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SCHOOL OF GADUATE STUDIES

NUTRITIONAL STATUS AND ITS DETERMINANTS FOR WOMEN LIVING IN FEMALE HEADED HOUSEHOLDS IN ETHIOPIA: A MULTILEVEL ANALYSIS

BY

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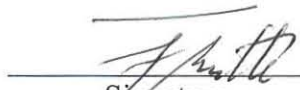
Dr. Butte Gottu Examiner	 Signature

This manuscript is in memorial of:

- My Father;

Ato Abere Ayalew

And

- My Sister;

Firehiwot Genet

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List of Acronyms

AIDS	Acquired Immune Deficiency Syndrome
CSA	Central Statistical Agency
BMI	Body Mass Index
CED	Chronic Energy Deficiency
DHS	Demographic and health survey
EA	Enumeration Areas
EDHS	Ethiopian Demographic and Health Survey
FAO	Food and Agriculture Organization
HIV	Human Immune Virus
GNP	Gross National Product
GOE	Government of Ethiopia
IFPRI	International Food Policy and Research Institute
MDG	Millennium Development Goal
MOFED	Ministry of Finance and Economic Development
NGO	Non Governmental Organization
SDPRP	Sustainable Development and Poverty Reduction Program
SNNP	South Nations Nationalities and Peoples Region
SOFI	State of Food Insecurity
UN	United Nations
UNICEF	United Nations Children Fund
VIF	Variance Inflation Factor
WHO	World Health Organization

agricultural workers, having small household size, in the age group between 15-19 and 40-49, living in a household which did not have toilet facility and access to drinking water.

The risk of under nutrition was higher among women whose ages were between 15-19 and 40-49, having small family members, whose occupation was agriculture. In addition the likelihood of under nutrition was higher among women who were living in a household which did not have toilet facility, and among women living in Tigray regions. Women who were living in rural area and those having small parity were likely to be malnourished as compared to women having zero parity. Economic status had a positive influence on the nutritional status of urban women living in female headed households. Based on the above findings, creation of awareness about the importance of women nutrition, avoidance of childbirth at early and late ages, improvement of environmental sanitation and economic status of women and providing labor saving technology to the women are suggested recommendation.

CHAPTER ONE

INTRODUCTION

1.1 Background of the study

Nutritional status is an important element of human wellbeing and indicator of economic development, differing widely between countries overtime. Beginning from the work of Malthus economists have realized food intake to be a key cause and also an important consequences of activity levels and economic productivity. Then in the modern era they closely observe the history of the nutritional status of women in the now industrialized countries and underlined its importance in today's low-income countries. In fact researchers claimed that nutritional status variables are some of the most important and practical measures of human wellbeing (Bhagowalia, et al 2008).

Governments and donors emphasize the progressive realization of access to food and good nutrition as human right. For this reason, reductions of food insecurity and improving nutritional status have got great attention within the context of poverty reduction strategies. As a result of these, there is need to identify factors attributed to malnutrition and hence to poor nutritional status. Thus, their citizens will be healthy and reach functional and productive capacity (Kabubo-Mariara et al 2006).

There are 854 million malnourished people in the world out of which 820 live in developing countries, 25 million in the transition countries and the developed countries take a small proportion, 9 million in the periods 2001-2003. Sub-Saharan Africa accounts for 33 % of the undernourished people. It is the developing region with the highest proportion-one-third of people suffering from chronic hunger (FAO 2006).

Malnutrition can cause poor learning capacity, impair work capacity and have been associated with heightened morbidity and mortality. These problems are common particularly to vulnerable groups such as preschool children and women in general and to pregnant and lactating women in particular (Block 2007). In both normal and emergency periods, the most common victims of malnutrition are infants, children less than five years of age and pregnant and lactating woman. This is due to low dietary intakes than the daily minimum required, infectious diseases and lack of appropriate care and inequitable distribution of food within the household.

Women are often exhausted by the combination of reproductive demands, heavy work loads, and inadequate diets. Mothers particularly in developing countries are malnourished due to socio-cultural and biological factors (closely spaced pregnancies). Of particular importance is the prevalence of iron deficiency anemia, which reduces work capacity, increase fatigue, and elevated risk of hemorrhage and death in childbirth. The majorities of the world's women are anemic, largely because of iron deficiency resulting from shortage of iron in the diet and excessive iron losses due to parasites and closely spaced births. An undernourished woman is at an increased risk of adult chronic disease, giving birth to a low birth-weight baby who faces greater mortality risk (Baker, et al 1996).

Since most of the energy consumption of a household is human energy, a woman's income decreases if she doesn't have the energy for doing work. If she exerts less effort in domestic chores and management, the nutrition and health of the woman and her household members are at risk (McGuire and Popkin 1986). A malnourished woman has a reduced capacity to care for children, physical labor, abnormal physical development which causes a considerable risk for woman by increasing the danger of obstructed deliveries (CSA and ORC Macro, 2006).

The prevalence of malnutrition of young children and mothers around the world has declined. According to the report of FAO (SOFI) 2006, the prevalence declined by 9% i.e., from 37% to 28% between 1969-71 and 1979-81, by a further 8 percentage points to 20% between 1979 -81 and 1990-92 and decreased from 20% to 17% between 1990-92 and 2001-2003. Despite these improvements, the rates of malnutrition remain unacceptably high, and the progress is uneven between and within countries. The prevalence of women's malnutrition is high in South Asia, South East Asia and Sub-Saharan Africa. The countries in these regions are poor economically and hence have poor access to food. Therefore, those countries with a high degree of poverty have a high rate of malnutrition. Thus future reductions of malnutrition world wide will be achieved by a reduction of poverty and through development (Johnson-Welch and Kurz 2000).

Thus from the above points those who design, test and implement nutrition programs should adopt a new generation of approaches, that is, by focusing on the poor as well as on women. Women have important roles in taking care of their families. A key aspect of women's diverse roles is their participation in economic activities. In fact, in poor families women not only have economic contributions but also use the income to care for the families. This is particularly the case in households that are female headed. The types of care women provided their families, together with the conditions of economic activity in which they participate, determine whether family nutrition and welfare ultimately benefit (Beker et al 1996, Johnson-Welch and Kurz 2000).

Over the past 50 years there has been a dramatic increase in the number of female headed households throughout the world. The possible reason for this is demographic and social factors such as migration, death, marital disruption and unpartnered adolescent fertility (Buvinic and Gupta 1997).Currently female headed households constitute 13% of the households in the Middle East and North Africa, 16 % in Asia, 22% in sub-Saharan Africa and 24% in Latin America (Bongarts 2004; 14 cited in chant 2007). It is estimated that nearly 1.4 billion persons are poor in the world (UN 2008) and nearly 70 % of the worlds poor are women. Thus it is often argued that women, especially in developing countries have an unequal share of the burden of poverty. Most of the literature on gender and welfare in developing countries suggest that female headed households are one of the key target groups deserving special attention to reduce poverty and thus to improve nutritional status (Panda 1997).

