

**DETERMINANTS OF WOMEN NUTRITIONAL STATUS IN KENYA**

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## **DECLARATION**

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

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## **DEDICATION**

I dedicate this research paper to my parents, Mr. Jackson Owino and Fleriah Adoyo who inspired me to reach out for greater things. I also dedicate it to the love of my life, Nickson Owiti Karewa and our little princess, Lucinda Hallie who make life worthwhile.

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## ABSTRACT

Poor woman's nutrition has negative consequences on her health and that of the entire family. However, despite the central role that a woman plays in the health and well-being of members of her household, little attention has been paid to her nutrition needs as other development challenges have been viewed as more important. Available evidence from Demographic and Health Surveys suggest deteriorating nutritional status.

This study used BMI for women as a measure of nutritional status. Both descriptive and econometric techniques were employed. Probit analysis was applied after the proposed IVProbit regression was considered inappropriate after endogeneity test carried out proved that socioeconomic status was exogenous to women's nutrition status. The results showed that factors such as: place of residence; employment status; marital status; education level; age of the woman and socioeconomic status are significant to undernutrition. Undernutrition was higher among urban than rural. For overweight/ obesity, factors that turned out to be important determinants include: employment status; marital status; education level; age of the woman; socioeconomic status and type of toilet facility.

The study findings points to the need to implement a combination of policies to address malnutrition. In combating undernutrition, there is need to: scale up social protection to target urban poor women; carryout awareness creation on the importance of nutrition education among women. Increasing education funding, strengthening and ensuring sustainability of free primary and secondary education and ensuring completion/ retention among female students will help reduce women undernutrition. The government also needs to fast truck slum upgrading programme in the informal settlements as a long term solution to improve nutrition status. The slum upgrading can help in the provision of publicly provided inputs to nutrition production such as sewerage, portable water and electricity in these areas.

In dealing with overweight and obesity, this study suggests the need to establish policies that will discourage aggressive marketing of junk food culture. National development policies should also incorporate food, nutrition and lifestyle issues, with programmes that empower women to make healthy dietary decisions, including the consumption of local foods and vegetables. There is also need to incorporated dietary and healthy living topics in our education system as early as primary level education. The suggested approaches require efforts both from government and non-government actors for optimal results in alleviation of malnutrition among women in Kenyan.

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## LIST OF ACRONYMS

BMI	Body Mass Index
CED	Chronic Energy Deficiency
ECB	European Central Bank
FAO	Food and Agriculture Organization
GOK	Government of Kenya
HIV	Human Immunodeficiency virus
ICN	International Conference on Nutrition
IDD	Iodine Deficiency Disorder
IFAD	International Fund for Agricultural Development
KDHS	Kenya Demographic and Health Survey
KSPSR	Kenya Social Protection Sector Review
KSATN	Kenya Situation Analysis for Transform Nutrition
MoPHS	Ministry of Public Health Services
NFNSP	National Food and Nutrition Security Policy
OLS	Ordinary Least Squares
SSA	Sub-Saharan Africa
UNICEF	United Nations Children's Fund
WFP	World Food Programme
WHPFS	World Hunger and Poverty Facts and Statistics
WHO	World Health Organization

## **CHAPTER ONE: BACKGROUND**

### **1.1 Introduction**

Nutrition level is one of the main determinants of an individual's health status. Health status depends in part to nutritional status (Schiff and Valdes, 1990). Thus in improving health status, societies strive to eliminate malnutrition that is a condition that results either from eating a diet in which certain nutrients are lacking or is in excess (UNICEF, 2009). Malnutrition refers both to undernutrition (inadequate nutrients for growth and maintenance) or overnutrition (consumption of too many calories). Different nutrition disorders may occur depending on which nutrients are under or over abundant in diet. In most parts of the world, the most common form of malnutrition is undernutrition that is as a result of inadequate calories and protein. However, a rising form of nutrition disorder though common in wealthier nations is obesity. It has become a major public health concern in developed and developing countries as a result of consumption of diets in which energy, fats and refined carbohydrates are in excess.

Food and Agriculture Organization (FAO) has reported hunger and repeated malnutrition as major threats to world's public health, with many third world countries faced with a major challenge in improving nutritional status of their population. FAO (2012) further reported that 12.5% worldwide face chronic food deficit, while in the developing countries and Africa, the population faced with starvation is 15% and 25% respectively. World Hunger and Poverty Facts and Statistics (2013) show that, major causes of malnutrition include poverty and food prices, dietary practices and agricultural productivity, with many individual cases being a mixture of several factors. Multiple other factors that influence malnutrition especially in Sub-Saharan Africa include: maternal education; maternal employment status; close birth spacing; poor health seeking behavior; inadequate water; hygiene and sanitation (NFNSP, 2011).

Everyone needs to be adequately nourished to live a healthy and a productive life. Nutritional demands vary depending on age, sex; health status and activity level (Prentice et al. 1988). In women, undernourishment places a more intense burden due to their unique nutritional requirements. Their monthly loss of iron for example, leads women to require more of this

mineral than would be the case in men. Pregnancy and breastfeeding also make women vulnerable as a result of physiologically higher nutrient requirements, which are often not met (Lartey, 2008). They need significantly more protein and calories as well as vitamins and minerals (especially iron, iodine, calcium, folic acid and vitamin A, C and K). However, high nutritional costs during pregnancy and lactation also contribute significantly to their poor nutritional status. Women in some societies are also traditionally assumed to require less food than men since men are perceived to have heavier workload. However household chores and agricultural tasks which in many economies, Kenya included are predominantly women's responsibility can be arduous and require additional energy and nutrient (NFNSP, 2011). It has been reported that between 5% and 20% of African women have a low BMI as a result of chronic hunger and across the continent, the prevalence of anemia ranges from 21% to 80% (Lartey, 2008). And 42% of pregnant women and 30% of non-pregnant women worldwide are anemic of which half of the burden is as a result of iron deficiency (WHO, 2008).

Malnutrition in all its forms increases the risk of infection and infectious diseases while moderate malnutrition weakens every part of the immune system and can thus lead to early death. It causes severe disability leading to aggravating illness, reduced educational attainment, and diminished livelihood skills and options (UNICEF, 2009). In women, malnutrition results in slow recovery from illness, increased infection, increased risks of adverse pregnancy outcomes, impaired ability to nurture children, and low productivity (Leslie, 1991). Women with a body mass index (BMI) below 18.5 show a progressive increase in mortality rates as well as increased risk of illness, (Rotimi et al. 1999). Evidence show that approximately 20% of maternal deaths results from anemia (Linkages projects, 2001). It has been proven that poor maternal nutrition status may decrease a woman's reproductive capacity, thus affecting fertility (Pinto, 1994). Other consequences of maternal malnutrition are; increased prenatal and neonatal mortality, intrauterine growth retardation resulting to low birth weight babies, brain damage, stillbirths, and miscarriage, (Krasovec and Anderson, 1991). For HIV positive mother's, malnutrition and deficiencies in specific micronutrients, such as vitamin A, are associated with a greater risk of HIV transmission from mother to child. Anemia also increases viral shedding in the birth canal and consequently, mother to child transmission (Stillwaggon, 2008).

A woman's nutritional status has important implications for her health as well as the health of her children. Human welfare losses associated with women's malnutrition are vast and severe, including reduced quality of life for women themselves, impaired ability to bear and nurture children (Leslie, 1991). Apart from teaching children about proper food and health habits, women actually safeguard the health of family members, especially the more vulnerable ones (FAO, 2001). Her compromised nutritional status affects the health and nutrition of her family. Despite these central roles that the woman plays in the health and well-being of members of her household, little attention has been paid to her nutrition needs.

United Nations Children's Fund (UNICEF) developed a framework that recognizes the basic and underlying causes of malnutrition as environmental, economic, and sociopolitical contextual factors, with poverty having a central role (Black et al. 2008). Although addressing general food deprivation would result in substantial reductions in women malnutrition and should be a global priority, major reductions in malnutrition can also be made through other interventions (Schiff and Valdes, 1990). Understanding the key determinants of women malnutrition is critical to designing effective nutrition policies that work not only in the interest of women, but which also promotes the good nutrition status for all members of the family.

## **1.2 Nutritional Status of Women in Sub-Saharan Africa**

Malnutrition remains an important public health concern in the developing world. Most developing countries with higher levels of malnutrition often face multiple challenges-poverty, economic crisis, conflicts, disaster, all of them urgent and competing for scarce resources (UNICEF 2009). As a result, nutrition and especially women nutrition remains a low priority on the national development agenda of these countries despite the evidence of short and long term consequences of nutritional deficiency.

Evidence shows that in the 1980s and 1990s in Sub-Saharan Africa, development strategies were dominated by the fear of population bomb and erroneous Malthusian arguments that the power of population is so superior to the power of the earth to produce subsistence for man. Programs that were supposed to address human development thus targeted birth as the problem not poverty,

sickness and early death. Women were viewed as reproducers only by policy makers and scholars. For these proponents, women's health meant reproductive health, not the health of women in all their roles, thus the poor indicators of maternal health, nutrition included over the years (Stillwaggon, 2008).

Protein energy malnutrition and micronutrient deficiency has been reported as major nutrition problem besetting the Sub-Saharan Africa (SSA) region (World Health Organization, 2004). WHO (2001) indicated that from various demographic and health surveys (1990 – 1995), 52% and 42.3% of pregnant and non-pregnant women respectively had iron deficiency anemia. Another report by WHO (2008), showed that no progress had been made on maternal nutrition as the surveys of various countries (1993-2005) indicated that that the percentage of pregnant and non-pregnant women who had iron deficiency anemia had increased to 57.1% and 47.5% respectively.

Woman's nutritional status in the region should be given priority as the human welfare losses associated with women's malnutrition are vast. Some studies have also shown that there is bidirectional causality between health and economic growth and development (Mugo, 2012). Thus women's nutrition should be prioritized as good nutrition leads to better health indicators that in turn promote the economy's development that the SSA strive to achieve.

### **1.3 Nutritional Status of Women in Kenya**

Like most Sub-Saharan countries, Kenya has over the years taken important steps aimed at improving health status of her citizens including nutrition. However, Kenya is still facing low nutritional levels. According to Kenya Nutrition Profile – Food and Nutrition Division, FAO (2005), Kenya's national dietary energy supply barely meets population energy requirements, resulting in undernourishment for a third of the population and most Kenyans still rely on diets composed primarily of staple foods that are not sufficiently diverse and rich in micronutrients. The table 1.1 depicts the nutrition trends for women in Kenya over the years

**Table 1.1: Kenyan women nutrition status trends**

<b>Women Nutritional status indicators</b>	<b>1993</b>	<b>1998</b>	<b>2003</b>	<b>2008-09</b>
BMI <18.5	9%	12%	11%	12%
BMI 18.5- 24.9 (normal)	72%	65%	61%	61%
BMI 25.0- 29.9 (Overweight)	11%	15%	19%	18%
BMI ≥30.0 (Obese)	2 %	2.8%	8%	8%
Iron Deficiency Anemia: Pregnant Women	-	-	-	55%
Non-Pregnant women				47.9%
Iodine Deficiency Disorders (IDD)	-	-	-	36.8%
Zincdeficiency	-	-	-	52%

**Source: WHO Global Database on BMI and Various KDHS reports**

From table 1.1, nutritional trends for women aged 15years to 49 years in Kenya have not improved much over time. Women nutrition data were first captured in the 1993 KDHS. It indicated that 9% of women were too thin (BMI below 18.5). This increased to 12% in 1998 with a slight drop to 11% in 2003 which increased again to 12% in 2008-2009. Kenya is also increasingly faced with diet related conditions such as obesity, diabetes, cardiovascular disease and certain diet-related cancers especially in urban areas. Prevalence of overweight and obesity has risen over the years. The proportion of women aged 15-49 years who are overweight and obese was 13% in 1993 and 17.8% in 1998. This rose up to 27% in 2003 and 26% in 2008-09. This shows that not much progress has been made in reducing women malnutrition in the country over time.

