2004). Grilling or broiling meat over a direct flame results in fat dropping on the hot fire and the production of polycyclic aromatic hydrocarbon-containing flames. Polycyclic aromatic hydrocarbons (PAHs) adhere to the surface of food and the more intense the heat, the more PAHs are present. They are widely believed to play a significant role in human cancers (Norat & Riboli, 2001). A fairly consistent association between grilled or broiled, but not fried, meat consumption and stomach cancer implies that dietary exposure to PAHs may play a role in the development of stomach cancer in humans (WCRF, 1997).

2.2.2 Breast cancer

Countries with a higher intake of fat, especially fat from animal products, such as meat and dairy products, have a higher incidence of breast cancer (Armstrong and Doll, 1975; Carroll and Braden, 1985; Rose et al, 1986). In Japan, for example, the traditional diet is much lower in fat, especially animal fat, than the typical western diet, and breast cancer rates are low. In the late 1940s, when breast cancer was particularly rare in Japan, less than 10 percent of the calories in the Japanese diet came from fat (Land et al., 1990). The American diet is centered on animal products, which tend to be high in fat and low in other important nutrients, with 30 to 35 percent of calories coming from fat. When, Japanese girls are raised on westernized diets, their rate of breast cancer increases dramatically.
Even within Japan, affluent women who eat meat daily have an 8.5 times higher risk of breast cancer than poorer women who rarely or never eat meat (Hirayama, 1990). One of the reasons is that fatty foods boost the hormones that promote cancer. The consumption of high-fat foods such as meat, dairy products, fried foods, and even vegetable oils causes a woman’s body to make more estrogens, which encourage cancer cell growth in the breast and other organs that are sensitive to female sex hormones. This suggests that, by avoiding fatty foods throughout life, hormone-related cancer risk decreases. A 2003 study, found that when girls aged eight to ten reduced the amount of fat in their diet, even very slightly, their estrogen levels were held at a lower and safer level during the next several years. By increasing vegetables, fruits, grains, and beans, and reducing animal-derived foods, the amount of estradiol (a principal estrogen) in their blood dropped by 30 percent, compared to a group of girls who did not change their diets (Dorgan et al., 2003).

Harvard researchers recently conducted a prospective analysis of 90,655 premenopausal women, ages 26 to 46, enrolled in the Nurses’ Health Study II and determined that intake of animal fat, especially from red meat and high-fat dairy products, during premenopausal years is associated with an increased risk of breast cancer. Increased risk was not associated with vegetable fats (Cho et al., 2003). In addition, researchers at the Ontario Cancer Institute conducted a meta-analysis of all the case-control and cohort studies published up to July 2003 that studied dietary fat, fat-containing foods, and breast cancer risk. Case-control and cohort study analyses yielded similar risk results, with a high total fat intake associated with increased breast cancer risk. Significant relative risks for meat and saturated fat intake also emerged, with high meat intake increasing cancer risk by 17 percent and high saturated fat intake increasing cancer risk by 19 percent (Boyd et al., 2003).

Several studies show meat intake to be a breast cancer risk factor, even when confounding factors, such as total caloric intake and total fat intake, are controlled (De Stefani et al., 1997; Matos et al., 1991). Part of the reason may be that meat becomes a
source of carcinogens and/or mutagens, such as HCAs, that are formed while cooking meat at high temperatures. A review of HCAs showed that certain HCAs are distributed to the mammary gland and that humans can activate HCAs metabolically (Snyderwine et al., 1994). As a consequence, frequent meat consumption may be a risk factor for breast cancer (De Stefani et al., 1997).

2.2.3 Colorectal cancer

As with breast cancer, frequent consumption of meat, particularly red meat, is associated with an increased risk of colon cancer (Singh & Fraser, 1998; Giovannucci et al., 1994). Total fat and saturated fat, which tend to be substantially higher in animal products than in plant-derived foods, and refined sugar, all heighten colon cancer risks. At Harvard University, researchers zeroed in on red meat, finding that individuals eating beef, pork, or lamb daily have approximately three times the colon cancer risk, compared to people who generally avoid these products (Giovannucci et al., 1994; Willett et al., 1990). A review of 32 case-control and 13 cohort studies concluded that meat consumption is associated with an increase in colorectal cancer risk, with the association being more consistently found with red meat and processed meat (Norat & Riboli, 2001). And, in the recently published Cancer Prevention Study II, involving 148,610 adults followed since 1982, the group with the highest red meat and processed meat intakes had approximately 30 to 40 percent and 50 percent higher colon cancer risk, respectively, compared to those with lower intakes (Chao et al., 2001). In this study, high red meat intake was defined as 3 ounces of beef, lamb, or pork for men and 2 ounces for women daily, the amount in a typical hamburger. High processed meat intake (ham, cold cuts, hot dogs, bacon, sausage) was defined as 1 ounce eaten 5 or 6 times a week for men, and 2 or 3 times a week for women—the amount in one slice of ham. In addition, earlier studies have also indicated that those consuming white meat, particularly chicken, have approximately a threefold higher colon cancer risk, compared to vegetarian (Fraser, 1999).
Secondary bile acids are probably part of the problem. In order to absorb fat, the liver makes bile, which it stores in the gallbladder. After a meal, the gallbladder sends bile acids into the intestine, where they chemically modify the fats eaten so they can be absorbed. Unfortunately, bacteria in the intestine turn these bile acids into cancer-promoting substances called secondary bile acids. Meats not only contain a substantial amount of fat; they also foster the growth of bacteria that cause carcinogenic secondary bile acids to form. Cooking methods that promote the formation of HCAs are believed to play a significant role in colorectal cancer risk. A case-control study in North Carolina that analyzed meat intake by level of doneness, cooking method, and estimated intake of HCAs in 620 colon cancer patients and 1038 controls, found that not only was red meat intake positively associated with colon cancer risk, but also pan-frying was the riskiest way to prepare meat due to high HCA formation (Butler et al., 2003). Confirmation of the link between frying and colorectal cancer risk was adduced in the review mentioned above, where high frying temperature was found to increase colon cancer risk almost twofold, and rectal cancer risk by 60 percent (Norat & Riboli, 2001).

2.2.4 Prostate cancer

Prostate cancer is one of the leading cancers among men in the U.S., and researchers have explored a number of possible dietary factors contributing to prostate cancer risk. These include dietary fat, saturated fat, dairy products, and meat, as well as dietary factors that may decrease risk, such as the consumption of carotenoids and other antioxidants, fiber, and fruit. As with breast cancer risk, a man’s intake of dietary fat, which is abundant in meat and other animal products, increases testosterone production, which in turn increases prostate cancer risk. One of the largest nested case-control studies, which showed a positive association between prostate cancer incidence and red meat consumption, was done at Harvard University in an analysis of almost 15,000 male physicians in the Physicians’ Health Study (Gann et al., 1994). Although this study primarily analyzed plasma fatty acids and prostate cancer risk, the authors found that men who consumed red meat at least five times per week had a relative risk of 2.5 for
developing prostate cancer compared to men who ate red meat less than once per week. The most comprehensive dietary cohort study on diet and prostate cancer risk reported on nearly 52,000 health professionals in Harvard’s Health Professionals Follow-Up Study, which completed food frequency questionnaires in 1986 (Giovannucci et al., 1993). The report, based on 3 to 4 years of follow-up data, found a statistically significant relationship between higher red meat intake and the risk of prostate cancer, with red meat as the food group with the strongest positive association with advanced prostate cancer. These and other study findings suggest that reducing or eliminating meat from the diet reduces the risk of prostate cancer (Kolonel, 1996)

### 2.3 Meat and diabetes

The adoption of a western diet characterized by high intakes of red and processed meat as well as other components, including refined grain products, snacks, sweets, French fries, and pizza, is believed to contribute to the epidemic of type 2 diabetes in the world (Hirmsworth HP., 1935). A diet high in red meat has long been suspected as an important and independent contributor to risk of type 2 diabetes. This hypothesis was first generated based on the evidence from ecologic and migrant studies (Kawate et al., 1979; Pratley, 1998) and subsequently supported by several cross-sectional and prospective studies of dietary patterns and diabetes (Gittelsohn et al., 1998; Williams et al., 2000; Van Dam et al., 2002).

Since the Seventh Day Adventists Study first reported a positive association between total meat intake and risk of type 2 diabetes in a population with a large proportion of vegetarians (Snowdon & Philips, 1985) few studies have specifically assessed this relation between meat consumption and incidence of diabetes. Two recent cohort studies in U.S. men and women observed a significant association between frequent consumption of processed meat and an increased risk of type 2 diabetes (Schulze et al., 2003; Van Dam et al., 2002).
Red meat, especially processed meat, contains certain types of preservatives, additives, or other chemicals arising from meat preparation, including preservation, packaging, and cooking. These compounds include nitrates and nitrites added in meat processing as well as a variety of heterocyclic amines and polycyclic aromatic hydrocarbons formed in red meat, especially when cooked well done (Lijinsky, 1999). These compounds can be converted to \( N \)-nitrosamines (Lijinsky, 1999) which were found to be toxic to pancreatic \( \beta \)-cell (LeDoux \textit{et al.}, 1986). Consumption of foods with a high content of nitrites and nitrosamines has been associated with type 1 diabetes (Dahlquist \textit{et al.}, 1990; Virtanen \textit{et al.}, 1994; Helgason and Jonasson, 1981). Also, advanced glycation and lipoxidation end products produced during the cooking or processing of meat have been associated with insulin resistance and diabetes-related complications in animal models (Hofmann \textit{et al.}, 2002) and human subjects (Peppa \textit{et al.}, 2002; Vlassara \textit{et al.}, 2002). Therefore, such specific compounds mainly present in processed meat might largely explain the observed significant association between processed meat intake and type 2 diabetes.