In most countries, disproportionately high numbers of female headed households have lowest socio-economic status (Buvinić and Gupta 1997, McGuire and Popkin 1990). The high rates of poverty among female headed households are attributed to the absence of economically contributing males and lower wages, less education of women, fewer adult workers in the household, unequal access to resources and child care (Panda 1997, Buvinić and Gupta 1997).

In Ethiopia the number of female headed households is increasing in great numbers. The census shows that as early as 1994 among the entire households in the country, 22.2% were female headed. One of the major characteristics of female headed households is their increased vulnerability to poverty (Panda 1997). A study conducted in Addis Ababa showed that among female headed households 52% belong to the low income category and 89.2% of the women

were engaged in the informal sector, from which they earn just enough to survive (Emebet and Heregewoin 2002). Another study conducted by Ahmed et al (2001) in Addis Ababa showed that the percentage of illiterate female heads (44.9 %) is more than double as compared to male heads (15.6%) and females have a lower probability to participate in economic activity. A number of social and cultural factors are responsible for this. Women face several economic, social, and cultural constraints that affect their access to education and resources. As a result their opportunity for employment and decent earning is minimal compared to their counterparts. Thus the family faces shortage of food and access to services. The women in female headed households work a lot of time to earn a better income and to do domestic works. Therefore due to the above constraints women and children in these households are much more likely to be malnourished (Silva 2005).

1.2 Statement of the problem

The economic growth and development of any country depends on the use of its human resources, both physical and intellectual. Human capacity, to fully reach its personal and economic potential, depends to a large degree on the individual's nutrition security status. A nutritionally secure people can fight poverty and pave the way to development. Ethiopia is not an exception in this regard. Whether it is to achieve the Millennium Development Goals (MDGs) or to efficiently and effectively implement the Sustainable Development and Poverty Reduction Program (SDPRP), nutrition should be at the center, since a nation that is not nutritionally secure achieves nothing in its socio-economic growth and development undertakings (Abera et al 2005).

Ethiopia is one of the least developed countries (171 out of 177 countries) in the world as measured by the (Purchasing Power Parity) GNP per capita or Human Development Index (UNDP, 2007/8), with about 36 percent of the population living below the poverty line (MoFED, 2006). According to the study by the Ethiopian Ministry of Economic Development and Cooperation, 50 percent of the Ethiopian population were living below the food poverty line and cannot meet their daily minimum nutritional requirement of 2200 calories (MoFED, 1999). Women in the reproductive age group and children are most vulnerable to malnutrition due to low dietary intakes, inequitable distribution of food within the household, improper food storage and preparation, dietary taboos, difficulty of accessing health services, infectious diseases, and care. Particularly for women, the high nutritional costs of pregnancy and lactation also contribute significantly to deplete their nutritional status.

A recent small-scale study in Kersa sub-district of Oromiya region showed that 35 percent of non-pregnant women in this southwestern part of the country had a body mass index (kg/m2) lower than 18.5 (indicative of poor nutritional status). The average height of these women was 155.5 cm and 20 percent of them were under 150 cm (Zerihun et al., 1997 cited in Timotiwos and woldemariam 2002). Another small-scale study conducted on 226 women illustrated that 16 percent of rural non-pregnant women were found to have second to third degree of chronic energy deficiency (CED) (Ferro-Luzzi et al., 2001).

Consequences of malnutrion to a woman are reduced productivity, an increased susceptibility to infections, retarded recovery from illness, and heightened risk of adverse pregnancy outcomes. A woman who has poor nutritional status as indicated by a low body mass index (BMI), short stature, anemia, or other micronutrient deficiency, has a greater risk of obstructed labor, having a baby with a low birth weight, producing lower quality breast milk, death due to postpartum hemorrhage, and illness for herself and her baby (CSA and ORC Macro, 2006). Low birth weight baby is likely to be malnourished and a baby from anemic women is also expected to be malnourished and these children are likely to be visited by disease and likely to die (Baker et al 1996). Hence women malnutrition is one of the factors that contribute to the high level of maternal and child deaths in Ethiopia.

According to the reports of CSA and ORC Macro 2001, 30 % of women were chronically malnourished (BMI less than 18.5). Average height of women was 156 centimeters and 4% of women were shorter than 145 centimeters which is the cut-off value for the height at which mothers can be considered at risk. After five years with very little improvement twenty-seven percent of women were found to be chronically malnourished, while only 4 percent were overweight or obese. The average height of women was 157 centimeters. Overall, 3 percent of women were shorter than 145 cm. Thirty percent of women aged 15-19 and women aged 45-49 were thin or undernourished which is high. This shows that there is a high prevalence of women malnutrition in the country (CSA and ORC Macro 2006).

Studies have indicated that future reduction in malnutrition is limited unless those who design test, and implement nutrition programs adopt special attention to the vulnerable groups such as children and women (Haddad 1999; Elizabeth & Leslie 2008; Leslie 1991). Particularly to those women and children living in households headed by women (John-Welch and Kurz 2000). Because in households headed by women there are high number of dependents, few economically active adults, less access to resources, little time for productive works etc. Hence they are poor and likely to have poor nutritional status.

Therefore, active policy measures should be taken in the area of nutrition to slow down this prevailing high level of malnutrition. Otherwise, it is difficult to progress the development of the country and to achieve the Millennium Development Goals (MDGs 1, 4 and 5 and). It is in response of this fact that the Ethiopian Government has prepared the National Nutrition Strategy. The success of this strategy largely depends on the identification of groups and how well the factors that lead to malnutrition are studied and understood.

Large number of studies have been conducted in the area of child nutrition. However few studies have been conducted regarding women nutrition. These studies focused on the socio-economic and demographic determinants of women's nutritional status living in both female headed and male headed households. These researches did not answer the question; "what are the determinants of the nutritional status of women living in female headed households?" Therefore, the purpose of this study is to answer this question, to compare the nutritional status of women in female headed households with that of male headed and to determine the nutritional status of women with special reference to households headed by female.

1.3 Rationale of the study

It is known that women in Ethiopia have low social status and hence limited access to resources. This has an impact to all members living in female headed household. One of the ways for reflecting it is nutritional status. In turn, nutritional status is a necessary component to address the developmental challenges that Ethiopia faces. Thus the results obtained from this study will have a direct relevance to development planners and policy makers in Ethiopia (particularly health) [Alemu et al 2006].

In view of the present low nutritional status in Ethiopia, it is highly desirable that an effective nutrition policy (strategy) be formulated as part of an overall developmental policy in general and health policy in particular. The results obtained from this study may indicate some measures that should be taken in order to improve the nutritional status of women living in female headed household. Because the health of the woman in general and her nutritional status in particular has a tremendous impact on the wellbeing of members living in this household including the nutritional status and to the development of a country.