Major micronutrient deficiencies among women include iron deficiency anemia, zinc and vitamins. Slightly over half of pregnant women experience iron deficiency anemia compared to

47.9% of non-pregnant women and approximately 52% of mothers experience zinc deficiency while 40% experience vitamin A deficiency (KSATN 2011).

The Kenyan government has taken several interventions to curb malnutrition in the country. In 2000, the Government developed a gender policy which outlined the government's commitment to advancing the status of women. The policy recognized poor maternal nutritional status and low birth weight and the fact that nutritional status of women can be negatively affected by certain food allocation. It also recognized women's role in the agricultural sector and their role in ensuring household food security and nutrition. It recommended that causes of inadequate nutritional status of pregnant and lactating mothers be addressed and awareness on negative implications to their health created (KSATN 2011). In the National Food and Nutrition Security Policy (2011), food security was identified as a basic human right. The framework took the view that the right to food includes not only sufficient numbers of calories but the right to nutritious foods that guarantee health, growth and development throughout a person's lifecycle. The policy focuses on the right of every woman and child to share equally or to have greater shares of the available food because of the required needs for growth and development. The Kenyan Ministry of Public Health and Sanitation (MoPHS) in 2011, also adopted 12 out of the 13 "High Impact Nutrition Interventions" published by Lancet on nutrition in 2008, seven of which directly focused on women malnutrition (KSATN 2011) and the latest is the National Nutrition Action Plan 2012-2017 that highlights improvement of women of reproductive age nutritional status as one of the objectives.

Despite these policies, large numbers of the country's population continue to face rising levels of poverty, hunger and malnutrition and women nutritional status remains unfavorable. Chronic and acute malnutrition, micronutrient deficiencies are prevalent, particularly among women in rural areas and the urban poor (KDHS 2008-2009). The reason for failure to eradicate women malnutrition could be attributed to the fact that these policies have been directed towards one input to nutrition production which is nutrients intake through provision of special nutrition interventions for women in specific regions. However, studies have shown that nutrition level depends only in part on its nutrients intake. It also depends on other privately and publicly

produced goods and services. The focus on food intake to improve nutrition is too restricted as it fails to consider the underlying causes of malnutrition. For effective improvement in women nutrition status, perhaps emphasis should also be placed on other determinants that affect nutrition level such as demographic, socioeconomic and environmental factors that could help curb malnutrition effectively and more feasible before it happens (Schiff and Valdes, 1990).

#### **1.4 Statement of the Problem**

Women represent half the world's population and contribute greatly to the functioning of society. Their poor nutrition status presents adverse health and socioeconomic consequences in society. The potential consequences include poor reproductive health outcomes such as maternal death during and or after child birth (Gemedo et al. 2013). Women nutritional status does not only affect them but the family at large especially the young children. For example, the nutritional status of babies and infants is closely linked to the health status of their mother before, during and after pregnancy (Smith and Haddad, 2000). However, little attention has been put to address the causes of women malnutrition as other development challenges have been viewed as more important thus given priority (Loaiza, 1997). Women's health thus needs to be improved so that they are able to lead a productive and healthy life.

Women malnutrition in Kenya is severe and should not be taken lightly. In some parts of the country like Samburu, the rates of malnutrition in pregnant women are higher than rates in children (UNICEF, 2006). Women nutrition interventions in the country has concentrated more on iron supplementation and monitoring weight gain during pregnancy but little effort to address other causes of malnutrition that are not related to food input.

Low level of understanding about the determinants of malnutrition is one of the challenges faced in addressing the problem of women malnutrition in Kenya. This is because of the inadequate studies available concerning the problem of malnutrition among women of reproductive age especially at the national level. In Kenya, most empirical studies have focused on child nutrition. There are only two studies on women nutrition; Steyn et al. (2011), who investigated the dietary,



social and determinants of obesity among Kenyan women but focusing on one element of malnutrition (obesity) and Marinda (2006) a regional study that examines intra-households resource allocation and how it affects nutrition and health of household members in rural Kenya. These two studies are limited in terms of geographical coverage and scope and cannot be used effectively to guide policy interventions at national level.

This study, observing the dearth of literature, seeks to provide understanding of the key determinants of women malnutrition in Kenya using nationally representative data (2008-2009 KDHS). The study is premised on the understanding that food intake only affects in part nutritional status and there are other underlying determinants of women malnutrition that need to be investigated.

This study therefore addresses the following questions:

1. What are the major determinants of women malnutrition other than food intake?
2. What are the impacts of these determinants on nutritional status of women in Kenya?
3. What are the policy implications for improving women's nutritional status in Kenya?

### **1.5 Objective of the Study**

The broad objective of this study is to empirically examine the determinants of women malnutrition in Kenya. Specific objectives are:

1. To identify the determinants of women malnutrition in Kenya.
2. To measure the impact of these determinants on nutrition status of women in Kenya.
3. To suggest appropriate policies based on the results of the study.

## **1.6 Relevance of the Study**

Women nutrition has not been given priority in most developing countries. Even the MDGs did not extensively address women malnutrition as it has been generalized under MDG1 (Eradicate Extreme Poverty and Hunger) which has not also proved effective in curbing women malnutrition. In Kenya, there exists shortage in research on the topic at the national level and the existing trends have indicated that no progression has been made in reducing maternal malnutrition. The government in addressing malnutrition has focused on comprehensive nutritional programmes targeting certain affected regions. However the coverage of these programmes has been low and their effectiveness limited (KSPSR, 2012). Change in approach in dealing with women malnutrition by policy makers aimed at addressing the causes of malnutrition before it occurs need to be adopted. Tackling malnutrition through socioeconomic and environmental factors could likely lead to a better outcome and cover the whole county than few narrowly targeted feeding programmes for pregnant and lactating women that have little scope for improving women's nutritional status in the country.

This study will use recent data of 2008-2009 Demographic and Health Survey Kenya incorporating other underlying factors in assessing the determinants of women nutritional status. This study will help in updating previous findings and add to literature in relation to nutritional status of women in the country. This study also comes at a time when the country is engaged in defining Post 2015 Development Agenda and evidence indicate that Kenya is unlikely to meet its target on improving maternal health (maternal mortality increased from 414 per 100,000 live births in 2003 to 488 per 100,000 in 2008-2009 as indicated in the 2008-09 KDHS). Maternal nutrition is crucial in ensuring good health especially during and after pregnancy. In-depth understanding of women's nutritional status is crucial to reducing maternal mortality and this study will be relevant to guiding policy makers as well as development interventionist on the various determinants of women malnutrition that could be effective in curbing malnutrition among women in Kenya.

Finally, it can be useful in providing information and recommendations for further research on women nutrition issues.

## **1.7 Organization of the Study**

This research paper comprises of five chapters. Chapter one presents the introduction, statement of problem, objective of study and relevance of the study. Chapter two reviews both the theoretical and empirical literature relevant to this study. Chapter three outlines the methodological approach that was employed in this study and it includes the analytical framework, estimation technique together with a description and analysis of data, definition of variables and data sources. Chapter four presents results and interpretation of findings from the study. Finally, chapter five presents a summary of the study, recommendations, limitation of the study and suggestions for further research.

## **CHAPTER TWO: LITERATURE REVIEW**

### **2.1 Introduction**

This chapter presents a review of literature on the determinants of women nutrition. The first section focuses on the theoretical literature on women nutrition while the second section presents the empirical literature of studies that have been carried out in the different parts of the world relating to women nutrition. Emphasis is given to socioeconomic, demographic and environmental factors mainly: maternal education level; maternal employment; household economic status; age of women; marital status; toilet facility; water source and place of residence. Section three provides an overview of the literature.

### **2.2 Theoretical Literature**

As mentioned earlier, nutritional status is one of the components of health. In the "production" of health, household production model in which households allocate goods and time to produce commodities sold either at the market or consumed at home can be applied (Becker, 1965). In the consumption of these goods, household's objective is to maximize utility. Thomas (1991) assumes that household maximizes utility which depends on consumption of commodities and leisure. The utility is maximized subject to total expenditure which is no greater than household earnings, unearned income and restrictions imposed by the health production function. Behrman and Deolalikar (1988) and Schiff and Valdes (1990) also states that, the determination of an individual's health are usually decisions made by the individual or by the household in which he or she lives, given assets, prices, the technology for producing nutrition and health and community endowments some of which may be determined by governmental actions.

The household model can be modified to model human capital outcomes by relaxing the assumption of perfect substitutability between home produced and market goods, (Strauss and Thomas, 1995). This is because, most human capital outcomes cannot be purchased in the market and the household production framework also encompasses the integration of biological, demographic and economic considerations. The estimated relationships are the reduced "form"

from an optimizing model of consumer choice in which individuals select goods so as to maximize the utility derived from the goods consumed (Ramezani and Roeder, 1995). The reduced forms are applied because prices of health inputs are exogenous to household.

As with the production of health at the household level and given the interrelationship between nutrition status and health status (nutrition is a determinant of health and one's health status also affects one's nutrition status), it can be assumed borrowing from Schiff and Valdes (1990), that the process of producing nutrition (women nutrition) is determined by inputs of nutrients (calories, protein, vitamins etc), inputs of non-nutrient food attributes which affect nutrition such as cleanliness and storability of food, privately and publicly provided inputs such as potable water, sewerage, electricity and nutritional information. The production of nutrition is also partly determined by individual health status as well as age, sex and location (rural and urban).

Households therefore choose to maximize women nutrition given the resources and information constraints they face. Grossman's work (1999) on the demand for health and the neoclassical theory of consumer economic behavior also discussed in Behrman and Deolalikar (1988) provides the theoretical basis for linking nutrition to a host of socioeconomic variables and other factors.

From the theories, household production and utility maximization concept have been utilized as a framework to illustrate how nutritional status as proxied by anthropometric measures is affected by other factors. Households maximize utility by minimizing women malnutrition subject to production function and budget constraints. The nutrition production function is a function of food inputs, non-food inputs and other unobserved factors such as education (Alderman and Garcia, 1994). Other variables included in the functions are individual and environmental characteristics such as one's age, marital status, water and toilet facilities (Staudigel, 2012).

### **2.3 Empirical Literature**

This section reviews empirical studies on the socioeconomic, demographic and environmental factors that affect women nutritional status.

Women of reproductive age are more vulnerable to malnutrition due to their physiologically higher nutrient requirement (Lartey, 2008). Studies have shown that women's age is an important factor that affects their nutrition. Ramachandran et al. (2006), in their study carried out in India using cross-sectional data and applying OLS estimation on log of BMI, found that BMI decreased with age at an increasing rate, implying that older women are more likely to be malnourished than their younger counterparts. Ajieroh, (2009) has also shown that women's age has positive effect on BMI across rural and urban. Girma and Genebo (2002) also found that women of age 15-19 and 35-49 are at significant higher risk of Chronic Energy Deficiency (CED) malnutrition and the problem is worse for rural women of the indicated age group.

Generally, those who are poor are more likely to suffer from undernutrition, while those who have high socioeconomic status are at risk of over nourished. According to Fotso and Kuate-defo (2005), individuals who are economically empowered do better on most measures of health status such as mortality, morbidity and malnutrition. UNICEF (1990) also highlights household economic status as a key determinant of maternal nutritional status. Household economic status is an indicator of access to adequate food supplies, use of health services, availability of improved water sources, and sanitation facilities that are key determinants of nutritional status. Tahrakan and Suchindran (1999) in a study carried out in Botswana using national cross-sectional statistic, established that economic status is an important determinant of malnutrition. Most studies conducted in developing countries using DHS (Loaiza, 1997; Ajieroh, 2009 and Girma and Genebo, 2002) have showed that women from higher household economic status have lower prevalence of malnutrition. A study in Kenya by Marinda (2006) also found similar results. Mugo (2012), in a study of the impact of parental socioeconomic status on child health outcomes in Kenya also noted that, as incomes increase, individuals invest in better diets, improve sanitation and allocate more resources to health care thus improving their health status.