2.4 Red meat and cardiovascular diseases

Red meat is often viewed as being harmful for heart health on the grounds of its fat and saturated fat content. Data regarding the association between red meat intake and the risk of CHD is conflicting. Several large studies comparing vegetarians to non-vegetarians have found an increased risk of CHD in persons who consume meat. In men, a 2-fold increase in risk was associated with eating beef more than 3 times per week 2 (Snowdon \textit{et al.}, 1984). In the Nurse’s Health Study, women with a higher ratio of red meat to fish and poultry intake had significantly higher risk of CHD although neither red meat alone nor fish alone was significantly associated with harm or benefit after adjusting for other cardiovascular risk factors (Hu \textit{et al.}, 1999). In another study, greater consumption of heme-iron, which is mainly derived from red meat, was associated with a higher risk of fatal and non-fatal CHD events (Ascherio \textit{et al.}, 1994).
One mechanism by which red meat intake could increase CHD risk is by increasing levels of harmful cholesterol. Increased total cholesterol has long been associated with increased risk of CHD. Total cholesterol is composed of three main elements: Low-density lipoprotein cholesterol (LDL cholesterol), High-density lipoprotein cholesterol (HDL cholesterol) and triglycerides. Increased levels of LDL cholesterol and triglycerides in particular have been associated with higher risk of CHD (Connor et al., 1997). LDL cholesterol is therefore called bad cholesterol. In contrast, HDL cholesterol has been found to protect against CHD and therefore, increased levels are desirable and therefore is called good cholesterol. The reason red meat has the potential to increase CHD risk is because it contains a high proportion of saturated fat. Saturated fat can be converted to both good and bad cholesterol in the body. Hence, these changes could offset one another resulting in no increase in CHD risk. Conversely, a reduction in total and saturated fat intake may cause a drop in HDL cholesterol that would offset the benefit of a reduction in LDL cholesterol. Furthermore, a large part of the saturated fat in beef is stearic acid, which has little effect on blood lipid (Bonanome & Grundy, 1988). Overall; it appears that the risk of CHD associated with fat intake might, in the end, depend upon the total balance of cholesterol raising saturated fats and cholesterol lowering unsaturated fats. Apart from its effects on cholesterol levels, red meat could contain other elements, such as animal proteins, that might adversely affect CHD risk factors, but this hypothesis has not been proven.

2.5 Red meat and obesity

The World Health Organization (WHO) defines obesity as a condition in which excess body fat has accumulated to such an extent that health may be adversely affected. The degree of body weight is usually expressed as BMI; this is the ratio of weight in kilograms to the square of height in meters. The BMI is used to classify a person's body weight as underweight (BMI less than 18.5), normal weight (BMI 18.5–24.9), overweight (BMI 25–29.9), or obese (BMI greater than 30) (WHO, 2000). In addition, it is customary to indicate the amount of abdominal fat mass. This can vary considerably
among individuals who have the same BMI. Abdominal fat is reported by measuring the waist circumference or the waist-to-hip circumference ratio. The waist circumference is thought to provide a better correlate with abdominal fat mass than the waist-to-hip ratio. High abdominal fat mass is frequently referred to as central obesity. This form of obesity has been shown to have more morbidity than if the fat distribution is predominantly on the hips (WHO, 2000).

The Diogenes project used data from ninety thousand men and women over about seven years and found that higher intake of total protein, and protein from animal sources was associated with subsequent weight gain for both genders, strongest among women, and the association was mainly attributable to protein from red and processed meat and poultry rather than from fish and dairy sources. There was no overall association between intake of plant protein and subsequent changes in weight (Halkjær et al., 2010). They also found an association between red meat consumption and increased waist circumference in a 1998 survey of about five thousand vegetarian and non-vegetarian people found that vegetarians had about 30% lower BMIs (Appleby et al., 1998). A 2006 survey of fifty thousand women found that those with higher western diet pattern scores gained about two more kilograms over the course of four years than those who lowered their scores (Schulze, 2006).

A ten-year follow up of 80,000 men and women found that ten-year changes in body mass index was associated positively with meat consumption as well as with weight gain at the waist (Seifert et al., 1992.). In a Mediterranean population of 8,000 men and women, meat consumption was significantly associated with weight gain (Bes-Rastrollo et al., 2006). Data from the National Health and Nutrition Examination Survey showed consistent positive associations between meat consumption and BMI, waist circumference, obesity and central obesity (Wang & Beydoun, 2009). A survey of twins found that processed meat intake was associated with weight gain (Hasselbalch et al., 2010). Western diets, which include higher consumption of red meats, are often
associated with obesity (Song et al., 2009; Paradis et al., 2009). Obesity greatly increases the risk for conditions such as type 2 diabetes, hypertension, dyslipidemia, gall bladder disease, sleep apnea, osteoarthritis, and lower back pain.
CHAPTER THREE
MATERIALS AND METHODS

3.1 Study design

This was a descriptive cross-sectional study.

3.2 Study site

The study was conducted in Laiser Hill location of Ongata Rongai, Kajiado North County.

Ongata Rongai is located between the Kaputiei plains and the Western slopes of the Ngong hills all within Kajiado. Rongai began in the late 1950's, first as a cattle market in present day Ongata Rongai shopping centre and as a stone mining township, therefore meat had been sold in this area from this time. The township is divided into five administrative units namely Kware, Mosoi Range, Laiser Hill, Ongata Rongai, and Entumoto locations, according to the 2009 Housing and Population census.

Laiser Hill was purposively sampled as it has a long history of frequent consumption of red meat. Furthermore, Laiser had homogeneity of socioeconomic status of the residents. It was dominated by the middle-class.

3.3 Study population

The target population of the survey consisted of all private households in this area. The survey did not cover other collective living quarters such as students’ hostels, old-age homes, hospitals, prisons and was therefore only representative of non-institutionalized households. The household heads were chosen to be interviewed.
3.4 Inclusion criteria

Those respondents included in the study were adult red meat consumers and those who gave consent.

Only one respondent from each household was interviewed.

3.5 Exclusion criteria

Any one below the age of 18 was excluded from the study. Also excluded were respondents who did not consume red meat. Those who declined to participate in the study were also excluded.

3.6 Sample size determination

The sample size chosen was calculated using the Fischer’s Exact Probability Test as shown below:

\[ n = \frac{Z^2 \times pq}{d^2} \]  

(Fisher and Yates, 1996)

Where:

- \( n \) = desired sample size if sample population is above 10,000
- \( Z \) = standard normal deviate at a required confidence level (in this case 95% confidence level)
- \( p \) = proportion in population estimated to have particular characteristics
- \( q = 1 - p \)
- \( d \) = level of precision at 95% confidence level

Therefore sample size in this case

\[ z = 1.96 \]

\[ p = 0.5 \]

\[ q = 0.5 \]

\[ d = 0.05 \]

\[ n = \frac{1.96^2 \times 0.5 \times 0.5}{0.05^2} = 385 \]
The value of \( p = 0.5 \) was used because the proportion of attitudes and practices of red meat consumption and awareness levels of lifestyle diseases was not known. Ten percent of the questionnaires were added to cater for non response which gave a target sample size of 423.

3.7 Sampling procedures

Cluster sampling was used to select households. Laiser Hill was first divided into 100 clusters of 120 households based on the 2009 census enumeration areas. Four clusters were then randomly chosen. Households in these clusters were chosen for data collection. To reduce bias of household selection, the first house to be visited was determined by the random walk method which involved two separate steps. The method entailed (1) randomly choosing a starting point and a direction of travel within the sample cluster, (2) conducting an interview in the nearest household, and (3) continuously choosing the next nearest household for an interview until the target number of interviews has been obtained.

3.8 Data collection

Data was collected using a semi-structured questionnaire (Appendix 2). The questionnaire was pretested on 10 respondents to ensure they were clear, the contents were suitable, understandable and there was a sequence in the flow of questions. The questionnaire was then refined for final use. All questionnaires were in the English language and also in Kiswahili for those who were not able to understand English but understood Kiswahili.

The initial part of the questionnaire covered the respondent’s demographic information which included age, sex, level of education, occupation, average monthly income and marital status. Part two covered questions on attitudes and perceptions on red meat consumption. Part three covered questions on respondents’ practices on red meat
consumption and part four covered questions on respondents’ awareness of lifestyle diseases.