CHAPTER TWO

REVIEW OF RELATED LITRATURES

2.1 Female headed households and the nutritional status of women

According to a report by UN 2008, it is estimated that there are nearly 1.4 billion poor. Out of this around 70 percent are women. Therefore, it is often argued that women especially in developing countries share unequally the burden of poverty. Many literatures on gender and welfare suggest that female headed households are one of the vulnerable groups deserving special attention in any strategy designed to reduce poverty (Panda 1997).

It is expected that female headed households tend to be poorer than male headed households. There are different factors that contribute for female headed households to be poor. Female headed households, despite their smaller family size in comparison to other types of households often have a higher dependency burden (Gupta and Mayra 1997; Moreno-black and Guerron-Montero 2001; Ahiadeke 2001). The main income earners of the family are women. But women have lower earnings than men; have fewer assets such as land, capital technology, little access to education and better paid jobs. The absence of assets become a barrier to access credits, which is useful for purchasing productivity enhancing inputs such as improved seed varieties, capital goods, hiring labor and fertilizer (Johnson-Welch and Kurz 2000). This makes female headed households economically vulnerable in general and to food shortage in particular. Such vulnerability arises from inequality in gender positions in society (Emebet and Haregewoin 2002, Osie-Hwedie 1998, Buvinic and Gupta 1997, WHO 2001). The other factor is women in these households have to earn income and also give care for their children this creates time constraints and burden to women (Panda 1997, Buvinic and Gupta 1997, Huisman 2004). These constraints could lower access to social services (health, education etc.) which are important to the household. Therefore these households are denied access to resources. Consequently there is a growing concern over the health and nutritional status of members of female headed households (Guerron-Montero and Moreno-Black 2001). From the above points women in these households are poor. Poor women are likely to be poorly nourished, which has a serious implication for the nutritional status of children born in the future. Malnutrition in women

constrains the ability of women to earn income, which tends to impair the nutritional status of their existing children.

A study conducted in Sir-Lanka shows that women in female headed households have more bouts of acute and chronic morbidity than male headed households and have poor nutritional status (Wickerama and Keith, 1990 cited in Dufour 1998). Another study conducted in Nigeria suggests that female headed farmers are poorly nourished. The possible explanation for this is that these farmers have limited access to investment capital, education, land, income, high rates of fertility and high dependency burden. Another study conducted in Ecuador suggests that female headed households do not appear to be very different in terms of food access and food intake patterns. The possible explanation for this is that the study was conducted during the harvest season. Hence it is likely that resources are available in abundant which are scarce some other times. Therefore the results might be reversed in different seasons of the year (Guerron-Montero and Moreno-black 2001). The study by Dufour (1998) is consistent with the latter findings.

A study conducted in southern Tigray Ethiopia shows that nearly 30 % of households are headed by women. And they are among the poorest of the poor. Members in these households have a 35% chance of being poor, whereas members of male headed households have an 8% chance of being poor. Female headed households are more likely to be landless and even when they have access to it nearly 70 % of the household must share the yield because they do not have access to enough labor and oxen to farm it for themselves hence they loose nearly half of the yields. Therefore, they are more prone to food shortage. According to Howard and Smith (2006) 80 % of all malnutrition cases are from female headed households. Women with control over resources tend to allocate the resources for the production of food. If women have better access to income, land and labor etc then this is a key promoter of household food security and nutrition to the household in general and to a woman in particular.

2.2 Nutritional status and Demographic characteristics of women

Number of children

Number of children a woman has is one of the important variables closely associated with the nutritional status of the woman. In developing countries like Ethiopia typically a woman gives many births in her life time. Thus frequent pregnancies, childbirth and lactation are common to women living in these countries. This frequent reproductive cycling is thought to lead to deterioration in health and nutritional status of women. A study conducted by Nabimta et al (2007) in rural area of Nigeria suggested that there is a significant difference in nutritional status between farmers having large and small number of children. That is as the number of children increases it is more difficult for a mother to attain optimum nutritional requirements. But other studies conducted in Bangladesh and Ethiopia suggest that there is no significant association between number of children and nutritional status of women (Adams et al 1998, Jemal et al 2003). The possible explanation given is that parity may not be an accurate indicator of reproductive stress as it does not take into account miscarriages, abortions or stillbirths, the stressful effects of short birth intervals or overlapping lactation and pregnancy.

Household size

Household size is one of the factors that affect the nutritional status of women. Traditionally women in some developing countries ate after all household members particularly men have already had their meal (Tinker. et al 2000; Haseen 2004). Thus women in large size families and in poor society where resources are scarce women may not eat sufficient food or may deprive themselves of food to feed their children. As a result, 20-45% of women of child bearing age in developing countries do not eat sufficient amount of food and get the recommended daily calorie intake. This insufficient and insecure food and nutrient intake leads to under nutrition (Haseen 2006). Therefore, female headed households clearly experience the above problems as female households do not have sufficient resources. On the other hand if the household has members in the productive age group the welfare of the household members is better than those not have members in the productive age category. For example a study conducted in Ethiopia shows that, in rural area, female headed households having a male member between in the productive age category have a better income and yield (Keremenz 1997). This is because these households can hire labor if it is surplus or if they have access to resources such as land they can farm their

enables women to have access to different resources which are important for the wellbeing of the woman and hence it is positively associated with nutritional status of women.

Region of residence

Region of residence is also one of the factors that show variation in the prevalence of malnutrition. In Ethiopia all regions are not equally developed, the climate condition and the availability of resources are not the same. There is variation in gender disparity between regions as measured in terms of education and hence employment, income, accessing health services, and power. Therefore, there is a difference among women in accessing resources between regions. Women particularly those in female headed households who live in regions where access to resources is relatively better have better nutritional status. The productivity between regions is different; women and children are the first to be affected if there is shortage of food. Therefore, women who live in regions where there is insufficient food security are likely to be malnourished and those who live in regions where there are inadequate social services like health and education are also likely to be malnourished. A study conducted in Ethiopia has shown that women in Afar, Gambela, and Benishangul-Gumuz are under higher risk of chronic energy deficiency (Timotiwos and Woldemariam 2002). A report by CSA and ORC Macro 2006 shows that 39 % and 38% of women are malnourished in Gambela and Tigray, respectively and the least in Addis Ababa. In summary there is variation in the prevalence of malnutrition between regions since there is difference between regions in terms development, productivity and accessibility of resources

Urban-rural residence (Place of residence)

Urban-rural residence is also another factor where the prevalence of maternal malnutrition varies. In less developed countries place of residence usually determines their social, cultural, and economic situation of the people including health conditions. In urban area there are better services including health services, which facilitates public health interventions. In addition, urban systems have improved water, sanitation, and roads thus food can reach to the people during emergency than their rural counterparts (Aremu and Uthman 2008). Studies conducted in Ethiopia suggest that women living in urban areas have a better nutritional status as compared to their rural counterparts the possible explanation for this is that women in urban areas have a better access and use of health services and clean water (CSA and ORC Macro 2006, Timotiwos

and Woldemariam 2002, Teller and Yimer 2000). Furthermore, the malnutrition rate of mothers of children under five is highest in rural areas and lowest in urban areas (ORC Macro 2001). A study by Gibson (2000) in Papua New Guinea suggest that there is differences in nutritional status by place of residence with the risk of chronic energy deficiency for mothers in rural areas being twice higher in rural areas than urban areas. Therefore, urban areas have better facilities and services which directly or indirectly affect nutritional status thus women living in urban areas have better nutritional status as compared to their counterparts.