Studies have shown that educated women are more informed than those who have no education on how to utilize available resources to improve their own nutritional status and that of their families (Blumberg, 2005). Education may enable women to make independent decisions, to be accepted by other household members, and to have greater access to household resources that are

important to nutritional status. Loaiza (1997) using DHS data for 18 developing countries ( 10 Sub-Saharan Africa, 5 Latin America/Caribbean and 3 Near East/ North Africa) collected between 1991 and 1993 in a study on maternal malnutrition applying both descriptive and multivariate analysis, showed that the higher the level of education, the lower the proportion of undernourished women. Girma (2007) using Ethiopia's Health and Demographic survey 2005 in a study of the impact of female education on nutritional status of women and children, found that education positively impact on nutrition level. In Kenya Marinda (2006) using a cross sectional research design, employed two-stage least squares regression analysis (2SLS) in analyzing the determinants of nutrition status. The study found that higher level of education contributes to improved nutrition status of household members. Steyn et al. (2011) in a study on the determinants of obesity in Kenyan women also found that women with low level education were more likely to be underweight than those with higher level of education. However as a result of urbanization and adopting the western culture, he also notes that women of higher education level are more likely to overweight/obese.

Another important determinant of women nutrition is the place of residence. Loaiza (1997) found that CED is common in rural area while obesity is predominant in urban areas. Fotso and Kuate-defe (2005) using Demographic and Health Survey (DHS) data set of 5 countries in Sub-Saharan Africa (SSA) found that urban-rural residence is an important determinant of CED. Uthman and Aremu (2008) applying meta-analysis and meta-regression in their study on malnutrition among women using DHS for 26 countries conducted between 1995 and 2006 noted that nutritional status of women in urban areas was better than those of rural women. They concluded that this is because conditions affecting health in developing countries are more favorable in cities than in rural areas. In West Africa, Ajieroh (2010) also noted that malnutrition is higher among rural households. Betew and Telake (2010), using 2000 and 2005 Ethiopian DHS, applied a regression analysis in examining under nutrition among rural and urban women and found that the level of under nutrition among rural women was 1.5 times higher than women in urban areas.

Most studies show that employed women have better nutrition level than those not employed. Ajieroh (2009), indicate that income earned by women is more likely to be used to benefit the

family health and nutrition than men's income. However, other studies have showed that women who are employed but have no control over their income and decision making authority within the household lack ability to take actions that will benefit their own well being thus are prone to malnutrition. Kennedy and Haddad (1991), in a study conducted in Africa indicated that at equal levels of income, households in which women have greater control over their income are well nourished as they are likely to spend their earnings on health and nutrition. Marinda (2006) also found similar results for rural Kenya.

Married women have been associated with better social and economic status, thus have better nutritional status than the unmarried ones. Bitew and Telake (2010) found that women who were not married whether living in rural or urban were malnourished in both the 2000 and 2005 DHS. Another study in Ethiopia by Girma and Genebo (2002) also found similar results. A study in Kenya, (Steyn et al. 2011); also found that malnutrition was significantly more likely for unmarried women.

Health environment in the form of availability of safe water and sanitation is also an underlying determinant of nutritional status (Ajieroh, 2009; UNICEF, 1990 and Engle, 1992) have also noted that unhygienic environment due to inadequate water and sanitation can increase chances of infectious diseases thus indirectly cause certain types of malnutrition. Nutritional status can be enhanced with improved water and sanitation conditions. Tahrakan and Suchindran (1999) in their study also identified toilet facility as a key determinant of malnutrition. Pongou et al. (2006) noted that unclean water may affect nutritional status through diarrheal diseases. Girma and Gebebo (2002) in their study showed that unprotected water source and non availability of toilet facility could lead to malnutrition as diarrhea (frequent stools) prevents adequate absorption of nutrients. Girma (2007) in her study found that environmental factors like access to modern toilet and clean water is highly significant in the nutritional status of both children and women. According to Schiff and Valdes (1990), other factors that affect nutrition status are publicly provided inputs such as potable water and sewerage. They argue that in urban areas, nutritional and health status can be raised through provision of publicly provided inputs such as sewerage and potable water while in rural areas nutritional and health status largely depends on



household inputs which depend on income. WHO, have also reported that water supply, sanitation and hygiene, given their direct impact on infectious disease such as diarrhea, are key determinants of malnutrition. However, other studies such as Kabubo-Mariara et al. (2008), found that environmental/sanitation factors such as piped water and toilet facilities were insignificant factors for nutritional status.

Most studies reviewed above used secondary data with few using primary data. The secondary data used were mainly Demographic and Health Survey (DHS) data by (Bitew and Telake, 2010; Girma and Genebo, 2002; Ajieroh, 2003 and Girma, 2007). The Kenya Integrated Household Budget Survey (KIHBS) 2005/2006 was also used by Mugo (2012). In order to have a better understanding of the determinants of nutritional status, some researchers opted to use data from several surveys. For instance, Pongou et al. (2006) used two sets of DHS for Cameroon conducted in 1991 and 1998 and in Kenya, Mariara et al. (2008), used pooled sample of 1998 and 2003 KDHS. Some studies were done using one particular country's data while others used data from more than one country. Fotso and Kuate-defo, (2005), used two rounds of DHS for five countries, Loiza (1997) used DHS for 18 countries and Uthman and Aremu (2008) used DHS for 26 countries. The studies reviewed that used primary data were mainly from Kenya. They are: Marinda (2006) and Steyn et al. (2011).

Different methods and techniques have also been applied in the empirical studies above. Different techniques have their strengths and weaknesses. Some studies have used only descriptive statistic in analysis, (Steyn et al. 2011). However descriptive statistics reveal association and do not show causal relationship between malnutrition and the variables. They may therefore not be useful in guiding policy formulation. Others have used both descriptive statistic and OLS regression in the analysis; Loaiza (1997); Pongou et al. (2006) and Girma (2007). Tharakan and Suchindran (1999); Girma and Genebo (2002); Fotso and Kuate-defu (2005) and Bitew and Telake (2010) have used descriptive statistic and ordered logistic regression method which considers confounding effect of each independent variables affecting malnutrition as you control for other factors. Marinda (2006) and Mugo (2012) applied 2SLS regression model in their study. While others studies have applied quintile regression technique

to analyze the determinants of malnutrition at various points on the distribution of dependent variables Odula (2010). Kabubo-Mariara et al. (2008) however opted to use survey regression as it takes care of sampling weights, clustering and stratification. Despite the different approaches, data and coverage (geographical/ administrative), the studies seem to concur on the effect of various factors affecting maternal nutrition.

From the literature reviewed, there is a gap in studies on determinates of women malnutrition in Kenya. This has necessitated inclusion of some studies on child nutrition in the literature review. These studies are Kabubo-Mariara et al. 2008; Odula (2010) and Mugo, 2012. There are only two studies on women nutrition which are also limited in terms of data used, range of variables and scope of study. For instance, Marinda (2006) focused on the determinants of women malnutrition in West Pokot district. Her study did not include variable like place of residence, it focused on one given area and therefore does not give a true representation of the whole country. Steyn et al. (2011) was concerned with determinants of obesity among Kenyan women which is just one element of women nutrition. No study has used KDHS to study women nutritional status. This study uses the recent 2008/2009 DHS data for Kenya to assess the impact of various factors on maternal nutritional status. The model encompasses demographic, socioeconomic as well as environmental factors in order to establish which of them is significant in influencing maternal nutrition.

## **2.4 An Overview of Literature**

Despite using different methodologies and data in studying the impact of socioeconomic, demographic and environmental factors on the nutritional status of women, some variables stand out as being important factors affecting nutrition. The variables include: woman's age; woman's education; household social economic status; place of residence and marital status. However there are mixed results from prior empirical works on the effects of environmental factors on nutritional status (Kabubo-Mariara et al. 2008). The impact of women employment status on their nutrition also had mixed results (Steyn et al. 2011).

Different studies have been done in developing countries on the determinants of women nutritional status but in Kenya, the studies available are very few. Marinda (2006) focuses on rural Kenya making it difficult to generalize the result to the entire country and Steyn et al. (2011) focused on obesity among women but the study is descriptive in nature. There is need for national level empirical study to measure the impact of the different factors affecting women nutritional status for national policy formulation level. This study attempts to fill this gap by investigating the impact of socioeconomic, demographic and environmental factors on the determinants of women nutrition status in Kenya. Demographic Health Survey data is the most commonly used data in most of the studies. This study also uses the Kenya Demographic and Health Survey of 2008-09 applying two-stage least squares (2SLS) regression analysis to cater for endogenous nature of women education as some studies (Smith and Haddad, 2000; Marinda, 2006 and Mugo, 2012) found that women's education was endogenous to nutritional status.

## CHAPTER THREE: METHODOLOGY

This chapter outlines the theoretical framework; the model specification, the data types and sources. It also defines and discusses the variables to be analyzed.

### 3.1 Theoretical Framework

In analyzing determinants of nutrition status, theories of human capital investments by Becker (1965), and Grossman (1999), household production function framework can be applied. According to Grossman (1999), health is treated as a durable item. Individuals inherit an initial stock of health capital that depreciates with age at an increasing rate at least after some stage in the life cycle and can be increased by investment. The net investment in the stock of health equals gross investment minus depreciation. Direct investments in health include the own time of the consumer, medical care, diet, exercise, recreation among others. The health production function represents the technology available to the household to transform inputs into health. The household, on the basis of some optimality criteria, determines the amounts of inputs into the health production function. In addition, Grossman (1999) further noted that the production function is affected by the efficiency or productivity of a given consumer as reflected by his or her personal characteristics. He give an example of how years of formal schooling completed play a large role in this context. Most often in the literature, it is assumed that such criteria are imposed via a household utility maximization problem.

In the household production framework, households allocate time and goods to produce commodities sold on the market, those consumed at home and those for which no market exist, (Strauss and Thomas, 1995). Households have preferences that can be characterized by the utility function  $U$ , which depends on consumption of a vector of commodities that yield utility but has no direct effect on health  $X$ , and a vector of health related commodities that affect health  $Y$ . The utility function is given by:

$$U = f(X, Y) \tag{1}$$

To maximize utility, the household chooses the optimal consumption bundle, subject to a production function and a budget constraint. According to Strauss and Thomas (1995), total consumption of commodities cannot exceed full income given market price and wages. The production function of the consumption goods then depends on a vector of household input supplies. The household model can be modified to model human capital outcomes by relaxing the assumption of perfect substitutability between home produced and market goods, (Strauss and Thomas, 1995).

Following Thomas (1991), women nutrition can be conceptualized as being generated by a production function in which nutritional status, depends on market purchased inputs such as food (or nutrient) and health services. Households choose to maximize nutritional status given resources and information constraints they face (Kabubo-Mariara et al. 2008). Using this background, the reduced form demand equation for health in equation (1) can be modified to include women nutrition status (H), assuming that good nutritional status is desirable in its own right, (Rosenzweig and Schultz (1983). Equation (1) can therefore be modified to obtain equation (2) below:

$$U = f(X, Y, H) \tag{2}$$

Women nutrition production function can further be expressed in a linear function as:

$$H = F(Y, K, \epsilon) \tag{3}$$

Where:

Y is the proximate inputs to woman nutrition (cooking fuel, water and sanitation environment)

K is the nutrition knowledge possessed by the woman given by her education level

$\epsilon$  is the observed characteristics such as in born healthiness and measurement errors

The proximate inputs  $Y$  are chosen by household to reduce malnutrition. They depend on woman's health endowment ( $\varepsilon$ ), prevailing market prices and specific constraints posed by the household's physical environment ( $E$ ) and household wealth ( $W$ ).