Most of the data collection was done all day during the weekend when most family members were present. Some data collection was also done during the weekdays where some respondents were still available.

3.9 Data management and analysis

All filled questionnaires were checked for their completeness before the interviewer left that area. Where information was missing the interviewer revisited the respondent for further information unless they had initially declined to disclose. Upon processing of all the field data, analysis was done under the domain of descriptive statistics using SPSS Version 17 software. Two questions on attitude were open ended while one was closed, while those on practices were close ended and those on awareness involved a mixture of closed and open ended questions. Responses on open ended questions were grouped around central themes according to the responses given. They were then coded and analyzed accordingly. At first, the coding was open whereby data was broken down, examined, compared, conceptualized, and categorized. This data coding represented the gradual building up of categories out of the data. Later, axial coding was employed. This involved the data being put back together in new ways after open coding, by making connections between categories. Bivariate analysis using Chi-square test and Fishers Exact Test was then done to measure the association between the independent and dependent variables. For variables with frequencies of less than five observations Fisher Exact Test was used to test the association. Odds Ratio (OR) and 95% Confidence Interval (CI) were used to estimate the strength of association between independent variables and the dependent variable. The threshold for statistical significance was set at p<0.05. Multivariate binary regression using the odds ratio was used to model those associations that were significant in binary analysis. Significance was determined at values of p<0.05. Data was presented using tables and charts.
3.10 Ethical considerations

Ethical clearance for this study was sought from the KEMRI scientific steering committee (SSC), Ethical review committee (ERC), and JKUAT board of post graduate studies.

The study provided no harm to the individual and was entirely based on the principle of voluntary participation. The participants were informed of their rights to privacy and confidentiality. An informed consent form was issued to the respondents before administration of questionnaires. No coercion or intimidation was used to obtain any information. Data collected was strictly confidential and all information collected was filed and all files kept under lock and key in a cabinet.

3.11 Study limitations

Non-response - this was especially in reference to respondents not at home at the time of visit. This was minimized by conducting most of the interviews on the weekend where the likelihood of them being available was higher

Ethical issues – some respondents were resistant as they were concerned that their information could be accessed by others. However this was minimized by assuring the respondents of utmost confidentiality and privacy and that no questionnaires contained their names for identification.
4.1 Demographic characteristics

The total number of respondents was 387. The demographic characteristics of the respondents as summarized in Table 4.1 showed that there were almost similar proportion of females (51.7%, 200) compared to males (48.3%, 187). 58.4% of the respondents were aged 18-38 years. A higher proportion of the respondents (42.7%) had tertiary and university education while 27.1% were high school graduates. Half of the respondents (50.1%) were married.

Table 4.1: Demographic characteristics of the respondents

<table>
<thead>
<tr>
<th>Demographics</th>
<th>Frequency</th>
<th>Percent (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>187</td>
<td>48.3</td>
</tr>
<tr>
<td>Female</td>
<td>200</td>
<td>51.7</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18-28</td>
<td>115</td>
<td>29.7</td>
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<tr>
<td>29-38</td>
<td>111</td>
<td>28.7</td>
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<td>39-48</td>
<td>89</td>
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<td>49-58</td>
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<td>&gt;58</td>
<td>32</td>
<td>8.3</td>
</tr>
<tr>
<td>Education Level</td>
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<td></td>
</tr>
<tr>
<td>No school</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Primary</td>
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<td>0</td>
</tr>
<tr>
<td>Secondary</td>
<td>105</td>
<td>27.1</td>
</tr>
<tr>
<td>College</td>
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<td>42.7</td>
</tr>
<tr>
<td>University</td>
<td>117</td>
<td>30.2</td>
</tr>
<tr>
<td>Marital Status</td>
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<td></td>
</tr>
<tr>
<td>Single</td>
<td>184</td>
<td>47.5</td>
</tr>
<tr>
<td>Married</td>
<td>194</td>
<td>50.1</td>
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<tr>
<td>Separated</td>
<td>7</td>
<td>1.9</td>
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<tr>
<td>Divorced</td>
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<td>0.5</td>
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<tr>
<td>Occupation</td>
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<td></td>
</tr>
<tr>
<td>Formal employment</td>
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<td>45</td>
</tr>
<tr>
<td>Casual employment</td>
<td>52</td>
<td>13.4</td>
</tr>
<tr>
<td>Business person</td>
<td>151</td>
<td>39</td>
</tr>
</tbody>
</table>
### 4.2 Perception towards red meat consumption

Perceptions given as illustrated in Figure 4.1 were grouped according to those associated with taste, those associated with the nutritional value/health promoting attributes and, those related to quantity eaten. Seventy four percent 74.7% (289) said they liked consumption of red meat mainly because of the taste, 22.7% (88) reported that caution should be taken in its consumption and it should be consumed in moderation while 2.6 % cited that they liked red meat mainly because it built the body and promoted health.

![Figure 4.1 Perceptions towards consumption of red meat](image)

### 4.3 Perceived health benefits of red meat consumption

Responses from perceived health benefits of meat consumptions illustrated in Table 4.2 were grouped as to those associated with protein, energy and to those related to vitamins and minerals. About ninety percent, 90.4%, were of the opinion that red meat was a good source of protein, another 7.5%, said that it was a source of energy while 2.1 %, said red meat was a good source of vitamins and minerals.
Table 4.2: Perceived health benefits of red meat consumption

<table>
<thead>
<tr>
<th>Health benefit</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Good source of proteins</td>
<td>350</td>
<td>90.4%</td>
</tr>
<tr>
<td>Provides some vitamins/minerals</td>
<td>8</td>
<td>2.1%</td>
</tr>
<tr>
<td>Source of energy</td>
<td>29</td>
<td>7.5%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>387</td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

4.3 Most important characteristic when buying meat products

Majority of the respondents (49.6%, 192) as illustrated in Figure 4.2 said that when considering to buy meat products the most important characteristics they considered was price followed closely by nutritional value (40.1%, 155). Taste was also considered (9.8%, 38) with an insignificant number considering where the meat came from (0.5%, 2). The findings implied that when purchasing meat products the respondent’s primary concern was price and not nutritional value (Figure 4.2).

Figure 4.2: Characteristic considered important when buying meat products
4.3 Practice of red meat consumption

When asked how the respondents prepared their meat, 25% of the respondents said that they preferred to boil the meat, 70% said that they liked to fry their meat while 5% said that they preferred to cook their meat in an oven or barbecued.

Furthermore, 89.4% of the respondents preferred their meat well done, 10.1% preferred medium cooked meat and the rest 0.5% preferred their meat rare. For 31% of respondents, the quantity of meat consumed in the last two years had increased, for 24.2% of respondents it had decreased while for 44.2% of the respondents the quantity had remained the same.

The quantity of meat consumed by respondents in a week showed that, most of them consumed meat after every other day (4 times a week) representing 43.4%. Those who ate meat twice a week were 27.2%, 22.2% ate once a week while only 7.2% ate meat every day.

The actual quantity of meat consumed by individuals, per meal, in grams showed that; most respondents, 66.9% consumed less than 250 grams (1-3 portions of regular serving spoon), 28.9% consumed between 250-500 grams (4-6 portion of regular serving spoon), while 4.2% consumed between 500 grams -1 kg (more than 6 regular serving spoon).

To ascertain the number of times in a week in which respondents consumed processed meat (including one or more of sausages, smokies, hamburgers hotdogs) showed that; most respondents, 42% did not take processed meat weekly. Thirty five percent of the respondents took 1-2 times weekly, 15% took 3-4 times weekly, while 8% who took more than four times weekly.

The number of times respondents consumed roast meat revealed that 41% consumed roast meat once every weekend, 10% consumed two to three times in a week, 6%
consumed more than three times in a week, and 43% said that they did not take roast meat weekly but only on special occasions. (Table 4.3)