Work status

Women in female headed households have to work for a log period of time to sustain the welfare of the household members. But the type of work can be informal which earns less income and formal which has a better income. Thus, if a woman is employed she would earn a better income clearly this is beneficial for the welfare of the household members in general and to the woman in particular. As a result this benefits the nutritional status of the woman (Timotiwos and Woldemariam 2002). Another study by Gibson (2000) suggests that availability of work increases the income of the household. And the nutrient availability responds positively with increased income of the household. Thus it can be generalized that an employed woman earns income which enables a woman to access different resources that are essential for the wellbeing of the woman in general and to her nutrition in particular.

2.4 Nutritional status of women and health related environmental factors

Another major factor affecting women's nutrition is illness. The interaction between health and nutritional status is two ways. Malnutrition increases vulnerability to disease and disease increases the vulnerability to poor nutritional status. The type of illness that leads to poor nutritional status include anemia, hook worm infection, malaria (Baker et al 1996). Sickness affects nutritional status through a number of ways such as by causing loss of appetite, gastrointestinal malabsorpition of ingested nutrients, and metabolic wastage of available nutrients in the body (Abera et al 2005).

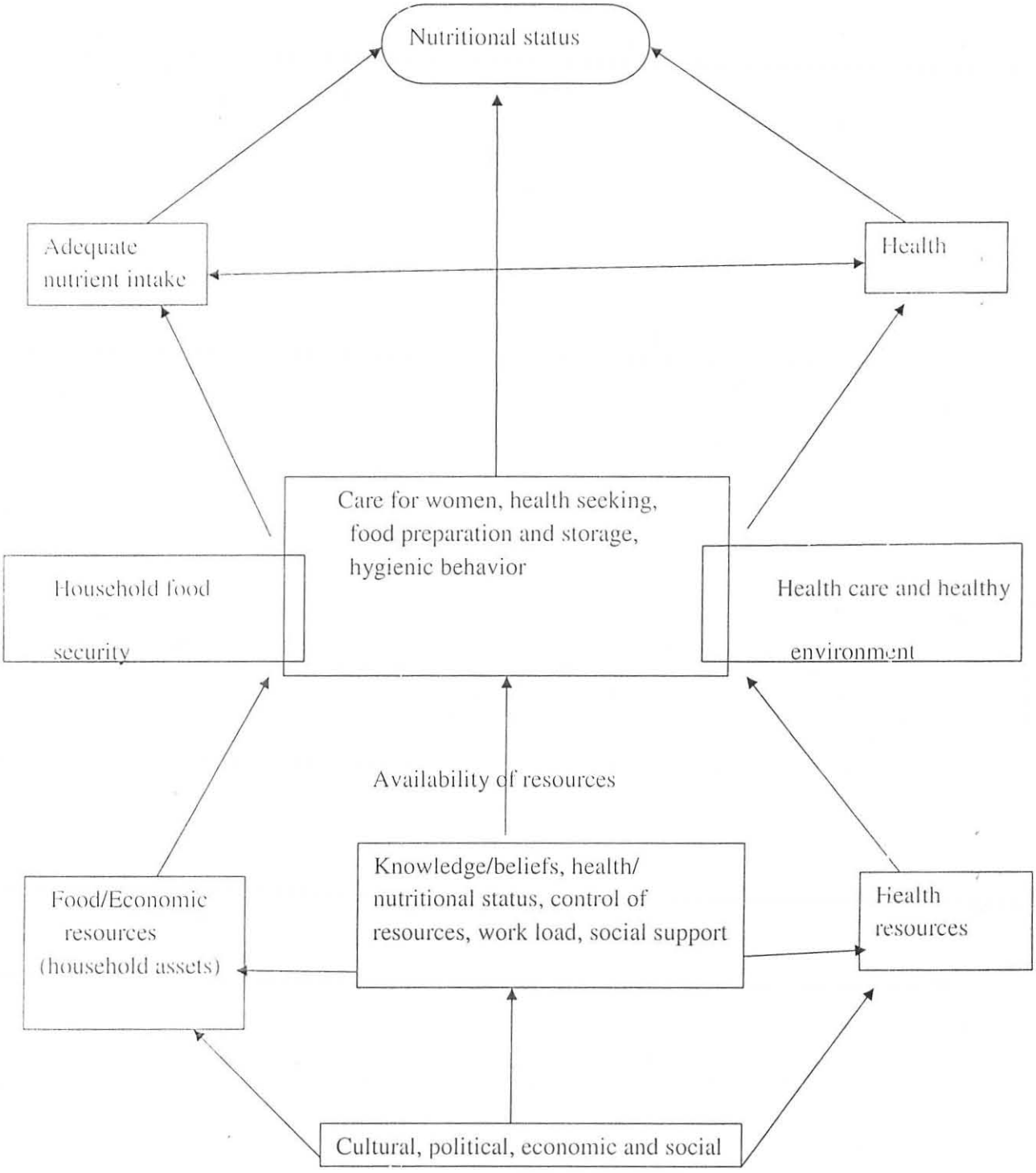
The prevalence of anemia is increasing in Sub-Saharan Africa, 51% of pregnant women and 42% for all women. The main causes are lack of iron in the diets, hookworm infections, malaria (destroys red blood cells), HIV/AIDS and foliate, vitamin A and protein deficiencies and loss of

iron due to reproductive related reasons (Baker 1996). Most of the above problems are due to the prevalence of infections and infestations with parasites and the health problems due to this are disease of communicable nature that are due to poor personal hygiene, sanitation, lack of clean water, and poor access to health services. Data from 63 developing countries that achieved a total reduction of 5% in malnutrition between 1970- 1995, is a result of improvement of the health environment as measured by access to clean water contributed a reduction of malnutrition by 19.3 % (Abera et al 2005).