The woman maximizes the utility function in equation (2), given the production function (3) subject to budget constraint for the household given by equation (4)

$$W = XP_X + YP_Y \quad (4)$$

Where:

$W$  represents the household income

$P_X$  is the price of the consumption good with no direct effect on nutrition such as clothing

$P_Y$  is the price of nutrition related good

Assuming prices and income are exogenous to the household, the reduced form household demand functions are therefore given as:

$$X = D_X(P_X, P_Y, K, W, \varepsilon) \quad (5a)$$

$$Y = D_Y(P_X, P_Y, K, W, \varepsilon) \quad (5b)$$

Substituting demand functions for  $Y$  (5b) in health production function (3) we arrive at:

$$\begin{aligned} H &= F(D_Y(P_X, P_Y, K, W, \varepsilon), k, \varepsilon) \\ &= F(P_Y, K, W, \varepsilon) \end{aligned} \quad (6)$$

Equation (6) shows that woman's nutrition status can be explained by relative price  $P_Y$ , household knowledge  $K$ , household income  $W$  and woman's health endowment  $\varepsilon$ . Following Ajakaiye and Mwabu (2007),  $X$  is a nutrition-neutral good and therefore woman's demand for this input is ignored thus focusing on the estimation of equations 5b. However, the price of  $X$  is

allowed to affect demands for Y through the budget constraint. Other studies like (Behrman and Deolalikar, 1988) have also include a form of the above health production function into a framework that depicts households as utility-maximizing entities in order to arrive at reduced form equations that are functions of exogenous variables only. This allows for the investigation of effects of exogenous changes in the socioeconomic, demographic and environmental factors of the household on nutrition outcomes.

### 3.2 Empirical Model

Guided by the theoretical framework and underlying literature, and assumes identical prices for nutrition inputs given that DHS data do not have information on prices; the reduced-form input demand function is given by:

$$H = F(Y, K, W, \varepsilon) \quad (7)$$

From equation (7), this study estimates demand for health function including several vectors of exogenous variables; variables Z at the level of individual i, the household h and the community c.

$$H_i = f(Z_i, Z_h, Z_c) \quad (8)$$

Where H is women nutritional status;  $Z_i$  is the vector of woman specific characteristics;  $Z_h$  is a vector of household-specific characteristics and  $Z_c$  is community-level characteristics included to capture water and sanitation (Kabubo-Mariara et al. 2008).

Woman's nutrition demand function can then be expressed in a reduced-form equation as:

$$H_i = \alpha Z + \varepsilon_i \quad (9)$$

Where  $H_i$  is a vector of anthropometric measures of women under consideration given by Body Mass Index (BMI) calculated as height in meters over weight in kilograms squared (W/H), Z is a

vector of covariates  $\{Z_i, Z_h, Z_c\}$ . Where  $Z_i$ , are characteristics such as: woman's age; education level; employment status and marital status.  $Z_h$  includes: household economic status and region of residence.  $Z_c$  are community level characteristics such as: type of toilet facility and type of water source and  $\varepsilon_i$  is the error term with zero mean (Girma, 2007).

The estimable form of equation (9) can be expressed as;

$$HW_i = \alpha_0 + \alpha_1 WE_i + \alpha_2 WA_i + \alpha_3 WES_i + \alpha_4 WMS_i + \alpha_5 HES_i + \alpha_6 R_i + \alpha_7 T_i + \alpha_8 HWS_i + \varepsilon_i \quad (10)$$

Where:

$HW_i$ = woman's nutritional status measured using BMI

$WE_i$ = woman's education level

$WA_i$ = individual woman's age

$WES_i$ = woman's employment status

$WMS_i$  = woman's marital status

$R_i$ = region of residence

$T_i$ = access to improved toilet facility

$HWS_i$ = type of water source for the household

$HES_i$ = household economic status/ wealth

$\varepsilon_i$ = error term

This study examines the impact of the above stated socioeconomic, demographic and environmental factors on women's nutritional status using two-stage least squares regression analysis (2SLS). IV estimation is appropriate to use in a health production function since health inputs are regarded as chosen by households and therefore there is likely to be a problem of endogeneity in the use of OLS (Mwabu, 2007).

The potentially endogenous variable in the model is household socioeconomic status. Some studies in Kenya have identified household socioeconomic status as endogenous to health status,



(Marinda, 2006 and Mugo, 2012). Following these two studies, this study hypothesizes that household socioeconomic status is endogenous to the nutrition status of women.

In this study, the number of household members is used as to instrument for household socioeconomic status. More household members reduce the average household wealth. ECB, (2013), reported that households with more than four members had lower wealth compared to those that have 2-3 members. However they also note that household with only one person is likely to have low wealth. Number of household members is likely to be strongly correlated with household socioeconomic status and not with her nutrition status

The hypothesized endogenous variable (household socioeconomic status), is modeled as:

$$HES_i = \delta_0 + \delta_1NHM + \delta_2WE + \delta_3WES + \delta_4WA + \delta_5WMS + \delta_6R + \delta_7T + \delta_8HWS + \mu_i \quad (11)$$

Where:

NHM = Number of household members

WE, WES, WA, WMS, R, T and HWS are as defined in equation 10 above.

$\mu_i$  = error term

### 3.3 Definition of Variables

#### Dependent variables

The study focuses on determinants of women nutritional status. In this study, the indicator used to assess malnutrition in women is body mass index (BMI). It is calculated as height in meters over weight in kilograms squared (W/H). A BMI less than 18.5 kg/m<sup>2</sup> indicates chronic energy deficiency, or under nutrition, a BMI between 18.5 and 24.9 is considered normal, overweight for a BMI between 25.0 and 29.9 and BMI of 30.0 and above is obese (WHO, 1995).

The other dependent variable is the household socioeconomic status that will be estimated using wealth index.

In this study, there are three regressions. The first equation is for women with an indication of underweight from the results of anthropometric measures results. Women with underweight are assigned the value (1) while those without underweight are given the value (0). The other regression is for women with an indication of overweight and obese. Those with either overweight or obese are assigned the value (1) while those without overweight/obese are given the value (0). A third regression which is run for comparison purposes is for those who have malnutrition in the form of either underweight or overweight/obese combined.

### **Independent variables**

Selected determinants of women nutrition included in this study are: maternal education level, age of women, woman's employment status, marital status, place of residence, toilet facility, water source and household economic status. Other variables that are known to affect nutrition production such as food intake and physical activity are not included in this study because data was not available. The explanatory variables are discussed in table 3.1.

**Table 3.1: Measurements and expected signs of explanatory variables**

<b>Variables</b>	<b>Measurement</b>	<b>Expected relationship and literature source</b>
Woman education	Education categories considered are: no education, primary, secondary and higher education. Each of these categories is assigned a dummy value 1 and zero otherwise. No education is used as reference category.	It is expected that higher education level will improve maternal health status through her increased bargaining power in household decisions and better utilization of health services (Blumberg, 2005; Loaiza, 1997 and Steyn et al. 2011).
Age of the woman	Woman's age in years.	As age increases the health status is expected to improve. (Ramachandran et al. 2006 and Girma, 2007).
Woman employment status	Woman's employment status is assigned the value 1 if woman is employed and 0 otherwise.	Employed women are expected to have better nutrition status than their unemployed counterparts as are they are more likely to access variety of foods (Kenedy and Haddad, 1991 and Marinda, 2006).
Woman's marital status	Marital status assigned value 1 if woman is married and 0 otherwise (the unmarried category also include widowed and divorced).	Married women are expected to have better nutrition status than unmarried. Marital status of women is associated with better social and economic status (Bitew and Telake, 2010; Steyn et al. 2011).
Area of residence	Rural residence is assigned the value 1 and 0 otherwise.	The expected sign is indeterminate. Different area of residence provide different socioeconomic environment that can either contribute to better nutrition status or lead to deteriorating health

Variables	Measurement	Expected relationship and literature source
		of its members. Undernutrition is more likely in rural areas (Uthman and Aremu, 2008; Betew and Telake, 2010) while overweight and obesity is more in urban areas (Steyn et al. 2011).
Type of toilet facility	The different toilet facilities are flush toilets, ventilated, traditional pit latrine. Use of the above are considered improved, however, those who used flush to somewhere else or do not know where their flush is directed to are considered under unimproved facility which also included pit latrine without slab, no facility, composting, buckets, hanging toilets and others. Dummy variable that take the value 1 is assigned to households with improved toilet facility and 0 otherwise.	Access and use of improved toilets facility is expected to improve nutrition status (Tahrakan and Suchindran, 1999; Girma, 2007).
Type of water source	Dummy variable that takes the value 1 if household has access to piped water and 0 otherwise. The unpiped include; wells, springs, river, dam, lake, ponds, stream, canal, rain water and other sources.	Use of protected water source is expected to improve health than use of unprotected one. Access to piped water therefore reduces infections related to ingestion of untreated water. The expectation is that households with access to piped water would have better nutritional outcomes. Engle (1992) and Odula (2010).

<b>Variables</b>	<b>Measurement</b>	<b>Expected relationship and literature source</b>
Household Economic status	Household socioeconomic status is based on household wealth index factor score.	The higher the wealth status of the household, the better the nutritional status. The economic status of household is an indicator of access to adequate food supplies (Fotso and Kuatdefo, 2005 and Girma, 2007).
Size of household	The size of household is given in terms of number of people residing in the household. Dummy variable that takes the value 1 is assigned if household has 2-4 household members and 0 otherwise.	Higher numbers of household members is expected to increase dependency thus lower the average household wealth. A household with more than four members are likely to have low wealth. At the same time household with only one person also tend to have low wealth, (ECB, 2013).

### **3.4 Data Sources**

This study is based on data from the 2008-09 Kenya Demographic and Health Survey (KDHS) which is a nationally representative sample of 10,000 households. The KDHS provides for separate estimates for key indicators for Kenya as a whole and each of the eight provinces in Kenya namely: Nairobi, Central, Rift Valley, Nyanza, Western Coast, Eastern and North Eastern provinces as well as for the urban and rural areas separately. The survey utilized a two-stage sample based on the 1999 Population and Housing Census. Stage one involved selection of data collection points ‘clusters’ from national master sample frame where a total of 400 clusters; 133 urban and 267 rural were selected from the master frame. Stage two of the selection involved the sampling of households from an updated list of households. Data collection took place over a three month period, from 13<sup>th</sup> November 2008 to late February 2009. The survey was conducted on 8,444 women age 15–49 in all households and 3,465 men age 15–54 in half of households.

## CHAPTER FOUR: STUDY FINDINGS

### 4.1 Introduction

This chapter presents the research findings for this study. Descriptive statistics are presented first followed by the findings on impact of the demographic, socioeconomic and environmental determinants on women malnutrition in Kenya.

### 4.2 Descriptive Statistics

After cleaning the data, the final sample was 8308 women. Table 4.1 presents the descriptive statistics for the variables that were continuous in the analysis.

*Table 4.1: Continuous household's, demographic and socioeconomic variables*

Variable	Mean	Std. Dev	Min	Max
BMI	23	4.6	12	59
Woman's Age	28	9.5	15	49
House household members	5	13.4	1	19
Socioeconomic status (wealth index factor score)	-0.03	1	-2.09	2.6
Socioeconomic status if (wealth Index)=1 (poorer)	-1.11	0.17	-2.09	-0.89
Socioeconomic status if (wealth Index)=2 (poor)	-0.78	0.06	-0.89	-0.68
Socioeconomic status if (wealth Index)=3 (middle)	-0.52	0.11	-0.68	-0.29
Socioeconomic status if (wealth Index)=4 (rich)	0.09	0.24	-0.29	0.56
Socioeconomic status if (wealth Index)=5 (richer)	1.36	0.5	0.56	2.62

From table 4.1, the mean BMI for the women was 23 with a minimum BMI of 12 and a maximum of 59. The mean age of interviewed women was 28 with the youngest being 15 years old. On average the number of household members was 5, with a minimum of 1 person and a maximum of 19 members. The mean socioeconomic status given by wealth factor score is -0.03 whereas the minimum (poorer) is -2.09 and the maximum (richer) is 2.6. The mean, minimum

and maximum values of the wealth factor scores categorized into wealth index quintile categories are also presented. The mean for the poorer category is -1.11 while the mean for the richer category is 1.36.