Table 4.3: Practice of red meat consumption

<table>
<thead>
<tr>
<th>Question</th>
<th>Choice</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meat preparation</td>
<td>Boiled</td>
<td>25%</td>
</tr>
<tr>
<td></td>
<td>Stewed</td>
<td>70%</td>
</tr>
<tr>
<td></td>
<td>Barbecued /oven</td>
<td>5%</td>
</tr>
<tr>
<td>Preference of doneness</td>
<td>Well done</td>
<td>89.4%</td>
</tr>
<tr>
<td></td>
<td>Medium</td>
<td>10.1%</td>
</tr>
<tr>
<td></td>
<td>Rare</td>
<td>0.5%</td>
</tr>
<tr>
<td>Change in quantity consumed (last 2 yrs)</td>
<td>Has increased</td>
<td>31%</td>
</tr>
<tr>
<td></td>
<td>Has decreased</td>
<td>24.2%</td>
</tr>
<tr>
<td></td>
<td>Remained same</td>
<td>44.8%</td>
</tr>
<tr>
<td>Frequency of red meat consumption</td>
<td>Everyday</td>
<td>7.2%</td>
</tr>
<tr>
<td></td>
<td>4-5 times a week</td>
<td>43.4%</td>
</tr>
<tr>
<td></td>
<td>Twice a week</td>
<td>27.2%</td>
</tr>
<tr>
<td></td>
<td>Once a week</td>
<td>22.2%</td>
</tr>
<tr>
<td>Estimated consumption per meal</td>
<td>0-0.25kg</td>
<td>66.9%</td>
</tr>
<tr>
<td></td>
<td>0.26-0.5kg</td>
<td>28.9%</td>
</tr>
<tr>
<td></td>
<td>0.6-1kg</td>
<td>4.2%</td>
</tr>
<tr>
<td>Frequency of processed meat consumption</td>
<td>1-2times a week</td>
<td>35%</td>
</tr>
<tr>
<td></td>
<td>3-4times a week</td>
<td>15%</td>
</tr>
<tr>
<td></td>
<td>4-5times a week</td>
<td>8%</td>
</tr>
<tr>
<td></td>
<td>Don’t take</td>
<td>42%</td>
</tr>
<tr>
<td>Frequency of consumption of roast meat</td>
<td>On weekends</td>
<td>41%</td>
</tr>
<tr>
<td></td>
<td>2-3times a week</td>
<td>10%</td>
</tr>
<tr>
<td></td>
<td>&gt;3 times a week</td>
<td>6%</td>
</tr>
<tr>
<td></td>
<td>Don’t take</td>
<td>43%</td>
</tr>
</tbody>
</table>
4.4 Awareness of lifestyle diseases

4.4.1 General awareness of lifestyle diseases

Ninety percent of the respondents said they were aware, and the rest 10% said they were unaware of what lifestyle diseases were. In a follow up to actually determine if the respondents could define what lifestyle diseases were, according to the best of their knowledge, 83.7% said that they were diseases that came about as a result of lifestyle choices, 8.8% of the respondents said that they were diseases which came about in old age, 5.7% said that they were diseases that came as a result of ethnicity and genetics, and the rest, 1.8% said that they are diseases from other infectious diseases. Majority (90.7%) of the respondents indicated that red meat consumption was factor causing lifestyle diseases while 9.3% said it was not a factor that caused lifestyle diseases (Table 4.4).

Table 4.4: Responses on awareness of lifestyle diseases, definition, red meat and lifestyle diseases

<table>
<thead>
<tr>
<th>Question</th>
<th>Choice</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aware what lifestyle diseases were</td>
<td>Yes</td>
<td>90%</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>10%</td>
</tr>
<tr>
<td>Definition of lifestyle diseases</td>
<td>Diseases of old age</td>
<td>8.8%</td>
</tr>
<tr>
<td></td>
<td>Diseases of ethnicity and</td>
<td>5.7%</td>
</tr>
<tr>
<td></td>
<td>genetics</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Diseases of lifestyle choices</td>
<td>83.7%</td>
</tr>
<tr>
<td></td>
<td>Diseases from other infectious diseases</td>
<td>1.8%</td>
</tr>
<tr>
<td>Whether consumption of red meat can cause</td>
<td>Yes</td>
<td>90.7%</td>
</tr>
<tr>
<td>lifestyle diseases</td>
<td>No</td>
<td>9.3%</td>
</tr>
</tbody>
</table>
4.4.2 Awareness of high intakes of red meat as a contributor to common lifestyle diseases

The following as illustrated in Table 4.5 was the levels of awareness of high intakes of red meat as a contributor to lifestyle diseases.

Table 4.5: Awareness of high intakes of red meat as a contributor to common lifestyle diseases

<table>
<thead>
<tr>
<th>Lifestyle disease</th>
<th>N</th>
<th>Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cancer</td>
<td>221</td>
<td>57%</td>
</tr>
<tr>
<td>Diabetes</td>
<td>240</td>
<td>62%</td>
</tr>
<tr>
<td>Obesity</td>
<td>298</td>
<td>77%</td>
</tr>
<tr>
<td>Hypertension</td>
<td>259</td>
<td>67%</td>
</tr>
<tr>
<td>Cardiovascular diseases</td>
<td>251</td>
<td>65%</td>
</tr>
</tbody>
</table>

4.4.3 Other factors causing lifestyle diseases

Respondents listed the following factors; excessive drinking (14%), smoking (5%), sedentary lifestyle (33%), stress (2%), inheritance (9%), use of drugs (9%) and (28%) said that they did not know what contributed to lifestyle diseases. Figure 4.3 indicates that sedentary lifestyle was a major contributor.
Figure 4.3: Other factors that cause lifestyle diseases

4.4.4 Awareness of risk of getting lifestyle diseases

Results in Figure 4.4 indicated that 98% of the respondents were of the opinion that anybody was at risk from the very young to the old of getting lifestyle diseases. This was a major shift from the notion that these diseases were affecting mostly wealthy and old people.

Figure 4.4: Risk of getting lifestyle diseases
4.4.5 Awareness of cure of lifestyle diseases

Sixty two percent (62%) of respondents indicated that the diseases could be cured but only when discovered early while (38%) of respondents did not believe that the diseases could be cured (Figure 4.5).

Figure 4.5: Awareness of cure of lifestyle diseases

4.5 Bivariate analysis

4.5.1 Association between demographic characteristics and attitude towards red meat consumption

For those variables with frequencies of less than five observations Fisher Exact Test was used to test the association. Fisher Exact Tests was conducted for occupation and marital status. Relationships between age \( \chi^2 = 12.069, \text{df} (4), p=0.017 \), education \( \chi^2 = 7.142, \text{df} (2), p=0.028 \), marital status \( 11.939, p=0.003 \) and attitude towards red meat consumption were statistically associated (Table 4.6). Gender and occupation were not statistically significant in explaining attitudes towards red meat consumption.
Table 4.6: Association between demographic variables and attitude towards red meat consumption

<table>
<thead>
<tr>
<th>Demographics</th>
<th>Negative Attitude</th>
<th>Positive Attitude</th>
<th>Fishers exact test and Chi Square</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>%</td>
<td>N</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18-28</td>
<td>64</td>
<td>56</td>
<td>51</td>
</tr>
<tr>
<td>29-38</td>
<td>59</td>
<td>53</td>
<td>52</td>
</tr>
<tr>
<td>39-48</td>
<td>35</td>
<td>39</td>
<td>54</td>
</tr>
<tr>
<td>49-58</td>
<td>12</td>
<td>30</td>
<td>28</td>
</tr>
<tr>
<td>&gt;58</td>
<td>17</td>
<td>53</td>
<td>15</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>100</td>
<td>53</td>
<td>89</td>
</tr>
<tr>
<td>Female</td>
<td>87</td>
<td>44</td>
<td>111</td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High school</td>
<td>61</td>
<td>58</td>
<td>44</td>
</tr>
<tr>
<td>College</td>
<td>79</td>
<td>45</td>
<td>86</td>
</tr>
<tr>
<td>University</td>
<td>47</td>
<td>44</td>
<td>70</td>
</tr>
<tr>
<td>Occupation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Formal emplmt</td>
<td>78</td>
<td>45</td>
<td>96</td>
</tr>
<tr>
<td>Casual emplmt</td>
<td>24</td>
<td>46</td>
<td>28</td>
</tr>
<tr>
<td>Businessperson</td>
<td>82</td>
<td>54</td>
<td>69</td>
</tr>
<tr>
<td>Farmer</td>
<td>2</td>
<td>25</td>
<td>6</td>
</tr>
<tr>
<td>Others</td>
<td>1</td>
<td>50</td>
<td>1</td>
</tr>
<tr>
<td>Marital status</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married</td>
<td>77</td>
<td>40</td>
<td>117</td>
</tr>
<tr>
<td>Single</td>
<td>105</td>
<td>57</td>
<td>79</td>
</tr>
<tr>
<td>Separated</td>
<td>4</td>
<td>57</td>
<td>3</td>
</tr>
<tr>
<td>Divorced</td>
<td>1</td>
<td>50</td>
<td>1</td>
</tr>
</tbody>
</table>

4.5.1 Multivariate analysis

Table 4.7 shows that age group of over 58 years was statistically associated with attitude towards red meat consumption (p=0.024). The odds of having a good attitude were 3.119 times higher for those aged over 58 years compared to those aged 18-28 years.