The provision of safe and adequate water supply for the population has a wide range of advantage on health, productivity, and quality of life. The supply of clean portable water and sanitation in Ethiopia is a serious problem. Health related death due to water born diseases has become greater than 60% (GOE 2007). Even though there are improvements, access to clean water is still low, the supply of clean water is 52.5%, 82.0% and 46.4% for national, urban and rural respectively (MoFED 2006/7). In addition, the level of sanitation coverage in the country is low. According to the result of welfare monitoring survey (CSA, 2004), the sanitation coverage of the country is 30.4%, and 69.4%, 78.7% and 19.8% of households do not have toilet at country, rural and urban level.

Access to clean water and sanitation problems are inherent in poor households particularly in female headed households as these households have little access to resources. Therefore members in these households are likely to be hit by diseases. Obviously this affects the nutritional status of the household members in general and the woman in particular.

2.5 Conceptual frame work



Adapted from UNICEF 1990

Ethiopia is one of the countries having the highest prevalence of malnutrition. Therefore, in order to overcome this problem we have to deeply analyze the factors that leads to malnutrition. As indicated from the conceptual framework malnutrition is an outcome of several factors such as intermediate, underlying and basic determinants of malnutrition.

The intermediate factors include adequate nutrient intake and health are considered as the factors which directly affect nutritional status of an individual. The underlying factors such as household food security, care for women, food preparation and storage, hygienic behavior and health care and healthy environment are identified as the factors related to nutritional status through the intermediate factors. If these factors, i.e. the underlying factors are related positively to the proximate factors such as nutrient intake and health, the nutritional status of an individual will also be good otherwise the reverse situation is certain to happen. The relationship between the underlying and intermediate factors can be positive or negative depending on the availability of resources such as the physical and economic access to food, access to economic resources, knowledge, control of resources, social support, clean water and adequate sanitation.

Finally the basic determinants of malnutrition are cultural, political, social and economic institutions. The quality of the underlying determinants of nutritional status in a household is determined by these basic determinants. Basic determinants are related to the underlying determinants by affecting the quality, control, amount and use of various resources. For example, Household food security, care, availability and accessibility of resources, social support, belief, knowledge, work load of women and health resources are the outcome of several processes in a community such as political factors (related to policies on employment, prices, health, education) social conditions (division of labor, power relationships), level of technology, and ideological factors (cultural preferences, habits and beliefs) (Tefera 2005).

2.6 Objective of the study

2.6.1 General objective

The purpose of this study is to examine the nutritional status and determinants of nutritional status for women living in female headed households using data taken at one point in time. That is to give an overall picture of the nutritional status of this vulnerable group and the factors affecting their nutritional status.

2.6.2 Specific objectives

- To examine the relationship between demographic, socio-economic and health related environmental variables and nutritional status of women.
- To compare nutritional status of women living in female headed households with that of male headed households.
- To suggest further areas of research and appropriate policy measures that should be taken in order to improve the wellbeing of women residing in female headed household in general and their nutritional status in particular.

2.7 Hypothesis

Based on the literatures reviewed, the following hypotheses are tested

- The nutritional status of women living in male headed households is better than the nutritional status of women in female headed households.
- Women in the younger and older age group have poor nutritional status.
- Household size is associated negatively with the nutritional status of women.
- Availability of toilet facility is associated positively with nutritional status of women.

CHAPTER THREE

SOURCES OF DATA AND METHOD OF ANALYSIS

3.1 Data Source

The source of data for this study is the 2005 Ethiopian Demographic and Health Survey (EDHS 2005). This survey was designed to provide estimates for the health and demographic variables of interest by place of residence and region of residence. Since the aim is to study the nutritional status and determinants of nutritional status of women living in female headed households complete and plausible anthropometric data in the sample households are used.

According to CSA and EDHS (2006) report, a total of 540 clusters (145 from urban and 395 from rural) were selected from the list of enumeration areas (EA) from the 1994 population and housing census sample frame. Finally a representative sample of around 14,500 households was selected from 540 clusters.

The number of eligible women included for individual questionnaire is 14,717 from this 14,070 was interviewed and the response rate for women is 95.6. Among these women, 2864 women were non-pregnant and non-lactating and residing in female headed households. Out of these women 1329 women had anthropometric measures and this figure include all undernourished, normal and overweight/obese women. However this study tries to identify significant factors important in determining the condition of under nutrition for women living in female headed households. Therefore, 131 overweight/ obese women are excluded from the analysis and the rest 1198 women are used in multivariate analysis.

The 2005 EDHS used three types of questionnaires; that is, the household, women's, and men's questionnaire. The main purpose of household questionnaire was to identify women and men who were eligible for the individual interview. It also collected information about environmental variables and ownership of various goods. The women questionnaire primarily collected information about reproductive history, maternal and child health, nutrition, maternal mortality and socio-economic variables.

3.2.2 Accuracy of height and weight measurments

The quality of the measurement data such as weight and height is checked for possible preferences of digits while reading or recording of the data. If there is no digit preference in a given data, about twenty percent of the observation have terminal digits either '0' or '5'. The measure which is used to show digit preferences for such data is computed as the sum of the percentage of observetions whose terminal digit is either '0' or '5' divided by twenty (Loaiza 1997).

Table 3.1 indicates the percentage of concentration of measurments for each terminal digit 0-9 and the over all heaping ratio. As it is shown from table 3.1 the percentage of observation ending with terminal digit '0' or '5' for weight data is relatively not large as compared to the percentage of observations ending with other terminal digits. Moreover, the corresponding heaping ratio is 1.1, therefore this indicates that more or less there is no digit prefernce in recording or reading of weight data. However, the percentage of observation ending with terminal digit '0' or '5' for height data is relatively large as compared to other observations. In addition, the corresponding heaping ratio is 1.9, implying that there is heaping of height measurments ending with terminal digits '0' or '5'. The resean for this may be numbers on the scale above women's height may not be seen in the design board since the top part of the measuring board could cover the numbers (Loaiza 1997).

Table 3.1: percentage of concentration of height and weight readings for each terminal digit and heaping ratio.