**Table 4.2: Discrete demographic, household, environmental and socioeconomic variables**

<b>Variables</b>	<b>Mean</b>	<b>Std. Deviation</b>
Woman's Nutritional status		
(underweight=1)	0.12	0.32
(Overweight/obese=1)	0.27	0.44
Woman's Marital Status ( Married=1)	0.60	0.49
Woman's Education		
No Education=1	0.15	0.35
Primary=1	0.52	0.50
Secondary=1	0.25	0.43
Higher=1	0.08	0.28
Women Employment status ( Employed=1)	0.53	0.50
Place of Residence (Urban=1)	0.31	0.46
Type of drinking water source (Piped=1)	0.36	0.48
Type of toilet facility (Improved=1)	0.49	0.50
Sample Size (n)= 8308		

Table 4.2, shows that 12% of the women respondents had malnutrition in the form of being underweight (BMI of below 18.5), while those who had malnutrition in the form of overweight and obesity were 27%. The table also shows that 31% of the women respondents were from urban areas with majority from rural areas (69%). In regard to marital status, 60% of the women were married while 40% were unmarried, divorced or not living together with their spouses.

Further, majority of the women had only primary (52%) compared to those with no education at 15%, secondary at 25% and those with higher education were only 8%. Women that reported



that they were employed (all forms of occupation from profession to unskilled manual labour) were 53% while those not involved in any form of work were also substantial (47%).

Findings on environmental factors indicate that: households that used improved toilet facilities were (49%) while more than half the respondents use unimproved toilet facilities. The respondents that used piped water sources for drinking were only 36% while majority did not use piped water.

### **4.3 Econometric Results**

#### **4.3.1 Testing validity of the instrument**

The potentially endogenous variable to women nutrition status is socioeconomic status given inform of wealth index. This call for use of an instrument that is relevant and valid. An instrument is considered relevant if its effect on a potentially endogenous explanatory variable is statistically significant, and strong if the size of its effect is large. The instrument for socioeconomic status in the study is the number of household members.

From the test results, the p-value and the magnitude of the first stage F statistic on the instrument show that the instrument (number of household members) is valid and strong. The p-value = 0.000 an indication that the instrument is relevant. The F-value of 2,733 is way above the critical values suggesting that the instrument is very strong.

Three regressions were performed separately. The first one for women with chronic energy deficiency (undernutrition or underweight), the second one for women with overweight/obesity and the third regression for women with malnutrition both in the form of underweight, overweight/obese combined.

### **4.3.2 Determinants of undernutrition among women**

Socioeconomic status as suggested by literature, is potentially endogenous to women undernutrition. Endogeneity test carried out showed that the null hypothesis that the socioeconomic status is exogenous unexpectedly cannot be rejected (p value = 0.407). Therefore use of IVProbit may not be appropriate. However the results for IVprobit are also presented in table 4.3 but not interpreted. Probit model was employed to examine the net effect of each independent variable and the results also given in table 4.3. The dependent variable is coded 1 if woman is undernutrition and zero otherwise.

The coefficients of the probit result relates to the underlying liner index, which are usually interpreted in terms of latent variable  $y^*$  that is essentially unobservable and not measured in any kind of natural units as opposed to probability of participation. We therefore compute the marginal effects for continuous variables and average effects for the dummy variable to interpret the quantitative implications of the results.

**Table 4.3: Probit and IVprobit results of being underweight**

<b>Undernutrition</b>	<b>Probit</b>		<b>IVProbit</b>	
	<b>Coefficients</b>	<b>Marginal effects</b>	<b>Coefficients</b>	<b>Marginal effects</b>
Age	-0.009*** (0.002)	-0.002*** (0.000)	-0.009*** (0.002)	-0.016*** (0.004)
Marital Status (1= married)	-0.207*** (0.041)	-0.037*** (0.008)	-0.207*** (0.041)	-0.038*** (0.008)
Education level (1=primary)	-0.474*** (0.051)	-0.084*** (0.009)	-0.360** (0.149)	-0.065*** (0.025)
Education level (1=Secondary)	-0.545*** (0.065)	-0.079*** (0.008)	-0.367 (0.229)	-0.058** (0.029)
Education level (1=Higher)	-0.717*** (0.119)	-0.084*** (0.008)	-0.407 (0.398)	-0.058 (0.041)
Employment status (1= Employed)	-0.092** (0.042)	-0.016** (0.007)	-0.071 (0.049)	-0.126 (0.009)
Socioeconomic status	-0.353*** (0.040)	-0.061*** (0.007)	-0.632* (0.331)	-0.112* (0.063)
Place of residence (1=urban)	0.184*** (0.067)	0.033*** (0.013)	0.467 (0.331)	0.092 (0.078)
Type of toilet facility (1=improved)	-0.065 (0.064)	-0.011 (0.008)	0.064 (0.159)	0.011 (0.029)
Source of drinking water (1=piped)	0.059 (0.051)	0.010 (0.009)	0.174 (0.146)	0.032 (0.029)
Constant	-0.459*** (0.089)		-0.801** (0.408)	
<b>Statistics for Probit</b>		<b>Statistics for IVProbit</b>		
Number of observation = 8221		Number of observation =8221		
Wald chi2(10) = 492.39		Wals chi2(10) = 482.51		
Prob> chi2 = 0.000		Prob> chi2 =0.000		
Log pseudolikelihood = -2749.6544		Log pseudolikelihood = - 8703.407		
Pseudo R2 = 0.0911				

\*, \*\*, \*\*\* Significant at the 10%, 5% and 1% level respectively.

The results in table 4.3 show the probability of a woman being undernourished as a function of the given explanatory variables. The explanatory variables that are significant to undernutrition are; place of residence, employment status, marital status, education level, age of the woman and socioeconomic status. Environmental factors such as type of toilet facility and source of drinking

water however turned out to be insignificant. Interpretation of the findings therefore focuses on the marginal effects of the variables that were significant.

### **Woman's characteristics**

Woman's age is an important determinant to her nutrition status. The correlation is negative, implying that older women are more unlikely to be malnourished than their younger counterparts. An increase in age by one year is likely to lower undernutrition by 0.2%. This variable is significant at 1% level of significance. This could imply that as women grow older from teenage to young adults they become more knowledgeable in nutrient intake and thus the probability of undernourishment. This findings support other findings in literature that found woman's health and nutrition status to improve with age (Ramachandran et al. 2006 and Girma, 2007).

Marital status of women is also an important predictor of her nutrition status. The married women are less likely to be undernourished than their unmarried counterparts. Marital status of women is associated with better social and economic status. Marriage reduces the probability of a woman having CED by 3.7%. This variable is significant at 1% level of significance. This finding is consistent with other studies in literature (Girma, 2007 and Bitew and Telake, 2010).

Woman's education level also turned out to be an important factor in determining undernutrition. Educated women are less likely to be undernourished compared to those without education. Primary, secondary and higher educational attainment reduce undernutrition by 8.4%, 7.9% and 8.4% respectively, all significant at 1%. This finding implies that with education, the risk of undernourishment is lowered. This could be as a result of increased knowledge on food nutrient and general health knowledge offered through formal schooling. This finding supports the work of (Girma, 2007; Blumberg, 2005 and Loaiza, 1997) who found a positive relationship between woman's education and her nutrition status.

## **Household characteristics**

The risk of being undernourished is high among unemployed women. Employment reduces the risk of undernutrition by 1.6%. This could imply that employed women have better nutrition status than their unemployed counterparts as they are more likely to access variety of foods. This study supports literature such as (Kenedy and Haddad, 1991 and Marinda 2006). This variable is significant at 5% level of significance.

Household socioeconomic status is also one of the most important factors in determining undernutrition among Kenyan women at 1% level of significance. Higher socioeconomic status reduced the chances of undernutrition by 6.1%. This suggests that household socioeconomic status could be positively associated with household food security, which is a prerequisite for access to adequate nutrient intake and improved nutritional status for household members. Studies that found similar outcome were those of Fotso and Kuate-defo (2005) and Girma (2007).

Place of residence is also significant in determining undernutrition among women at 1% level of significance. However unlike other studies (Uthman and Aremu, 2008; Betew and Telake, 2010) that found that undernutrition was high among women residing in rural areas, this study found that women in urban areas are 3.3% more likely to be undernourished than those in rural areas. This result could be as a result of higher population in slums within the urban areas. One-third of the world's urban population lives in slums, and four out of ten inhabitants in the developing world Kenya included are informal settlers (UNHABITAT, 2003). These settlements have the most deplorable living and environmental conditions characterized by inadequate water supply, squalid environmental sanitation conditions, overcrowded and dilapidated habitation and are vulnerable to serious health risks, undernutrition included.

## **Environmental characteristics**

Environmental factors considered in the study such as type of toilet facility and source of drinking water turned out to be insignificant. Some studies, have found environmental factors to

be an important determinants of health and nutrition (Tahrakan and Suchindran, 1999; Pongou et al., 2006; Girma, 2007 and Odula, 2010). The findings of this study are however not uncommon in the literature as other studies such as Kabubo-Mariara et al. (2008), found that environmental/sanitation factors such as piped water and toilet facilities were insignificant factors for health status.

#### **4.3.3 Determinants of overweight/obesity among women**

This section presents the test results on the various determinants of overweight/obesity. Because socioeconomic status is potentially endogenous to overweight/obesity as suggested by literature, we first carry out endogeneity test. This test showed that the null hypothesis cannot be rejected (P value = 0.132) and therefore Probit model was employed. However results for IVprobit are also presented though not interpreted. Table 4.4, presents the results for the determinants of overweight/obese among women. The dependent variable is coded 1 if woman is overweight/obese and zero otherwise. Marginal effects for continuous variables and average effects for the dummy variables have been computed for interpretation of the quantitative implications of the results.

**Table 4.4: Probit and IVprobit results of being overweight/obese**

Overweight/Obese	Probit		IVProbit	
	Coefficients	Marginal effects	Coefficients	Marginal effects
Age	0.034*** (0.002)	0.010*** (0.000)	0.033*** (0.002)	0.010*** (0.001)
Marital Status (1= married)	0.180*** (0.035)	0.055*** (0.011)	0.179*** (0.038)	0.055*** (0.011)
Education level (1=primary)	0.263*** (0.055)	0.081*** (0.017)	0.099 (0.122)	0.031 (0.038)
Education level (1=Secondary)	0.339*** (0.062)	0.111*** (0.021)	0.079 (0.184)	0.025 (0.059)
Education level (1=Higher)	0.335*** (0.080)	0.113*** (0.029)	-0.111 (0.304)	-0.034 (0.089)
Employment status (1= Employed)	0.066* (0.034)	0.020* (0.011)	0.036 (0.039)	0.011 (0.012)
Socioeconomic status	0.322*** (0.030)	0.099*** (0.009)	0.725** (0.258)	0.227 (0.084)
Place of residence (1=urban)	0.009 (0.051)	0.003 (0.016)	-0.403 (0.272)	-0.119 (0.077)
Type of toilet facility (1=improved)	0.125*** (0.039)	0.039*** (0.012)	-0.063 (0.129)	-0.019 (0.077)
Source of drinking water (1=piped)	-0.036 (0.040)	-0.110 (0.013)	-0.204* (0.115)	-0.062* (0.035)
Constant	-2.108*** (0.088)		-1.562*** (0.393)	
<b>Statistics for Probit</b>		<b>Statistics for IVProbit</b>		
Number of observation = 8221		Number of observation = 8221		
Wald chi2(10) = 962.12		Wald chi2(10) = 995.22		
Prob> chi2 = 0.000		Prob> chi2 = 0.000		
Log pseudolikelihood = -4166.9176		Log pseudolikelihood = -10119.887		
Pseudo R2 = 0.1239				

\*, \*\*, \*\*\* Significant at the 10%, 5% and 1% level respectively.

The results in table 4.4 show the probability of a woman being overweight/obese as a function of the given explanatory variables. The explanatory variables that contribute significantly to being overweight/obese are; employment status, marital status, education level, age of the woman and socioeconomic status. On environmental factors, only type of toilet facility is significant, while

source of drinking water however turned out to be insignificant. The discussion that follows focuses only on the marginal effects of the variables that were significant.