High school education was statistically associated with attitude towards red meat consumption (p<0.05). The odds of having a good attitude were 4.408 times higher for those with university education compared to those with high school education.
Table 4.7: Logistic regression of age, education level and marital status and attitude towards red meat consumption

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>S.E.</th>
<th>DF</th>
<th>p-value</th>
<th>O.R</th>
<th>95% C.I.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Lower</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Upper</td>
</tr>
<tr>
<td>18-28</td>
<td></td>
<td></td>
<td>4</td>
<td>0.183</td>
<td>1.000</td>
<td></td>
</tr>
<tr>
<td>29-38</td>
<td>0.702</td>
<td>0.503</td>
<td>1</td>
<td>0.163</td>
<td>2.019</td>
<td>0.753</td>
</tr>
<tr>
<td>39-48</td>
<td>0.472</td>
<td>0.451</td>
<td>1</td>
<td>0.295</td>
<td>1.603</td>
<td>0.663</td>
</tr>
<tr>
<td>49-58</td>
<td>0.781</td>
<td>0.426</td>
<td>1</td>
<td>0.067</td>
<td>2.184</td>
<td>0.947</td>
</tr>
<tr>
<td>&gt;58</td>
<td>1.137</td>
<td>0.505</td>
<td>1</td>
<td><strong>0.024</strong></td>
<td>3.119</td>
<td>1.159</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>8.396</td>
</tr>
<tr>
<td>High school</td>
<td></td>
<td></td>
<td>2</td>
<td><strong>0.017</strong></td>
<td>1.000</td>
<td></td>
</tr>
<tr>
<td>College</td>
<td>-0.199</td>
<td>0.263</td>
<td>1</td>
<td>0.45</td>
<td>0.82</td>
<td>0.49</td>
</tr>
<tr>
<td>University</td>
<td>1.484</td>
<td>0.635</td>
<td>1</td>
<td><strong>0.019</strong></td>
<td>4.408</td>
<td>1.27</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>15.299</td>
</tr>
<tr>
<td>Married</td>
<td></td>
<td></td>
<td>3</td>
<td>0.22</td>
<td>1.000</td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>0.582</td>
<td>1.499</td>
<td>1</td>
<td>0.698</td>
<td>1.79</td>
<td>0.095</td>
</tr>
<tr>
<td>Separated</td>
<td>-0.04</td>
<td>1.501</td>
<td>1</td>
<td>0.979</td>
<td>0.961</td>
<td>0.051</td>
</tr>
<tr>
<td>Divorced</td>
<td>-0.06</td>
<td>1.68</td>
<td>1</td>
<td>0.972</td>
<td>0.942</td>
<td>0.035</td>
</tr>
<tr>
<td>Constant</td>
<td>-0.554</td>
<td>1.538</td>
<td>1</td>
<td>0.718</td>
<td>0.574</td>
<td></td>
</tr>
</tbody>
</table>

β –Coefficient for constant  S.E. – Standard Error  DF – Degrees of Freedom
OR – Odds Ratio  CI – Confidence Interval  Sig- Significance

4.5.2 Association between demographic characteristics and practices of red meat consumption

Association between education level and practices towards red meat consumption illustrated in Table 4.8 indicated that there was a significant association between education level and practices. This was supported by chi square results ($\chi^2 = 10.262$, df (2), p=0.006). For variables with frequencies of less than five observations Fisher Exact Test was used to test the association. Fisher Exact Tests was conducted for age, occupation and marital status. The relationship between age and attitude was insignificant (7.776, p=0.093) similarly occupation (5.900 (p=0.167) and marital status had insignificant associations (1.849 (p=0.582)).
Table 4.8: Association between demographic variables and practices of red meat consumption

<table>
<thead>
<tr>
<th>Demographics</th>
<th>Poor Practice</th>
<th>Good Practice</th>
<th>Chi Square &amp; Fisher Tests</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>%</td>
<td>N</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18-28</td>
<td>18</td>
<td>16</td>
<td>97</td>
</tr>
<tr>
<td>29-38</td>
<td>14</td>
<td>13</td>
<td>97</td>
</tr>
<tr>
<td>39-48</td>
<td>8</td>
<td>8</td>
<td>81</td>
</tr>
<tr>
<td>49-58</td>
<td>9</td>
<td>23</td>
<td>31</td>
</tr>
<tr>
<td>&gt;58</td>
<td>1</td>
<td>3</td>
<td>31</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>26</td>
<td>14</td>
<td>163</td>
</tr>
<tr>
<td>Female</td>
<td>24</td>
<td>12</td>
<td>174</td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High school</td>
<td>12</td>
<td>11</td>
<td>93</td>
</tr>
<tr>
<td>College</td>
<td>31</td>
<td>19</td>
<td>134</td>
</tr>
<tr>
<td>University</td>
<td>7</td>
<td>5</td>
<td>110</td>
</tr>
<tr>
<td>Occupation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Formal employment</td>
<td>26</td>
<td>15</td>
<td>148</td>
</tr>
<tr>
<td>Casual employment</td>
<td>9</td>
<td>17</td>
<td>43</td>
</tr>
<tr>
<td>Business person</td>
<td>13</td>
<td>9</td>
<td>138</td>
</tr>
<tr>
<td>Farmer</td>
<td>2</td>
<td>25</td>
<td>6</td>
</tr>
<tr>
<td>Others</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Marital status</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married</td>
<td>22</td>
<td>11</td>
<td>172</td>
</tr>
<tr>
<td>Single</td>
<td>28</td>
<td>15</td>
<td>156</td>
</tr>
<tr>
<td>Separated</td>
<td>0</td>
<td>0</td>
<td>7</td>
</tr>
<tr>
<td>Divorced</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
</tbody>
</table>

4.5.2.1 Multivariate analysis

Binary logistic regression was used to model relationship between education level and red meat consumption practices. Table 4.9 shows that high school education was statistically associated with red meat consumption practices (p<0.009). University education was statistically associated with red meat consumption practices (p<0.003). The odds of having good practices were 0.275 times lower for those with university education compared to those with high school education.
### Table 4.9: Logistic regression of education level and practice of red meat consumption

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>S.E.</th>
<th>Wald</th>
<th>DF</th>
<th>p-value</th>
<th>O.R</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Lower</td>
</tr>
<tr>
<td>High school</td>
<td>9.489</td>
<td>2</td>
<td>0.009</td>
<td>1</td>
<td>1</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>College</td>
<td>-0.707</td>
<td>0.496</td>
<td>2.031</td>
<td>1</td>
<td>0.154</td>
<td>0.493</td>
<td>0.187</td>
</tr>
<tr>
<td>University</td>
<td>-1.291</td>
<td>0.438</td>
<td>8.692</td>
<td>1</td>
<td>0.003</td>
<td>0.275</td>
<td>0.117</td>
</tr>
<tr>
<td>Constant</td>
<td>2.755</td>
<td>0.39</td>
<td>49.936</td>
<td>1</td>
<td>0.000</td>
<td>15.714</td>
<td></td>
</tr>
</tbody>
</table>

β –Coefficient for constant
OR – Odds Ratio
S.E. – Standard Error
CI – Confidence Interval
DF – Degrees of Freedom
Sig. – Significance

### 4.5.3 Association between demographic characteristics and awareness of lifestyle diseases

According to Fisher exact test the relationship between marital status and awareness was statistically associated \((13.263, p=0.002)\) whereas age \((4.723, p=0.314)\), gender \((\chi^2=0.977, p=0.323)\), education \((\chi^2=1.776, p=0.412)\) and occupation \((1.899, p=0.724)\) had insignificant association with awareness (Table 4.10).
Table 4.10: Association between demographic variables and awareness of lifestyle diseases

<table>
<thead>
<tr>
<th>Demographics</th>
<th>Poor Awareness</th>
<th>Good Awareness</th>
<th>Chi Square &amp; Fisher Exact Test</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>%</td>
<td>N</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18-28</td>
<td>98</td>
<td>85</td>
<td>17</td>
</tr>
<tr>
<td>29-38</td>
<td>89</td>
<td>80</td>
<td>22</td>
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<tr>
<td>39-48</td>
<td>77</td>
<td>86</td>
<td>11</td>
</tr>
<tr>
<td>49-58</td>
<td>36</td>
<td>90</td>
<td>4</td>
</tr>
<tr>
<td>&gt;58</td>
<td>30</td>
<td>94</td>
<td>2</td>
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<tr>
<td>Gender</td>
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</tr>
<tr>
<td>Male</td>
<td>165</td>
<td>87</td>
<td>24</td>
</tr>
<tr>
<td>Female</td>
<td>165</td>
<td>84</td>
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<tr>
<td>Education</td>
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</tr>
<tr>
<td>High school</td>
<td>92</td>
<td>88</td>
<td>13</td>
</tr>
<tr>
<td>College</td>
<td>143</td>
<td>87</td>
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</tr>
<tr>
<td>University</td>
<td>95</td>
<td>82</td>
<td>21</td>
</tr>
<tr>
<td>Occupation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Formal employment</td>
<td>148</td>
<td>86</td>
<td>25</td>
</tr>
<tr>
<td>casual employment</td>
<td>43</td>
<td>83</td>
<td>9</td>
</tr>
<tr>
<td>Business persons</td>
<td>131</td>
<td>87</td>
<td>20</td>
</tr>
<tr>
<td>Farmer</td>
<td>6</td>
<td>75</td>
<td>2</td>
</tr>
<tr>
<td>Others</td>
<td>2</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>Marital status</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married</td>
<td>176</td>
<td>91</td>
<td>17</td>
</tr>
<tr>
<td>Single</td>
<td>148</td>
<td>80</td>
<td>36</td>
</tr>
<tr>
<td>Separated</td>
<td>4</td>
<td>57</td>
<td>3</td>
</tr>
<tr>
<td>Divorced</td>
<td>2</td>
<td>100</td>
<td>0</td>
</tr>
</tbody>
</table>
5.5.3.1 Multivariate analysis

Binary logistic regression was used to model relationship between marital status and awareness of lifestyle diseases. Table 4.11 shows that being married was statistically associated with awareness towards lifestyle diseases (p<0.05).