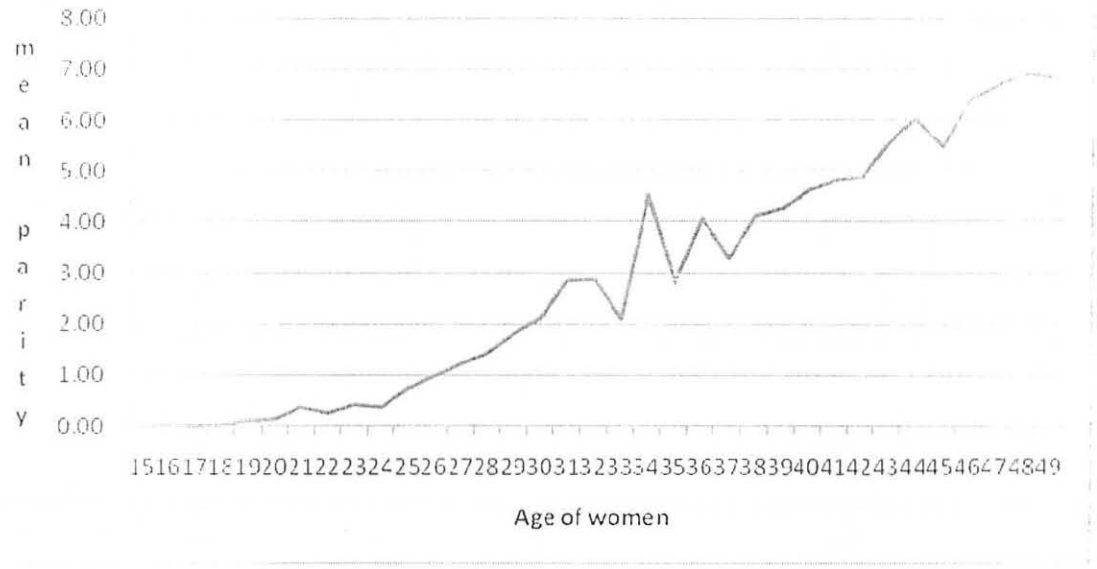
	Heaping for weight readings	Heaping for height readings
terminal digit	Percent	Percent
0	11.1	22.7
1	9.0	7.4
2	11.9	9.0
3	10.0	11.4
4	9.2	9.1
5	11.5	16.2
6	9.3	8.4
7	9.6	6.5
8	10.3	6.0
9	8.1	3.4
heaping ratio	1.1	1.9

Source : EDHS 2005; computed by the author

3.2.3 Average number of children ever born

The quality of the parity data are checked for possible omissions of children ever born by the women. If no problem with the quality of the parity data the graph of average parity by single year of women shows an upward trend. The parity data used in this study are plotted by single age of women as shown in fig 3.2. The overall trend of this graph depicts that, as the age of the woman increases the mean number of children ever born by the women also increases. This indicates that there was no omission of children ever born by the woman hence the parity data has good quality except between ages 33-38, around these ages the graph shows zigzag line this has happened may be as a result of age heaping. However, this problem could be reduced by grouping the age of the woman in to five year age categories (fig.1, Annex).

Fig 3.2: Average parity of women by single age of women



Source : EDHS 2005; computed by the author

In summary the overall quality of the data used in this study is somewhat good.

3.4 Study variables

Dependent variable

Nutritional status (undernourished or Normal): it is measured using BMI; if the BMI value of a woman is less than 18.5 then she is in the category of undernourished; however, if it is between 18.5 and 24.9 then she is under the category normal.

Independent variables

Socio-economic variables (Education, occupation, economic status, place of residence (Urban-rural), region, access to land and animals)

Wealth index is not used for the construction of economic status since the variables used for constructing wealth index are more of urban. A rich household may be categorized as very poor or poor as a result of dispossessing those variables used in the construction of wealth index. In this study economic status is constructed separately for urban and rural areas. Since materials indicating economic status in urban and rural areas are somehow different. Thus the values of the variables such as has radio, television, refrigerator, bicycle, motorcycle/scooter and car/truck were added and categorized into three such as very poor, poor and rich for determining urban economic status. And the values of the variables such as land used for agriculture, livestock, herds or farm animals, has radio, television, refrigerator, bicycle, motorcycle/scooter and car/truck were added and categorized into three such as very poor, poor and rich for determining rural economic status.

Demographic variables (age, household size, parity, sex of household head)

Health related environmental variables (availability of toilet facility, sources of drinking water type of waste management)

Source of drinking water has two categories such as improved (piped water, tube well, protected dug well, protected spring and rain water) and non-improved (unprotected dug well, unprotected spring, tanker track, and surface water).

Waste management has two categories: properly managed (collected by municipality, collected by private establishment, burned, dumped inside hole) and not properly managed (dumped in open space, dumped in river, others)

Table 3.2: List of variables used in this study together with their categories

No.	Variable name	Categories
1	Nutritional status	Under nourished=1, normal=0
2	Sex of house hold head	Male(R) , female
3	Age of women	15-19, 20-29(R), 30-39, 40-49
4	House hold size	Small, 1-3 (R), medium, 4-5, large, 6+
5	Parity	0(R), 1-2, 3-5, 6+
6	Education	No education (R), Primary, secondary
7	Occupation	Not working, agriculture (R), manual, non manual
8	Economic status	Very poor, poor , rich(R)
9	Access to land	No access(R), have access
10	Have animals	No(R), yes
11	Toilet facility	Have toilet(R), no toilet
12	Sources of drinking water	Improved(R), non improved
13	Place of residence	Urban(R), Rural
14	Region	Tigray(R), Amahara, Oromiya, SNNP, Harari, Addis Ababa, Dire dawa,Afar&Somali, Benishangul-Gumuz& Gambella

(R) Reference category

3.5 Limitations of the study

In EDHS 2005 data were collected from women in the age range 15 to 49 years. Thus women above 49 years are not included in the study. However it is from these years that most of the women become head of the household. Hence it is difficult to generalize the findings to all women living in female headed households. The health status of woman (disease) and income of woman are not collected in the EDHS. The absences of data on these variables are likely to affect the output. Moreover the data are collected in 2005 hence the output of the study may not reflect the current situation.

The 2005 EDHS data are used in this study which was collected four or five years back. Therefore, qualitative data are not collected for supporting the quantitative findings obtained from this data. Because the information obtained now from the qualitative data my not represent the situation four or five years back due to the dynamic nature of the society. Thus this can also be one of the limitations of this study. Furthermore, since it is difficult to collect primary data due to time and financial constraints, secondary data is used for this study. The number of cases used for the multivariate analysis is 1198. This will not give adequate number of cases for some of the regions and as a result, the estimates may be biased.

CHAPETR FOUR

BACKGROUND CHARACTERISTICS OF RESPONDENTS AND BIVARIATE RESULTS

4.1 Socio-economic and demographic characteristics of respondents

Table 4.1 depicts the distribution of women living in female headed households by region and type of place of residence in EDHS 2005 and whose anthropometric measures were taken. In this survey 1329 women living in female headed households had anthropometric measures. From these women 55.1% were living in urban area, whilst 44.9% were living in rural area. As can be seen from the table, 21.8% and 10.2 percent of the women were sampled from Addis Ababa and Dire Dawa respectively. Thus 32 % of the women were sampled from these two regions, 41.4% of the women were sampled from Tigray, Amhara, Oromiya, and SNNP regions and the rest were from the remaining regions.