### **Woman's characteristics**

Woman's age is an important determinant of being overweight/obese. The correlation is positive, implying that older women are more likely to be overweight/obese than younger ones. An increase in age by one year is likely to increase chance of being overweight/obese by 1%. This variable is significant at 1% level of significance. This implies that as women grow older from teenage to young adults, they become more the prone to being obese. This finding support other findings in literature that found woman's BMI to increase as her age increases (Girma, 2007 and Nsour et al. 2013), though a study in Kenya by Steyn et al. 2011 found that age has no effect on macronutrient distribution and therefore, overweight/obesity.

Marital status of women is also an important predictor of being overweight/obese. Married women are more likely to be overweight/obese than unmarried women. In marriage, both spouses are contributing towards food and other household input that would otherwise be limited or unaffordable to unmarried woman. The support from the husband could easily encourage the woman to adopt a sedentary lifestyle that has been associated with higher body weight and therefore obesity (Gonzalez et al., 1999). Marriage increase the probability of a woman having overweight/obese by 5.5%. This variable is significant at 1% level of significance. This finding is consistent with other studies in literature (Girma, 2007 and Malhotra et al. 2008) that found that married women tend to have higher BMI than their unmarried counterparts.

Woman's education level is also an important factor in determining overweight/obese. Primary, secondary and higher educational attainment increase chances of being overweight/obese by 8.1%, 11.1% and 11.3% respectively, all significant at 1%. Higher education level predisposes one to various opportunities such as; being able to secure high paying jobs, access to more information on the current global trends and use of advanced technologies that can lead to lifestyle change including; altering the quality, type and desirability of westernized diets and also reducing physical activity (Hawkes, 2007). Westernized diets have been indicated to have higher calories, sweeteners, animal and partially hydrogenated fats and low fiber intake which



contribute to obesity (Popkin, 2007). Some studies however found no association between educational status and the risk of being overweight/obese (Malhotra et al. 2008 and Mbochi et al. 2012).

### **Household Characteristics**

The risk of being overweight/obese is higher among employed women than their unemployed counterparts. Employment increases the risk of overweight/obese by 2%. This could imply that employed women have increased purchasing power of westernized diets, have access to inactive types of entertainment such as television that contributes to overweight/obesity (Popkin, 2007). As a result of globalization and advancement in technologies, most workers have shifted from more to less labour intensive works. These types of works without inherent opportunity to exercise could lead to obesity (Hawkes, 2007). This variable is significant at 1% level of significance. This study finding supports literature of studies such as (Steyn et al. 2011). However, some studies found that working women are less likely to be obese than unemployed ones especially in more developed countries (Nsour et al. 2013).

Household socioeconomic status is a key determinant of overweight/obesity among Kenyan women at 1% level of significance. Women in households with higher socioeconomic status have 9.9% increased chances of being overweight/obese compared to their counterparts from low socioeconomic status. The finding that obesity is greatest in the higher socioeconomic status group in Kenya can be explained in a number of ways. In Kenya people have only recently been exposed to westernized diets as opposed to the developed countries. The westernized diets are still prestigious and affordable to those with higher socioeconomic status in the developing countries (Hawkes, 2007). High socioeconomic status can also enable a woman to adopt a sedentary lifestyle such as driving to and from work, thereafter engage in passive entertainment (television watching) and even use the advanced technologies (dish washer, microwave, and vacuum cleaners) to perform household chore thus remaining physically inactive which increases chances of being obese (Gonzalez et al. 1999). This finding is consistent with other studies in literature (Steyn et al. 2011; Mbochi et al. 2012 and Girma, 2007).

Place of residence was not significant in determining overweight/obese among women in this study. However, other studies (Steyn et al. 2011 and Nsour et al. 2013), found that overweight/obese was higher among women residing in urban areas and attributes it to urbanization.

### **Environmental characteristics**

Type of toilet facility is an important determinant to women being overweight/obese at 1% level of significance. The findings of this study are not uncommon in the literature as other studies such as Steyn et al. (2011) and Girma (2007) found toilet facilities to be significant factors in determining overweight and obesity among women.

#### **4.3.4 Determinants of malnutrition among women**

This section presents the results on the determinants of malnutrition in the form of both underweight and overweight/obesity. However, because socioeconomic status is potentially endogenous to malnutrition, endogeneity test carried out. The test results showed that the null hypothesis that the socioeconomic status is exogenous to malnutrition cannot be rejected (p value = 0.629). Use of IVProbit may not therefore be appropriate. However, the results for Ivprobit are still given though not interpreted. Probit was employed to examine the net effect of each independent variable in the models and the results presented in table 4.5. Marginal effects for continuous variables and average effects for the dummy variables have also been computed for interpretation of the quantitative implications of the results. The dependent variable is coded 1 if woman has malnutrition and 0 otherwise.

**Table 4.5: Probit, and IVprobit results of malnutrition**

<b>Malnourished</b>	<b>Probit</b>		<b>IVProbit</b>	
	<b>Coefficients</b>	<b>Marginal effects</b>	<b>Coefficients</b>	<b>Marginal effects</b>
Age	0.022*** (0.002)	0.008*** (0.001)	0.022*** (0.002)	0.008*** (0.001)
Marital Status (1= married)	0.033 (0.031)	0.013 (0.012)	0.034 (0.032)	0.013 (0.012)
Education level (1=primary)	-0.175*** (0.045)	-0.067*** (0.017)	-0.222** (0.107)	-0.085 (0.041)
Education level (1=Secondary)	-0.142*** (0.053)	-0.053*** (0.019)	-0.216 (0.163)	-0.081 (0.059)
Education level (1=Higher)	-0.091 (0.072)	-0.034 (0.027)	-0.221 (0.279)	-0.082 (0.099)
Employment status (1= Employed)	-0.002 (0.031)	-0.001 (0.012)	-0.010 (0.036)	-0.004 (0.014)
Socioeconomic status	0.117*** (0.028)	0.045*** (0.011)	0.239 (0.254)	0.091 (0.097)
Place of residence (1=urban)	0.086* (0.047)	0.033* (0.018)	-0.037 (0.260)	-0.014 (0.099)
Type of toilet facility (1=improved)	0.057 (0.035)	0.022 (0.013)	-0.001 (0.121)	0.000 (0.014)
Source of drinking water (1= piped)	-0.006 (0.038)	-0.002 (0.014)	-0.056 (0.111)	-0.021 (0.001)
Constant	-0.861*** (0.072)		-0.709** (0.324)	
<b>Statistics for Probit</b>		<b>Statistics for IVProbit</b>		
Number of observation = 8221		Number of observation = 8221		
Wald chi2(10) = 363.34		Wals chi2(10) = 353.4		
Prob> chi2 = 0.000		Prob> chi2 =0.000		
Log pseudolikelihood = -5289.45		Log pseudolikelihood = -11243.432		
Pseudo R2 = 0.0352				

\*, \*\*, \*\*\* Significant at the 10%, 5% and 1% level respectively.

Table 4.5 show the probability of a woman being malnourished either in the form of underweight or overweight/obese as a function of the given explanatory variables. The explanatory variables

that are significant predictors of malnutrition are; place of residence, primary and secondary education level, age of the woman and socioeconomic status. Other variables like toilet facility, use of piped water for drinking, marital status and woman's employment and even higher education were not significant. The discussion of the results that follows focuses only on the marginal effects of the variables that were significant.

Woman's age is an important determinant of her malnutrition status. As a woman gets older by one year, she has 0.8% increased chances of being malnourished. This could imply that older women tended to be malnourished than younger women. This result is similar to that of Steyn et al., (2011), who found that older women have significantly lower mean energy, total fat and saturated fat intakes.

Education was also found to be a significant determinant of malnutrition among women at 1% level of significance. Women that have primary and secondary education are less likely to have malnutrition by 6.7% and 5.3% respectively compared to those with no education. This shows that even basic education can help eradicate malnutrition.

Place of residence was also found to be a key determinant of malnutrition among Kenyan women. Women residing in urban areas are 32.9% more likely to be malnourished than those in rural areas. This can be attributed to high population residing in the urban slums with deplorable living environment (UNHABITAT, 2003).

Household socioeconomic status also turned out to be an important determinant of malnutrition among women (both underweight and overweight/obese). This variable is significant at 1% level of significance. This study found that women from households with higher socioeconomic status have 4.5% increased chances of being either undernourished or overweight/obese than their counterparts from low socioeconomic status. This result can be attributed to the fact that those women who are overweight were more than those underweight thus leading to crowding effect of the outcome.

#### **4.3.5 Determinants of socioeconomic status**

Household socioeconomic status as suggested by literature was likely to be endogenous to women's nutritional status. Number of household members was used as an instrument for household socioeconomic status. The endogeneity tests results has however proved that socioeconomic status is in fact exogenous.

The first stage results (in appendix 1), however show that the number of household members is an important determinant of socioeconomic status at 1% level of significance. Households that have between 2 to 4 household members are 11.7% more likely to have higher socioeconomic status than households that have more than four members or even households with only one person. However in Kenya, households have an average of 5 household members with a maximum of 19 members (table 4.1) and only 37% of Kenyan households have between 2 to 4 members. This findings support other literature such as ECB, (2013).

Other independent variables that were significant to household socioeconomic status were: place of residence, woman's employment status, education levels, woman's age and environmental factors (both toilet facility and use of piped water). However marital status turned out to be negatively correlated to socioeconomic status at 10% level of significance.

Place of residence is an important determinant of household socioeconomic status. Households in urban areas are 98.7% more likely to have higher socioeconomic status than those households in rural areas. This can be attributed to better infrastructures and opportunities available in urban areas for development.

Households with healthier environmental conditions such as access to improved toilet facility and piped water have 44.9% and 40.5% increased chances of having better socioeconomic status respectively compared to households with no access to improved toilet facilities and piped water. Hygienic environment reduces the chances of recurring infectious diseases that can be costly to the household at the same time reduces one's productivity thus lowers the household socioeconomic status.

A woman's employment status is a key determinant to household's socioeconomic status. Households in which the woman is employed are 6.5% more likely to have higher socioeconomic status than household in which the woman is unemployed. This study finding supports the work of (Dauda, 2010).

Woman's education level is an important determinant of household socioeconomic status. Primary and secondary education levels are 38.2%, and 0.6% respectively more likely to improve household's socioeconomic status that no education. Higher education of a woman on the other hand, is likely to increase household socioeconomic status by 106%. This finding is consistent with other studies in literature that found woman's education to improve household socioeconomic status (Dauda, 2010).

A woman's age also turned out to be an important determinant of household socioeconomic status. An increase in woman's age by one year is likely to have an increase in household socioeconomic status by 0.2%.

## **CHAPTER FIVE: SUMMARY, CONCLUSIONS AND POLICY IMPLICATIONS**

### **5.1 Introduction**

This chapter presents a summary of the study findings, draws conclusions as well as offers some policy recommendations. Summary on determinants of undernutrition are presented first followed by that of overweight/obese and lastly findings on determinants of household socioeconomic status is also included. The chapter also presents limitations of the study and suggestions for future research.

### **5.2 Summary**

The major objective of this study was to empirically examine the determinants of women malnutrition in Kenya. This was motivated by the fact that despite several interventions, the Kenyan government has undertaken in curbing malnutrition in the country, which mostly focused on nutrients intake, nutritional trends for women aged 15-45 years has not improved much over time. This study contributes to the previous literature by establishing underlying causes of women malnutrition that could help curb malnutrition effectively and more feasible before it happens.

The study used the KDHS 2008-2009 to assess the different factors that determine nutritional status of women. Both descriptive and Probit regression analysis were applied after the endogeneity test carried out on the socioeconomic status proved that the variable was not endogenous to nutritional status as predicted by literatures.

The study found that in Kenya, 12% of women are underweight while 27% are either overweight/obese. 31% of the women reside in urban areas. On education levels, 15% of women have no education while a (52%) have only primary education. Those who have secondary and higher education are 25% and 8% respectively.

The study findings show that undernutrition is more pronounced among women living in urban areas than in rural. Undernutrition is 3.3% more likely to affect women residing in urban areas

than their counterparts living in rural areas. This suggests that there could be higher population in the urban informal settlements that are characterized by deplorable living conditions that are hazardous to health and nutrition status, (UN HABITAT, 2003). Improving the lives and living conditions of slum dwellers is paramount to improving undernutrition among women in urban areas.