Table 4.11: Logistic regression of marital status and awareness of lifestyle Diseases

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>S.E.</th>
<th>Wald</th>
<th>D F</th>
<th>P value</th>
<th>O.R</th>
<th>95% C.I.</th>
<th>Lower</th>
<th>Upper</th>
</tr>
</thead>
<tbody>
<tr>
<td>Married</td>
<td>1.4</td>
<td>0.505</td>
<td>6.241</td>
<td>151</td>
<td>0.015</td>
<td>1</td>
<td>1.170</td>
<td>9.533</td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>0.582</td>
<td>1.499</td>
<td>0.151</td>
<td>1</td>
<td>0.698</td>
<td>1.79</td>
<td>0.095</td>
<td>33.778</td>
<td></td>
</tr>
<tr>
<td>Separated</td>
<td>0.472</td>
<td>0.451</td>
<td>1.096</td>
<td>1</td>
<td>0.295</td>
<td>1.603</td>
<td>0.663</td>
<td>3.879</td>
<td></td>
</tr>
<tr>
<td>Divorced</td>
<td>-0.06</td>
<td>1.68</td>
<td>0.001</td>
<td>1</td>
<td>0.972</td>
<td>0.942</td>
<td>0.035</td>
<td>25.335</td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>-21.205</td>
<td>28419</td>
<td>3</td>
<td>0</td>
<td>0.999</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

β –Coefficient for constant  S.E. – Standard Error  DF – Degrees of Freedom
OR – Odds Ratio  CI – Confidence Interval  Sig- Significance
CHAPTER FIVE
DISCUSSION

5.1 Attitude and perceptions of red meat consumption

Majority of the respondents 74.7%, (289) indicated that taste was the major contributing factor to their (hgh, 99999999) consumption. This corroborates with previous other studies that reported taste as the single largest driver for maintaining meat consumption habits even in situations of uncertainty or risk (Goodson et al., 2002, Verbeke, 2001, Grunert and Anderson, 2000, Richardson et al., 1994). However 22.7%, (88) of the residents reported that caution should be taken in its consumption and it should be consumed in moderation. These results complement the recommendations by the American Institute for Cancer Research and the World Cancer Research Fund to reduce red and processed meat intake to decrease mortality and cancer incidence (Kahn et al., 1984; WCRF/AICR, 2007).

A study done in meat consumption in Europe found that the lower the price of a product the more people would buy it. It was reported that while beef had the highest mean per-capita consumption, it also had the lowest mean price and the opposite was true for fish. The mean price of poultry was nearly as high as for fish (Rivera-Ferre, 2009; Westhoek et al., 2011). Recent demand studies also indicate that price still has some explanatory importance in meat demand (Bansback, 1995). In the study when considering purchasing meat products price was a consideration at 49.6% with an insignificant number (0.5%) considering where the meat came from. This is however in contrast to studies done in Tuscany, Italy where the importance purchase criteria showed that expiration date, freshness, and taste were the most important when purchasing red meat (Marija et al., 2005).

Associations between age and attitude towards red meat consumption showed that there was a statistical relationship between age and attitude of red meat consumption (p<0.05).
Binary logistic regression used to model this association showed the odds of having a good attitude were 3.119 times higher for those aged over 58 years compared to those aged 18-28 years. This could be associated with increased risk of acquiring communicable diseases as one gets older. This is supported by WHO report that susceptibility to NCDs increase with age where older populations tend to experience a greater share of deaths due to NCDs compared to younger populations. (WHO 2010)

Studies done by Woodward, (1988), Beardsworth & Keil, (1991) and Richardson et al., (1993, 1994) indicated that more educated respondents had better nutritional awareness of meat and were more concerned on perceived unhealthiness of red meat. Association of education levels and attitudes towards red meat consumption indicated that there was statistical association between education and attitude towards red meat consumption (p<0.05). The odds of having a good attitude were 4.408 times higher for those with university education compared to those with high school education.

Marital status also played a role in determining attitude as comparisons of marital status against indicated that there was statistical association between marital status and attitude of red meat consumption (p=0.003) but this association was not significant when modeled using logistic regression. Other demographic characteristics like gender ($\chi^2 = 3.116, \text{df (1)}, P=0.078$), and occupation ($\chi^2 = 0.370, \text{df (4)}, p=0.946$) against attitudes towards red meat consumption indicated that there was no significant association between them and attitude of red meat consumption.

5.2 Practice of red meat consumption

Changes that occur when red meat is cooked, especially at high temperatures under moist conditions lead to the production of compounds in meat called heterocyclic amines (HCAs). These are mutagens compounds that can cause changes in DNA and raise risk for cancer. Therefore the way meat is prepared affects production of HCAs. Those who eat meat that is fried or well done have a greater risk for cancer than those
who eat meat cooked in other ways (Lang *et al.*, 1994). In this study good practices of meat preparation were therefore reported in 25% of the respondents who preferred to boil their meat while poor practices were seen in 5% who preferred to cook their meat in an oven or barbecued. Studies done on the Masai diet revealed that they mainly preferred half cooked meat and raw meat mixed with blood (Merker, 1971). Therefore in our study poor practices were seen in 89.4% of the respondents preferred their meat well done.

A research done by World Cancer Research Fund recommended that people limit consumption to 500g (cooked weight) of red meat a week and completely avoid processed meat. In the study good practices were observed in 66.9% who consumed less than 250 grams (1-3 portions of regular serving spoon) while poor practices were observed 4.1% who consumed between 500 grams -1 kg (more than 6 regular serving spoon) per sitting. The number of times in a week in which respondents consumed processed meat (including one or more of sausages, smokies, hamburgers hotdogs) showed that 42% had good practices as they did not take processed meat weekly.

In their study, Liu and Deblitz (2007) found that consumers who were well educated possessed good income which was an important purchasing criterion for beef consumption in China. In this study there was a significant relationship between education level and practices (*P*<0.05). The odds of having good practices were 0.275 times lower for those with university education compared to those with high school education. This can further be supported by studies done on red meat consumption and preferences in Tekirdağ Province, Turkey by Ebru *et al.*, (2015) where the increased level of education of the consumers increased consumption of red meat as well.

### 5.3 Awareness levels of lifestyle diseases

Good awareness was seen in 90% of the respondents, who were aware of lifestyle diseases with 83.7% being able to correctly identify what they were. 90.7% of the
respondents could also associate high consumption of red meat to cause of lifestyle diseases, with over 50% associating red meat with different lifestyle diseases. These finding can be compared to a community study done in Sudan on lifestyle patterns and the awareness of the risks of non-communicable diseases where respondents were aware of the benefits of all lifestyle habits that are related to NCDs including consumption of white meat however, they consumed red meat much more. Knowledge of the Sudanese community with regards to healthy diet was found to be quiet adequate. However, the daily lifestyle practices were almost unhealthy and contradicted their knowledge (Eiman et al., 2014).

There was a major shift from the notion that these diseases were affecting mostly wealthy and old people as 98% of the respondents were of the opinion that anybody was at risk from the very young to the old of getting lifestyle diseases. 62% of the respondents reported that the diseases could be cured but only when discovered early with 38% of respondents reporting that the diseases could not be cured. Other common factors reported to contribute to lifestyle diseases included excessive drinking and smoking (14%), sedentary lifestyle (33%), stress (2%), inheritance (9%), use of drugs (9%) and (28%) don’t know.

Associations of demographic characteristics like age (p=0.314), gender (p=0.323), education (p=0.412), occupation (p=0.724) and awareness of lifestyle diseases indicated that there was no statistical association between them and awareness of lifestyle diseases. Association of marital status and awareness of lifestyle diseases indicated that there was statistical association between marital status and awareness of lifestyle diseases. This was shown by Fishers Exact test of 13.263(p=0.002).
CHAPTER SIX

CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusion

Taste was a major (74.7%) contributing factor in consumption of red meat. The major (90%) perceived health benefit of consumption of red meat was that it had nutritive value. The primary consideration when considering purchasing meat products was price.

There was a significant relationship between age and attitude toward red meat consumption as older (>58) respondents had better attitudes than younger (18-28) respondents. There was also a significant relationship between education and attitude as those with university level of education had better attitudes than those with high school level of education.

Most respondents (70%) liked to stew their meat and red meat was mainly consumed four times in a week. There was significant relationship between education and practices. We can also conclude that majority of the respondents (90%) were well aware of what lifestyle diseases were.

6.2 Recommendations

This study recommends:

1. Increased health promotion especially in relation to practices of red meat consumed.

2. Continued awareness campaigns on the dangers of overconsumption of red meat in relation to its contribution to non-communicable diseases.
3. A multi-sectorial approach in tackling non-communicable diseases should include health sectors, private and governmental agencies, NGOs, the civil society, political will and above all the involvement of the community at large.
REFERENCES


APPENDICES

Appendix 1: Consent form

Title: Factors associated with attitude and practice of red meat consumption and awareness of lifestyle diseases among residents of Laiser Hill location, Kajiado North County.