Table 4.1: Number and percentage of women by type of place of residence and region

	Urban		Rural		National	
Background characteristics	Number of women	Percent	Number of women	Percent	Number of women	percent
place of residence						
Urban					732	55.1
Rural					597	44.9
Total					1329	100
Region						
Tigray	30	4.1	94	15.7	124	9.3
Afar	21	2.9	43	7.2	64	4.8
Amhara	39	5.3	94	15.7	133	10.0
Oromiya	56	7.7	101	16.9	157	11.8
Somali	20	2.7	41	6.9	61	4.6
Ben-Gumz	16	2.2	39	6.5	55	4.1
SNNP	38	5.2	99	16.6	137	10.3
Gambela	15	2.0	48	8.0	63	4.7
Harari	91	12.4	19	3.2	110	8.3
Addis Abeba	281	38.4	9	1.5	290	21.8
Dire Dawa	125	17.1	10	1.7	135	10.2
Total	732	100	597	100	1329	100

Source: EDHS 2005; computed by the author

The distribution of the sampled women according to their education showed that, 44.8% were illiterate, 22.8% had primary education and 32.4% had secondary and higher education. Thus majority of the sampled women were illiterate. On the other hand, the distribution of women by their occupation showed that the sample was dominated (53.8 percent) by women having no occupation followed by women whose activity was non-manual (sales, clerical and services) (24.3 percent). Women whose occupation was agriculture, skilled and unskilled manual and professional constitute a small percentage of the sampled women (see table 4.2).

Table 4.2: Number and percentage of women by socio-economic factors and place of residence

	Urban		Rural		National	
Socio-economic factors	Number of women	Percent	Number of women	Percent	Number of women	percent
Education						
no education	170	23.2	425	71.2	595	44.8
Primary	170	23.2	133	22.3	303	22.8
Secondary	392	53.6	39	6.5	431	32.4
Total	732	100	597	100	1329	100
Occupation						
Not working	363	49.9	348	58.5	711	53.8
non manual	254	34.9	67	11.3	321	24.3
Agriculture	4	0.6	124	20.8	128	9.7
Skilled&unskilled manual	66	9.1	47	7.9	113	8.5
Professional	40	5.5	9	1.5	49	3.7
total	727	100	595	100	1322	

Source: EDHS 2005; computed by the author

Age distribution of the sampled women shows that 45.5 percent were from the first two age groups. Whereas, women in the age group 30-34 constituted a small proportion (8.9 percent) of the sampled women. Women in the last age group, 45-49 constituted 12 percent of the sampled population. The sample was dominated by women who had never experienced childbearing; they accounted more than 50 percent of the sampled women. On the contrary 14.6 percent of the women included in the sample had six or more children. Almost the same percentages of women in the sample had 1-2 and 3-5 children. Majority of the women were sampled from households having two or more members. The sample constituted a small percentage of women selected

from households having one household size (6.7 percent). Most of the women were sampled from households having 4-5 members (see table 4.3).

Table 4.3: Number and percentage of women by demographic factors and place of residence

	Urban		Rural		National	
Demographic factors	Number of women	percent	Number of women	Percent	Number of women	percent
Age						
15-19	195	26.6	185	31.0	380	28.6
20-24	147	20.1	78	13.1	225	16.9
25-29	119	16.3	50	8.4	169	12.7
30-34	63	8.6	55	9.2	118	8.9
35-39	80	10.9	56	9.4	136	10.2
40-44	65	8.9	76	12.7	141	10.6
45-49	63	8.6	97	16.2	160	12.0
Total	732	100	597	100	1329	100
Children						
0	428	58.5	262	43.9	690	51.9
1-2	154	21.0	74	12.4	228	17.2
3-5	102	13.9	115	19.3	217	16.3
6+	48	6.6	146	24.5	194	14.6
Total	732	100	597	100	1329	100
household size						
1	66	9.0	23	3.9	89	6.7
2-3	215	29.4	189	31.7	404	30.4
4-5	230	31.4	232	38.9	462	34.8
6+	221	30.2	153	25.6	374	28.1
Total	732	100	597	100	1329	100

Source : EDHS 2005; computed by the author

4.2 Distribution of women by health related environmental factors

Table 4.4 indicates that among women living in female headed households and included in this study. 77.4 percent had access to improved drinking water whereas 22.6 percent did not have access to improved source of drinking water. Among women living in urban areas 96.9 percent had access to improved drinking water the rest 3.1 percent did not have access to improved drinking water. However 53.8 percent of women living in rural areas had access to improved drinking water whereas 46.2 percent did not have access to improved drinking water. From women used in this study, a large percentage of them lived in households which had toilet

facility (61.5 percent) in contrast a small proportion (38.5 percent) of women lived in households which did not have toilet facility. Out of women living in urban areas 89.6% were residing in households which had toilet facility but a small percentage (27.5%) of rural women were living in households which had toilet facility and the rest 72.5% were living in households which did not have toilet facility. The distribution of women by type of waste management shows that 46.8% of women were living in households which did not properly manage wastes whereas 53.2% were living in households which properly manage wastes. Among women living in urban areas 73.6% were living in households which properly managed wastes and the rest 26.4% were living in households which did not properly manage wastes. However 13.9% rural women were living in households which properly managed wastes while 86.1% were living in households which did not properly manage wastes.

Table 4.4: distribution of women by health related environmental factors and type of place of place of residence

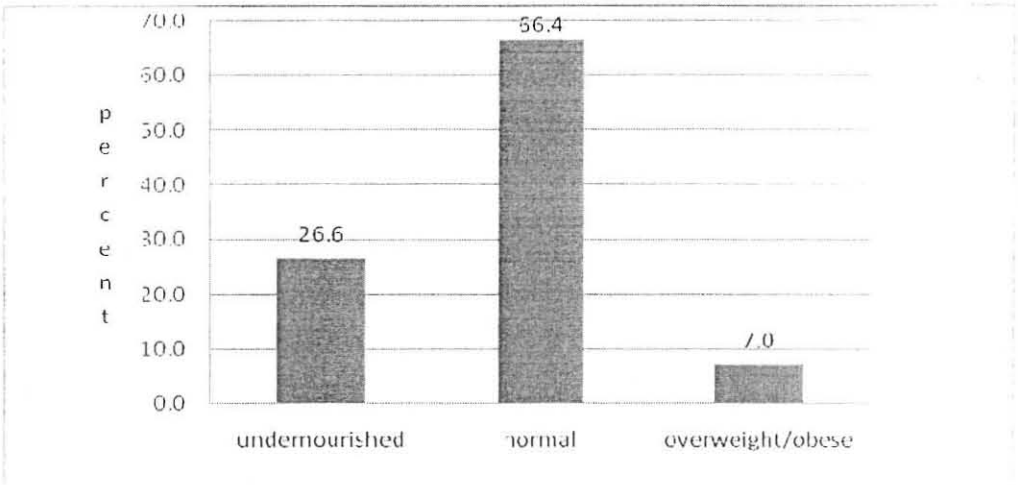
	Urban		Rural		National	
	Number of women	Percent	Number of women	Percent	Number of women	Percent
source of drinking water						
Improved	691	96.9	317	53.8	1008	77.4
non improved	22	3.1	272	46.2	294	22.6
Total	713	100	589	100	1302	100
availability of toilet						
have facility	639	89.6	162	27.5	801	61.5
do not have facility	74	10.4	427	72.5	501	38.5
Total	713	100	589	100		100
Waste management						
Properly managed	539	73.6	83	13.9	622	46.8
Not properly managed	193	26.4	514	86.1	707	53.2
Total	732	100.0	597	100.0	1329	100.0