A second, key result is that age is an important determinant of undernourished. As women grow older, they become more knowledgeable in nutrient intake and thus reducing the probability of undernourishment. These findings suggest the importance of ensuring that younger girls are not only enroll in school but ensure their retention.

Thirdly, women education contributes significantly to reduced level of undernutrition. Women with primary, secondary and higher education unlikely to be undernourished by 8.4%, 7.9% and 8.4% respectively, compared to women with no education. Thus education through formal schooling is key in increasing knowledge on food nutrient and general health knowledge thus reducing undernutrition levels.

The fourth finding is that women from households with higher socioeconomic status are 6.1% less likely to be undernourished than their counterparts from low socioeconomic households. Household wealth explains a lot in regard to household's living standard in terms of ability to purchase food nutrient and use of better sanitation. Therefore there is need to improve household's wealth so as to improve women's nutrition status. Women employment status is also important in determining her nutrition status. This implies that ensuring increased employment opportunity for women will help reduce their undernourishment.

Finally for being underweight, the results show that marital status is important in determining undernourishment among women. Being married impacted positively on the nutrition status of women's as it gives them status in the socioeconomic structure of the society which in turn gives the woman better access to services and improved living conditions. This suggests the need to empower women economically such that they should also be able to support themselves even in the absence of husbands (being separated or widowed).



Obesity, which appears at the other end of the malnutrition scale, is considered a silent epidemic which is very prevalent among Kenyan women (27% are either overweight or obese). This study found that employment status; household socioeconomic status; education; marital status; woman's age and type of toilet facility are major determinants of being overweight/obese.

The study findings show that women who are employed and come from households with higher socioeconomic status are more likely to be overweight or obese compared to those from low socioeconomic households. These variables have effect on improved purchasing power that can allow the woman to engage in consumption of westernized diets. This implies that empowering women economically alone is not enough to improve their nutrition status. Ensuring that they purchase healthy diets is important.

Secondly, increase in the level of education increases the risk of a woman being overweight/obese in Kenya. Higher education level can enable one to secure high paying jobs, access more information on the current global trends and use of advanced technologies which can ultimately lead to lifestyle change inclined towards sedentary living hence increased risks of obesity (Gonzalez et al., 1999). This implies that healthy diets need to be encouraged among all women regardless of education level.

Thirdly, the study revealed that as women grow older they are more likely to be overweight/obese. Newman (2009), in his study indicated that body-fat mass is determined by energy intake and conversion. The possible decrease in physical activity as one grows older may lead to weight gain hence overweight/obese. This suggests the encouragement of physical exercise and healthy living among women.

Lastly, the environmental factor that contributes to overweight in the study is the type of toilet facility. The use of improved toilet facility has been associated with overweight/obesity as it correlates with better socioeconomic status. Easy access to improved toilet facility can also reduce one's physical activity thereby explaining the finding that women who use improved toilets are likely to be overweight/obese.

In the course of establishing the determinants of nutrition status, this study also found out some important determinants of household's socioeconomic status. This study found number of household members; place of residence; woman's employment status; education levels; woman's age and environmental factors (both toilet facility and use of piped water) to be important determinants of household socioeconomic status.

This study found that Kenyan households have an average of 5 household members with a maximum of 19 members. In order to improve the household's socioeconomic status, there is need for family planning within households.

This study also found that households in urban areas are 98.7% more likely to have higher socioeconomic status than those households in rural areas. This could imply that there are better infrastructures and job opportunities in urban areas that can be attributed to unequal distribution of resources between rural and urban areas. There is need for ensuring even development for both rural and urban areas.

Households in which the woman is employed are 6.5% more likely to have higher socioeconomic status than in household in which the woman is unemployed. Empowering women will help improve household's socioeconomic status.

Woman's education leads to better household's socioeconomic status. This study has shown that higher education could increase household socioeconomic status by 106%. Improved educational levels of women would help reduce poverty and enhance household socioeconomic status.

This study also found that woman's age is an important determinant of household socioeconomic status. This could imply that households in which the woman is younger have low socioeconomic status. Discouraging early marriages among girls can help improve household's social economic status.

Finally on the determinants of household socioeconomic status, healthy environmental conditions such as use of improved toilet facility and piped water also increases the chances of a

household having better socioeconomic status. Improving the living environment can help improve the quality of lives of household member's thereby increasing household socioeconomic status through improved productivity.

Considering the findings of this study, it is therefore clear that determinants of nutritional status include not only food intake, but also other determinants such as age, woman's education, employment status of women; access to infrastructural services, such as safe drinking water and sanitary toilet facilities; and economic status that serve to influence dietary intake and health and nutritional status of all family members (Smith and Haddad, 2000). This calls for different policy instruments to address malnutrition among women. This study provides useful insights on the determinants that may provide guidelines for new policies, modification and continuance of existing policies to curb malnutrition among Kenyan women and the entire population.

### **5.3 Policy Recommendations**

Based on study findings, a set of policy recommendations to improve women nutritional status as well as household socioeconomic status can be drawn.

The study findings show that urban women are more likely to be underweight than those in rural areas which can be attributed to higher population in the urban informal settlements. This call for provision of welfare support programmes by the government to the urban poor. Although the government has been implementing social protection programmes targeting orphans, physically challenged and the elderly, there is need to scale up these programmes to include poor families in the informal settlements so as to help reduce undernutrition among women and their families at large as a short-term solution. There also exist urban food subsidy mainly by donors in form of cash transfer with very few beneficiaries (only 5,150) which has minimal effect in curbing undernutrition in urban areas (KSPSR, 2012). The government can strengthen the program through increased funding and ensure urban power women are covered. The social welfare programmes can also be pegged on willingness for those without jobs to relocate to their rural homes to help curb mushrooming of the informal settlements in urban areas.

Schiff and Valdes (1990), noted that nutrition and health status in urban areas can be raised through the provision of publicly provided inputs such as sewerage, portable water and electricity. Though the government has also started slum upgrading programmes to improve the living environment of the slum dwellers which in turn can help reduce underweight in the long-run, the programme has been mired by resistance from different groups and financial constraints. The government should fast track the programs so as to provide the residence with better living conditions thus reducing women undernutrition.

Education is a key determinant of undernutrition. Though the government is already implementing free primary and secondary education, it is important to come up with ways to strengthen and ensure sustainability of the programmes. Increasing financial allocation, ensuring timely release of education funds and ensuring efficient utilization of the funds will help the programme realize its objective and ensure promotion of universal education of girls and women. Although this study is not on education efficiency, it is known that if we have leakages in program funds, then the objective may not be realized.

Another variable affecting the nutritional status of women is poverty. There is need for the government to put in place measures to support the very poor country wide and for long-term solution, fast track the development agenda under Kenyan Vision 2030 so as to bring rapid economic growth at the national level.

Women's employment alongside marriage were found to be important determinants of undernutrition. Therefore, strategies must be developed to empower women so that they can increase their incomes without compromising their own health and nutritional status. The government has put in place policy that ensures 30% of its contract is given to women and youths. Aggressive sensitization program to the women to enable them take up these opportunities should be considered. This can be done with the help of non-governmental organizations. Awareness creation on the importance of nutrition education among unmarried women needs to be undertaken.

In dealing with overweight and obesity, there is an urgent need for health policy makers to come up with appropriate policies to mitigate the negative effects of nutrition transition. These policies should also aim at discouraging aggressive marketing of the external junk food culture that is fast replacing indigenous food consumption patterns.

National development policies need to incorporate food, nutrition and lifestyle issues, with programmes that empower women to make healthy dietary decisions, including the consumption of local foods and vegetables. Women should be encouraged do physical activity/exercise to help increase body fat/energy conversion as studies have shown that obesity is more common among older women than younger counterparts due to decreased physical activities (Newman 2009).

Education policy makers also need to incorporate dietary and healthy living topics in schools. This should also include primary schools to inculcate healthy life styles right from childhood.

On the determinants of household socioeconomic status, the study found that; investment in women education, empowering women economically, ensuring even development for both rural and urban areas, discouraging early marriage, provision of piped water to households and undertaking awareness campaigns on the importance of use of improved toilet facility are crucial for improving household socioeconomic status in Kenya.

This study therefore recommends increased investment on women education and implementation of gender policy measures such as 30% rule to building women's capacity so as to help reducing poverty and improve household socioeconomic status. Aggressive family planning campaigns by both government and non-governmental organizations and programmes aimed at preventing early marriages among girls should be undertaken to help reduce dependents in households.

Article 43 of the Constitution of Kenya 2010, recognizes socioeconomic as an individual's right. It states among others, that every person has a right to clean safe water in adequate quantities and reasonable standards of sanitation. To actualize these rights and to improve household socioeconomic status, both governments and non-governmental agencies should provide piped

water to all households and undertake health campaigns on the importance of use of improved toilet facilities.

Finally to improve the socioeconomic status of households in rural areas, the national and county government should ensure adequate funds allocation of infrastructural development in these areas.

It should be noted that a combination of these policies would help reduce malnutrition among women and also improve household socioeconomic status in Kenya. This therefore requires efforts across government and non-government actors for realization of optimal results.

#### **5.4 Limitations of the Study and Areas for Further Research**

The limitations faced while carrying out the study is unavailability of data on variable that are closely related to nutritional status such as nutrient intake (food consumption) and intra-household food distribution. The variables selected for analysis in this study are therefore limited by the information available in the survey. The other limitation is inadequate national level studies on the determinants of women nutritional status in the country. This limited comparison of the relationship between the various selected variables as most studies in Kenya on nutrition focus on children.

There is need for further research on the topic incorporating, intra-household food distribution, and physical activity in assessing women nutrition status at national level.

## REFERENCES

- Alderman, H. and Garcia, M. (1994). Food security and health security: Explaining the level of nutritional status in Pakistan. *Economic development and cultural change*, 42 (3): 485-507.
- Ajakaiye, O. and Mwabu, G. (2007). The demand for reproductive health services: an application of control function approach. Paper prepared for presentation to the 12<sup>th</sup> Annual Conference of African Econometric Society, 4-6 July 2007.
- Ajieroh, V. (2010). A quantitative analysis of determinants of child and maternal malnutrition in Nigeria. Nigeria strategy support program. Brief No. 11, *International Food Policy Research Institute (IFPRI)*.
- Becker, G.S.(1965). 'Theory of Allocation of Time'. *Economic Journal*, 75:493-517
- Benham, L. (1974). Benefits of women's education within marriage. Economics of family; marriage, children and human capital. In Theodore W. Schultz, eds. Vol. 1 ISBN: 375-394.
- Benoist, B., Mclean, E., and Cogswell, M. (2008). Worldwide prevalence of anemia 1993-2005. WHO global database on anemia 2008 pp.vi + 41 pp. <http://www.cabdirect.org/abstract/20093013528>. Accessed December 5, 2013.
- Behrman, J. and Deolalikar (1988). "Health and Nutrition". In *Hollis Chenery and T.N. Srinivasan, eds., Handbook of Development Economics, Vol. 1*. Amsterdam: North-Holland.
- Bitew, F. and Telake D (2010). Undernutrition among women in Ethiopia: Rural-Urban Disparity. DHS working Paper No. 77. *Calverton, Maryland, USA: ICF Macro*.
- Black, E.R., Lindsay, H. A., Bhutta, Z., Caulfield, L.E., Onis, M., Ezzati, M., Mathers, C., Rivera, J., (2008). Maternal and child undernutrition: global and regional exposures and health consequences. *The Lancet*, 371 (9608): 243-260.
- Blumberg, R. (2005). Women's economic empowerment as the "Magic Potion" of development? Paper presented at the 100<sup>th</sup> annual meeting of the American sociological association Philadelphia. University of California San Diego.
- Dauda, R.O. (2010). Women's status, household food security and coping strategies in Nigeria: A survey based analysis. *Pakistan Journal of Social Science*, 7(3): 262-268.
- Engle, P.L. (1992). Care and child nutrition. Theme paper for the international conference on nutrition (ICN): Paper prepared for nutrition section, UNICEF, New York.
- European Central Bank-ECB, (2013). The Eurosystem Household Finance and Consumption Survey Results from the first wave. Statistics Paper Series, NO 2.