Institutions: Jomo Kenyatta University of Agriculture and Technology and Kenya Medical Research Institute (KEMRI)

Location: Laiser Hill, Kajiado North County

Investigator: Lilian Nyomenda Bosire

Supervisors

1. Professor Anselimo Makokha-JKUAT
2. Dr Charles Mbakaya – KEMRI

Purpose of the research

The purpose of this study is collect information to establish the attitudes and perceptions of red meat consumption among residents of Laiser hill, to determine meat consumption patterns among adult residents of Laiser hill and to establish awareness levels of lifestyle diseases among red meat consumers.

Description of the research

This research will involve your participation in answering loosely structured questionnaire that will take about one hour to complete. You are being invited to take part in this research because we feel that your input as a resident of this area will contribute much to our understanding and knowledge of lifestyle diseases.
Potential harm, discomforts and risks
No physical harm will come to you as you take part in the research however. There is a risk that you may share some personal or confidential information by chance, or that you may feel uncomfortable talking about some of the topics. However, we do not wish for this to happen. You do not have to answer any question or take part in the survey if you feel the questions are too personal or if talking about them makes you uncomfortable.

Potential benefits
Your participation is likely to help us find out more about how to prevent and treat lifestyle diseases in the community and also guide policy makers and community leaders on polices that can be implemented to promote better lifestyle choices in our community.

Confidentiality
We will not be sharing information about you to anyone outside of the research team. The information that we collect from this research will be kept private. Any information about you will have a number on it instead of your name. Only the researcher will know what your number is and we will lock that information up with a lock and key. Data will be kept for a period one year after completion of research.

Compensation
There is no direct compensation to volunteers for their participation

Participation
Your participation in this research is entirely voluntary. It is your choice whether to participate or not. You may change your mind later and stop participating even if you agreed earlier. If you withdraw your information will be confiscated so that no other
person can have access to it.

Contact information

If you have any questions or concerns about the study or in the event of a study related injury you may contact me on:

Address: 20944-00100, Nairobi.
Telephone number: 0724315377
E-mail: i2008c@yahoo.co.uk

My supervisors:

Professor A.O. Makokha –JKUAT
Telephone 0713817436

Dr Charles Mbakaya –CPHR
Telephone 0722846964

For any questions pertaining to the rights as a research participant the contact person is:

The Secretary, KEMRI Ethics Review Committee,
P.O Box 54840-00200, Nairobi.
Telephone numbers 020-2722541, 0722205901, 0733400003
Email: erc@kemri.org

Consent

Should you agree to participate in the study, please sign your name below, indicating that you have read and understood the nature of the study, your responsibilities as a study participant, the inconveniences associated with voluntary participation in the study
and that all your questions and concerns concerning the study have been answered satisfactorily. You will receive a copy of this signed consent form to take away with you.

Signature of Study Participant and Date ............................................................

Signature of Person Obtaining Consent and Date ..............................................

Signature of Witness and Date ...........................................................................

FOMU YA KIBALI

Mada: Mambo yanayohusiana na maoni na mazoeo ya kula nyama nyekundu na kiwango cha ujuzi kuhusu magonjwa yasiyoambukizwa kwa wakazi wa Laiser Hill, counti ya Kajiado kusini.

Taasisi: Jomo Kenyatta University of Agriculture and Technology na Kenya Medical Research Institute (KEMRI)

Eneo : Laiser Hill, Kajiado North County

Mchunguizi: Lilian Nyomenda Bosire

Wasimamizi

1. Professor Anselimo Makokha-JKUAT
2. Dr Charles Mbakaya – KEMRI

Lengo la utafiti
Majongwa yasiyoambukizwa yameenea na kufanya maafa ya watu tuliwapenda na hata kutegemea. Tungependa kutafuta njia za kupambana na magonjwa haya na kupata suluhu. Tunamatumaini kuwa utaweza kutusaidia kwa kutueleza yale unayoyajua kuhusu majonjwa haya na zile itikada umechukua kujisalimisha kutokana na magojwa haya. Maoni yako yataenda mbali kuchangia katika uwakaji wa mikakati ya kuzuia uenezaji wa magonjwa haya.

**Utaratibu wa utafiti**

Utafiti huu utakuwajibu kujibu maswali kadhaa kwa muda usiopiya saa moja. Umealikwa kuchangia kwa utafiti huu kama mkaazi wa eneo hili kwani maoni yako yatachangia pakubwa sana.

**Hatari/ machungu**

Hakuna madhara yoyote itatokea kwa wale watakaohusika katika utafiti huu.

**Faida/ manufaa**

Utafiti huu ni kwa ajili ya masomo. Matooke ya utafiti huu yatafaidi sayansi ya kiafya kuweza kushughulikia mahitaji ya afya katika jamii yetu.

**Malipo ya utafiti**

Yeyote ambaye angependelea kuhusishwa katika utafiti huu hatahitajika kutoa wala hatapewa aina yoyote ya malipo kwa usaidizi atakaotoa.

**Kutojihusisha**

Kama mhusika, una uhuru wa kukataa kuhusishwa katika utafiti huu wala hakuna hatari, machungu ama vitisho vyovyote vitakavyoambatana na uamuzi wako.

**Usiri**

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Kujitolea

Simu Nambari: 0724315377
Barua pepe: i2008c@yahoo.co.uk

AMA
Professor A.O. Makokha –JKUAT
Telephone 0713817436

Dr Charles Mbakaya –CPHR
Telephone 0722846964

Kwa maswali yeyote kuhusu kibali changu kufanya utafiti huu unaweza wasiliana na:

Secritari, KEMRI Ethics Review Committee
P.O.BOX 54840-00200, Nairobi.
Nambari ya Simu 020-2722541, 0722205901, 0733400003
Barua pepe :erc@kemri.org

Kibali cha kuhusishwa
APPENDIX 2: SEMI-STRUCTURED QUESTIONNAIRE

We wish to learn about your knowledge, attitudes and practices regarding lifestyle diseases associated with red meat consumption. The information you provide will help in implementing better preventive measures. Your answers will not be released to anyone and will remain anonymous. Your name will not be written on the questionnaire or be kept in any other records. Your participation is voluntary and you may choose to stop at any time. Thank you for your assistance.

Please tick the most suitable answer.

SOCIO-DEMOGRAPHIC QUESTIONS

1. What is your age bracket?
   1. 18–25
   2. 26–33
2. What is your gender?
   1. Male
   2. Female

3. What is the highest level of education you have completed?
   1. No school
   2. Primary
   3. Secondary
   4. Tertiary

4. What is your main occupation?
   1. Formal employment
   2. Casual employment
   3. Businessperson
   4. Farmer
   5. Others (specify)

5. What is your marital status?
   1. Married
   2. Single
   3. Separated
   4. Divorced

**ATTITUDE ON RED MEAT CONSUMPTION**

6. What is your general perception/opinion towards consumption of red meat?

7. In your opinion what are the health benefits of consumption of red meat?
8. What characteristic / feature is the most important when you buy meat products?

1. Nutritive value
2. Taste
3. Price
4. Producer/Manufacturer
5. Package

**PRACTISES OF RED MEAT CONSUMPTION**

9. How do you usually prepare the meat?
   1. Boiled
   2. In oven
   3. Barbecue
   4. Fried In oil
   5. Stewed
   6. Others (specify)

10. How do you prefer your meat?
    1. Well done
    2. Medium cooked
    3. Rare (cooked slightly)

11. During the last 2 years, the quantity of meat purchased monthly or weekly has:
    (Please give reason why)
    1. It has increased
    2. It has decreased
    3. It has remained the same
12. How many times in a week do you consume fried beef or goat including lunch time either as itself or mixed with other dishes e.g vegetables?
   1. Everyday
   2. After every other day
   3. Twice a week
   4. Once a week
   5. Other (specify)

13. However many times you consume the red meat what quantity do you take at once?
   1. Less than half a kg
   2. between half a kg and 1 kg
   3. More than 1 kg
   4. Other (please specify)

14. In a week how many times do you consume any of the following processed meat (sausages, hotdogs, smokies or hamburgers)?
   1. 1-2 times a week
   2. 3-4 times a week
   3. 4-5 times a week
   4. Don’t take

15. How many times in a week do you consume roast meat (nyama choma) either at home or away?
   1. Once on the weekends
   2. 2-3 times in a week
   3. More than 3 times
   4. Others (specify)
AWARENESS OF LIFESTYLE DISEASES

16. Are you aware of what lifestyle diseases are?
   1. Yes
   2. No

17. In your opinion, how would you best define lifestyle diseases?
   1. They are diseases that come about because of old age
   2. They are diseases that come about because of our ethnicity and genetics
   3. They are diseases that come about as a result of our lifestyle choices
   4. They are diseases that arise we get from other/infectious diseases.

18. In your opinion do you think consumption of red meat can be a factor that causes lifestyle diseases?
   1. Yes
   2. No

19. Are you aware that high intakes of red meat can contribute to the following diseases? Please answer yes or no to each disease according to the best of your knowledge

<table>
<thead>
<tr>
<th>Diseases</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Diabetes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Cancer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Obesity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Hypertension (high blood pressure)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Cardiovascular diseases (diseases of the heart e.g. heart attack)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

20. In your opinion which other factors can cause a person to get a lifestyle disease?

21. In your opinion, who can get a lifestyle disease?
1. Anybody
2. Only poor people
3. Only alcoholics
4. Only drug user
5. Other (please explain):

22. Can lifestyle diseases be cured?
   1. Yes
   2. No

FOMU YA MASWALI KWA WAKAZI WA LAISER HILL
Jina la anyehoji………………………………namba ya fomu ……………………..
Tarehe…………………………………………………………

Tungependa kujua zaidi juu ya maanani,mtazamo ya kula nyama nyekundu na
ile hali ya kujua magonjwa yanayohusisha na ukulaji wa nyama nyekundu. Maelezo
utakayotupatia hayataonyeshwa yeyote nayataba kiasi.Jina lako halitaandikwa kwa
fomu hii au kwingine.Kujihusisha kwako ni kwa hiari na unaweza kukataa wakati
wowote. Asante kwa usesaidizi wako.

Tafadhali chagua jibu anayokufaa

MASWALI YA KIJAMII NA IDADI YA WATU

1. Una umri upi?
   1. 18-25
   2. 26–33
   3. 34–42
   4. 43-50
   5. Zaidi ya 50

2. Jinsia yako ni ipi?
1. Kiume
2. Kike
3. Umesoma hadi kufikia wapi?
   1. Sijasoma
   2. Kidato cha nane
   3. Secondari
   4. Chuo kikuu

4. Kazi yako haswa ni gani?
   1. Nimeandikwa kazi
   2. Vibarua vya muda
   3. Mfanyibiashara
   4. Mkulima
   5. Zingine

5. Jinsia yako kwa jamii ni ipi?
   1. Nimeolewa
   2. Sijaolewa
   3. Tumewachana kwa muda
   4. Tumetalakiana

**KIPIMA MTAZAMO KUHUSU ULAJI WA NYAMA NYEKUNDU**

6. Maoni yakoni ipi kuhusu ulaji wa nyama nyekundu?

7. Kwa maoni yako ni faida gani unaweza pata kutokana na ulaji wa nyama nyekundu?

8. Ni kitu gani unachozingatia unapotaka kununua nyama?onyesha kwa alama kutoka 1 hadi 5, (1)ikiashiria iliyo muhimu sana na (5) ikiashiria isiyomuhimu sana.
   1. Umuhimu wake kwa mwili
2. Inavyoonja
3. Bei
4. Mwenye kutengeneza
5. Vile imefungwa

**MAZOEA YA KULA NYAMA NYEKUNDU**

9. Kawaida unatayarisha aje nyama yako?
   1. Nachemsha
   2. Tanuri
   3. Barbecue
   4. Nachomakwa mafuta
   5. Ninakaanga
   6. Zingine (zitambulishe)

10. Unapendelea nyama yako iive kiasi gani?
    1. Iive kabisa
    2. Iive kiasi tu
    3. Iive kidogo

11. Kwa muda wa miaka miwili iliyopita kiasi ya nyama unayonunua kwa mwezi au wiki:
    (tafadhali tupe sababu)
    1. Imeongezeka
    2. Imepungua
    3. Imebakia ile ile

12. Ni mara ngapi kwa wiki unakula nyama iliyokaangwa hata ikiwa imechanganywa na vyakula vingine?
    1. Kila siku
    2. Baada ya siku moja
3. Mara mbili kwa wiki
4. Mara moja kwa wiki
5. Zingine(zitambulishe)

13. Kulingana ya uzoefu wako ni kiwango kipi unachukua mara hiyo?
   1. Chini ya nusu kilo
   2. Kati ya nusu kilo na kilo
   3. Zaidi ya kilo
   4. Zngine( zitambulishe)

14. Kwa wiki ni mara ngapi unakula nyama zifuatazo (Sausage, Hotdogs, Smokies, Hamburgers)?
   1. Mara 1-2 kwa wiki
   2. Mara 3-4 kwa wiki
   3. Mara 4-5 kwa wiki
   4. Sili

15. Kwa wiki ni mara ngapi unkula nyama choma nyumbani au kwingine
   1. Mara moja wakati wa jumamosi au jumapili
   2. Mara 2-3 kwa wiki
   3. Zaidi ya mara 3
   4. Zingine (zitambulishe)

**KUJUA KWA MAGONJWA YASIYOAMBUKIZWA**

16. Unatambua majongwa yasiyoambukizwa ni gani?
   1. Ndio
   2. Hapana
17. Kwa maoni yako ni gani kati ya hizi inayoeleza maana ya majongw yasiyoambukizwa?

   1. Ni magonjwa yanayokuja juu ya uzee
   2. Ni magonjwa yanayokuja juu ya ukabila wetu au ukoo wetu
   3. Ni magonjwa yanayokuja juu ya jinsi tunavyoishi maisha yetu
   4. Ni magonjwa yanayokuja juu ya magonjwa mengine

18. Kwa maoni yako unadhani kula kwa nyama nyekundu kunachangia kupata magonjwa haya

   1. Ndio
   2. Hapana

19. Unajua kuwa ulaji wa kiwango kikubwa cha nyama nyekundu kumehusishwa na magojwa yafuatayo? tafadhali jibu ndio ama hapa kwa kila ugonjwa kadri ya uwezo wako

   1. Ugonjwa wa sukari
   2. Saratani
   3. Kunona kunaopindukia
   4. Shinikizo la damu
   5. Magonjwa ya moyo

20. Kwa maoni yako ni nini kingine kinaweza changia kupata magonjwa haya

21. Kwa maoni yako ni nani anaweza pata magonjwa haya

   1. Yeyote
   2. Wasiojiweza kiuchumi
   3. Wanaochukuwa pombe zaidi
   4. Wanaochukuwa madawa ya kulevya
   5. Wengine(watambulishe)

22. Magonjwa haya yana tiba?
1. Ndio
2. Hapana

Asante sana kwa kushiriki.
APPENDIX 3: SCIENTIFIC CLEARING COMMITTEE AUTHORIZATION LETTER
APPENDIX 4: ETHICAL CLEARANCE
KENYA MEDICAL RESEARCH INSTITUTE

KEMRI/RES/7/3/1

March 11, 2013

TO: LILLIAN NYOMENDA ROSIRE,
PRINCIPAL INVESTIGATOR

THROUGH: DR. YERI KOMBE,
DIRECTOR, CPRD

RE: SSG PROTOCOL NO. 7385 – REVISIEd RE-SUBMISSION:
ATTITUDES AND PRACTICES OF RED MEAT CONSUMPTION AND
AWARENESS OF LIFESTYLE DISEASES AMONG RESIDENTS OF
LAISIRI LOCATION, KAILIHO NORTH COUNTY

We acknowledge receipt of:

This is to inform you that the Ethics Review Committee (ERC) reviewed the documents listed above and is satisfied that the issues raised at the initial review have been adequately addressed.

The study is granted approval for implementation effective this 31st day of March 2013. Please note that authorization to conduct this study will automatically expire on March 10, 2016. If you plan to continue with data collection or analysis beyond this date, please submit an application for continuing approval to the ERC Secretariat by January 28, 2014.

Any unanticipated problems resulting from the implementation of this protocol should be brought to the attention of the ERC. You are also required to submit any proposed changes to this protocol to the ERC for initiation and advice the ERC when the study is completed or discontinued.

You may embark on the study.

Sincerely,

DR. ELIZABETH BUNUSA,
ACTING SECRETARY,
KEMRI/NATIONAL ETHICS REVIEW COMMITTEE

In Search of Better Health

APPENDIX 5

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APPENDIX 6: ETHICS TRAINING
CITI Collaborative Institutional Training Initiative

Biomedical Research - Basic/Refresher Curriculum Completion Report
Printed on 5/25/2012

Learner: illian bosiire (username: nyomanda)
Institution: Kenya Medical Research Institute
Contact Information:20944
nairobi, 00100 kenya
Department: itromid
Phone: 0724315377
Email: i2008c@yahoo.co.uk

Biomedical Research - Basic/Refresher: Choose this group to satisfy CITI training requirements for investigators and staff involved primarily in biomedical research with human subjects.

Stage 1. Basic Course Passed on 03/26/12 (Ref # 7626954)

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<th>Date Completed</th>
<th>Score</th>
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<td>3/3 (100%)</td>
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<tr>
<td>History and Ethical Principles</td>
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<td>Basic Institutional Review Board (IRB) Regulations and Review Process</td>
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<td>Informed Consent</td>
<td>03/12/12</td>
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<td>2/2 (100%)</td>
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<tr>
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