Food and Agricultural Organization, (2001). Gender and nutrition. Gender and development fact sheets. Sustainable development department. [http://fao.org/sd/2001/pe0703a\\_en.htm](http://fao.org/sd/2001/pe0703a_en.htm). Accessed March 5, 2014.

Food and Agricultural Organization, (2005). Nutrition Country Profiles – Republic of Kenya. [http://www.fao.org/ag/agn/nutrition/profiles\\_en.stm](http://www.fao.org/ag/agn/nutrition/profiles_en.stm). Accessed November 15, 2013.

FAO, WFP and IFAD, (2012). The state of food insecurity in the world 2012. Economic growth is necessary but not sufficient to accelerate reduction of hunger and malnutrition. Rome, F.A.O.

Fotso, J.C. and Kuate-Defo B. (2005). Measuring Socioeconomic Status in Health Research in Developing Countries: Should we be focusing on Households, Communities or Both? *Social Indicators Research*, 72(2): 189-237.

Gemeda, D., Fekadu, B., Wondu, G. and Habtamu, F, (2013). Assessment of Nutritional Practices of Pregnant Mothers on Maternal Nutrition and Associated Factors in Ethiopia. *Science, Technology and Arts Research Journal*, 2(3):105-113.

Girma, W. and Genebo, T. (2002). Determinants of Nutritional Status of Women and Children in Ethiopia. *Calverton, Maryland, USA: ORC Macro*.

Girma, E. (2007). Impact of Female Education on Nutritional status of women and Children in Ethiopia. *Unpublished Master of Arts Research paper*. University of Nairobi.

Gonzalez, M.A, Martinez, J. A, Hu, F.B, Gibney, M.J and Kearney, J (1999). Physical inactivity, sedentary lifestyle and obesity in the European Union. *International Journal of Obesity*, 23: 1192-1201.

Grossman, M. (1999). The Human Capital Model of the Demand for Health. *Working paper 7078. National Bureau of Economic Research, Cambridge USA*.

Hawkes, C. (2007). Globalization and the Nutrition Transition: A Case Study: “Food policy for developing countries: the role of government in the global food system”. Cornell University. <http://www.cip.cornell.edu/respository>. Accessed November 10, 2014.

Kabubo-Mariara J.W, Ndenge G. and Mwabu D.K. (2008). Determinants of Children's Nutritional Status in Kenya: Evidence from Demographic and Health Surveys. *Journal of African Economies*, 18 (3): 363-387.

Kennedy, E. and Haddad, L (1991). Food security and nutrition, 1971-1991: lessons learned and future priorities. Testimony before the U.S house of representative, select committee on hunger.

Kenya National Demographic and Health Survey Report, 2008-2009. *Calverton, Maryland: KNBS and ICF Macro*. (2010). Available at: <http://www.measuredhs.com>. Accessed July 18, 2014.



Kenya situation analysis for transform nutrition, (2011). <http://www.transformnutrition.org/file/2011/11/>. Kenya situation analysis. Accessed December 10, 2013.

Kenya Social protection Sector Review (2012). <http://www.planning.go.ke>. Accessed October 30, 2014.

Krasovec, K., and Anderson M.A. (1991). Maternal nutrition and pregnancy outcomes: Anthropometric assessment. *Scientific Publication* No. 529. Washington D.C: Pan American Health Organization

Lartey A. (2008). Maternal and Child Nutrition in Sub-Saharan Africa: Challenges and intervention. Department of Nutrition and Food Science, University of Ghana. *Proceeding of Nutrition Society*, 67: 105-108.

Leslie, J. (1991). Women's nutrition: the key to improving family health in developing countries. *Health policy and planning*, 6(1): 1-19.

Linkages Project (2001). Essential Health Sector Actions to Improve Maternal Nutrition in Africa. *Regional Centre for Quality of Health Care*. Makerere University, Uganda.

Loaiza,E. (1997). Maternal nutritional status. DHS Comparative Studies No. 24, *Calverton, Maryland, USA*: Macro International Inc.

Malhotra, R, Hoyo C, Ostbye T, Hughes G, Schwartz D, Tsolekile L, Zulu J, Puoane, T. (2008). Determinants of obesity in an urban township of South Africa. *South Africa Journal of Clinical Nutrition*, 21(4):315-320.

Marinda, P.A. (2006). Child-Mother nutrition and health status in rural Kenya: the role of intra-household resource allocation and education. *International Journal of Consumer Studies*, 30(4): 327-336.

Mbochi R.W, Kuria E, Kimiywe J, Ochola S, and Steyn N.P (2012). Predictors of overweight and obesity in adult women in Nairobi Province, Kenya. *BMC Public Health* 12(823): 1471-2458.

Mugo, M. (2012). Impact of parental socioeconomic status on child health outcomes in Kenya. *African Development Review*, 24 (4): 342-357.

Mwabu, G. (2007). Health economics for low-income countries. Economic growth center, Yale University. *Center discussion paper* No. 955.

Nagat, E. (1989). Determinants of women's education in the Middle East and North Africa: Illustrations from seven countries. World Bank Education and Employment Division, ERIC number ED 378082: 89.

- Nsour, M.A, Kayyali, G.A and Naffa, S. (2013). Overweight and obesity among Jordanian women and their social determinants. *Eastern Mediterranean Health Journal*, 19 (12)1014-1019.
- Odula, J. (2010). Determinants of child nutrition status in Kenya. Unpublished Master of Arts Research paper, University of Nairobi.
- Oladimeji, T. (1999). Determinants of women's employment in urban Nigeria: the impact of socio-cultural factors. *Journal of Asian and African Studies*, 34:279-297.
- Pinto, A. (1994). Determinants of Postpartum Amenorrhea: A Multi-State Hazard Approach. Center for Demography and Ecology. *Working Paper*: No 96-03.
- Pongou, R., Salomon, J. and Ezzati, M. (2006). Household and community socioeconomic and environmental determinants of child nutritional status in Cameroon. *BMC Public Health* 6:98.
- Popkin, B.M (2007). Understanding global nutrition dynamics as a step towards controlling cancer incidence. *Nature Reviews Cancer* 7: 61-67.
- Prentice, A.M, Lucua, A., Vasquez-Velasquez, L., Davies, P.W., and Whitehead (1988). Are current dietary guidelines for young children a prescription for overfeeding? *Lancet*, 5:1066-1069.
- Prosannajid, S. (2009). Determinants and effect of early marriage in Bangladesh. *Research Journal of Applied Science*, 415(5): 178-184.
- Ramachandran, M., Kumar, K.S and Viswanathan, B, (2006). Vulnerability to Chronic Energy Deficiency: An Empirical Analysis of Women in Uttar Pradesh, India. Paper provided by East Asian Bureau of Economic Research in its series Development Economics Working Papers No. 22508.
- Ramezani, C. and Roeder, C. (1995). Health knowledge and nutritional adequacy of female heads of households in the United State. *The Journal of Consumer Affairs*, 29 (2): 381-402.
- Republic of Kenya - National Food and Nutrition Security Policy (2011). Nairobi: Government Printer, Kenya.
- Rosenzweig, M. and Schultz, P. (1983). Estimating a household production function: heterogeneity, the demand for health inputs and their effects on birth weight. *Journal of Political Economy*, 91(5): 722-746.
- Rotimi, C., Okosun, I., Johnson, L., Owoaje, E., Lawoyin, T., Asuzu, M., Kaufman, J., Adeyemo, A. and Cooper, R. (1999). The distribution and mortality impact of chronic energy deficiency among adult Nigerian men and women. *European Journal of Clinical Nutrition* 53(9): 734-739.

- Schiff, M. and Valdes, A. (1990). The Link between Poverty and Malnutrition- A household Theoretic Approach. *Trade Policy Division County Economics Department*. Working Papers No. 536.
- Smith, L. C. and Haddad, L. (2000). Explaining child malnutrition in developing Countries: a cross-country analysis. *International Food Policy Research Institute*. Research Report; 111.
- Staudigel, M. (2012). On the application of household production theory to health and nutrition. <http://purl.umn.edu/137389>. Accessed November 13, 2013.
- Steyn, P., Nel, J., Parker, W., Ayah, R. and Mbithe D., (2011). Dietary, social and environmental determinants of obesity in Kenyan women. *Schandinavian Journal of Public Health*, 39: 88-97.
- Stillwaggon, E. (2008). Race, sex and the neglected risks for women and girls in Sub-Saharan Africa. *Feminist Economics*, 14(4): 67-86.
- Strauss, J. and D. Thomas (1995). Human resources: “Empirical modeling of household and family decisions”. In J. Behrma and T.N. Srinivasan, eds., *Handbook of Development Economics*, Vol 3A. Amsterdam: North-Holland.
- Tharakan, C.T. and Suchindran, C.M. (1999). Determinants of child malnutrition: an intervention model for Botswana. *Nutrition Research*; 19(6): 843-860.
- Thomas, D. (1991). Intra-household resource allocation: An inferential approach. *Journal of Human Resources*, 26(1):635-64.
- United Nations Children’s Fund (1990). Strategies of improving nutrition of children and women in developing countries. New York: UNICEF. Accessed, December 5, 2013.
- United Nations Children’s Fund, (2006). Nutritional surveillance system in Kenya. Accessed, April 30, 2012.
- United Nations Children’s Fund, (2009). Tracking progress on child and maternal nutrition. New York: UNICEF. Accessed, December 5, 2013.
- United Nations HABITAT, (2003). Slums of the World: The Face of Urban Poverty in the New Millennium? Global Urban Observatory. Nairobi: UNHABITAT. Accessed, October 6, 2014.
- Uthman, O.A. and Aremu, O. (2008). Malnutrition among women in Sub-Saharan Africa: rural – urban disparity. *Rural and Remote Health* 8:381.
- WHO (1995). Maternal anthropometry and pregnancy outcomes: a WHO collaborate study. *Bull world health organ* 1995, 73:1-98.
- WHO (2004). The Nutritional situation in African region: challenges and perspectives. 54<sup>th</sup> session. Brazzaville, Republic of Congo. AFR/RC54/RT/1. Accessed, December 5, 2013.

WHO (2008). Essential nutrition actions: improving maternal-newborn-infant and young child health and nutrition. [www.who.int/nutrition/EB128\\_18\\_backgroundpaper2](http://www.who.int/nutrition/EB128_18_backgroundpaper2). Accessed, December 5, 2013.

WHO. Turning the tide of malnutrition: responding to the challenge of the 21st century. Geneva: WHO, 2000 (WHO/NHD/00.7).

World Hunger and Poverty Facts and Statistics (2013). [www.worldhunger.org/articles/learn/world%20facts%202002.htm](http://www.worldhunger.org/articles/learn/world%20facts%202002.htm). Accessed, December 10, 2013.

WHO (2006). Global Database on Body Mass Index. [apps.who.int/bmi/](http://apps.who.int/bmi/). Accessed, December 10, 2013.

### Appendix 1: Results of the first stage regression/ Determinants of socioeconomic status

	<b>Coefficients</b>	<b>Standard Error</b>
<b>Socioeconomic status</b>		
Place of residence (1=urban)	0.987***	0.019
Type of toilet facility (1=improved)	0.449***	0.013
Employment status (1= Employed)	0.065***	0.012
Marital Status (1= married)	-0.021*	0.013
Education level (1=primary)	0.382***	0.015
Education level (1=Secondary)	0.006***	0.019
Education level (1=Higher)	1.061***	0.029
Source of drinking water (1=piped)	0.405***	0.016
Age	0.002**	0.001
No. of household members(1= ideal household number,2-4)	0.118***	0.002
Constant	-1.253***	0.022
<b>Statistics</b>		
Number of observation =8221		
F(10, 8210) = 2733.49		
Prob>F =0.000		
R- squared = 0.7512		

\*, \*\*, \*\*\* Significant at the 10%, 5% and 1% level respectively.