Source : EDHS 2005; computed by the author

4.3 Nutritional status of women

From 2005 EDHS, 2864 women were non-lactating, non-pregnant and living in female headed households. Out of these women 1329 had anthropometric measures, and hence their nutritional status was assessed. Figure 4.1 shows the nutritional status of women living in female headed households. Referring from this figure 26.6% of these women were undernourished, 7% of women were over weight/obese (over nourished) and the rest were normal. Among women who were undernourished (thin) 10.2% were moderately and severely thin whilst the remaining 16.4% were mildly thin. On the contrary a small percentage of women were overweight (6%) and obese (1%) (Fig. 2, Annex).

Fig 4.1: Percentage of women in different categories of nutritional status.



Source : EDHS 2005; computed by the author

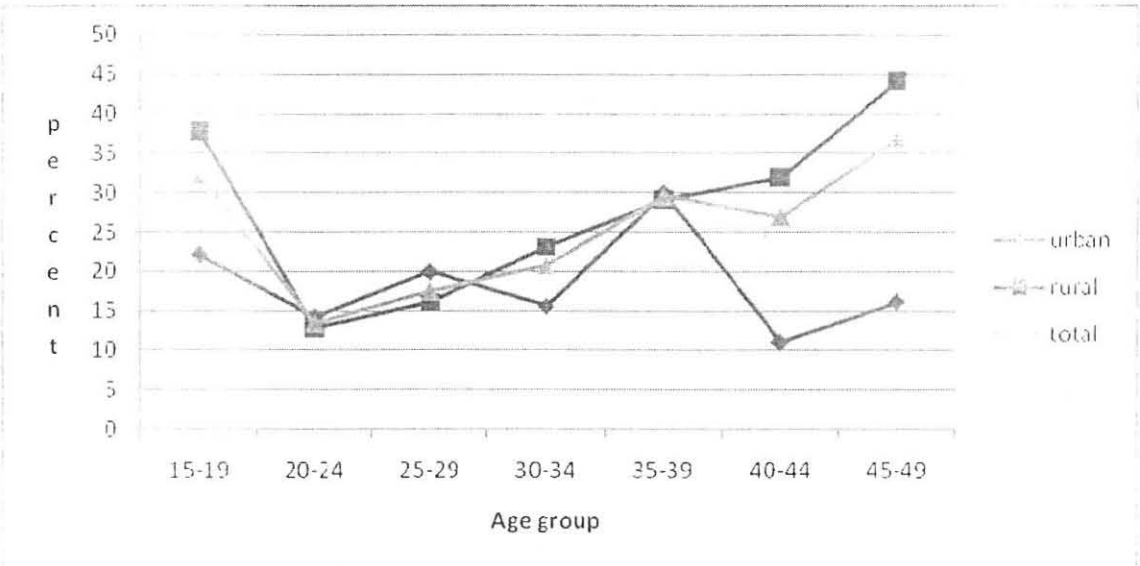
4.3.1 Nutritional status of women and demographic factors

Age and nutritional status of women

Age of the respondent had significant association in explaining the variation in nutritional status of the women (X^2= 42.2, P<0.001). The trend of the nutritional status of women with age showed that the percentage of undernourished women is higher in teen ages (15-19). It decreased and reached lowest level in the age interval 20-24. Then it starts increasing with age of the woman. A similar pattern was observed for women living in rural areas. For women who were living in urban areas, the percentage of undernourished women decreased between the age groups 15-19 and 20-24, it started rising up to the age group 25-29, then it slightly decreased

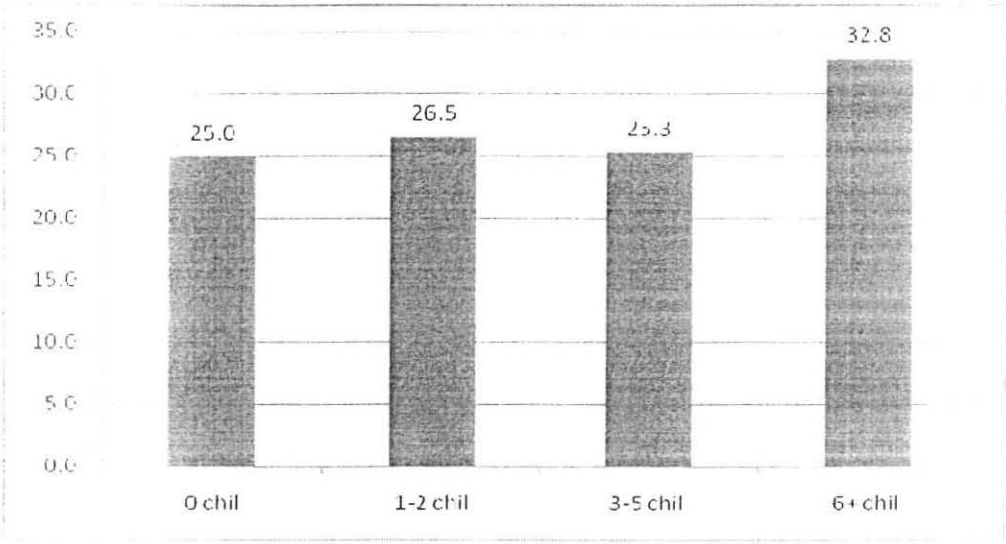
until the age group 30-34, again it started moving up to the age group 35-39. Then it decreased and reached its lowest level up to the age group 40-44. After that it started slightly increasing up to the age group 40-44 finally it declined. On average the trend showed that the percentage of undernourished women increased as the age of the woman increased in urban area even though the extent is less in urban areas (see fig. 4.2). Moreover, as shown in table 4.5, the average BMI for women in the age group 15-19 was lower than the average BMI values of women in the other age group except the last age group. Referring from this table there is a higher gap in prevalence of under nutrition between urban and rural women in the last two age groups. This is probably rural women in these age groups are illiterate, affected by reproductive stress, and do not have sedentary life style as compared to their counterparts.

Fig 4.2: Percentage of undernourished women by five year age group.



Source : EDHS 2005; computed by the author

Fig 4.3: Percentage of undernourished women by parity

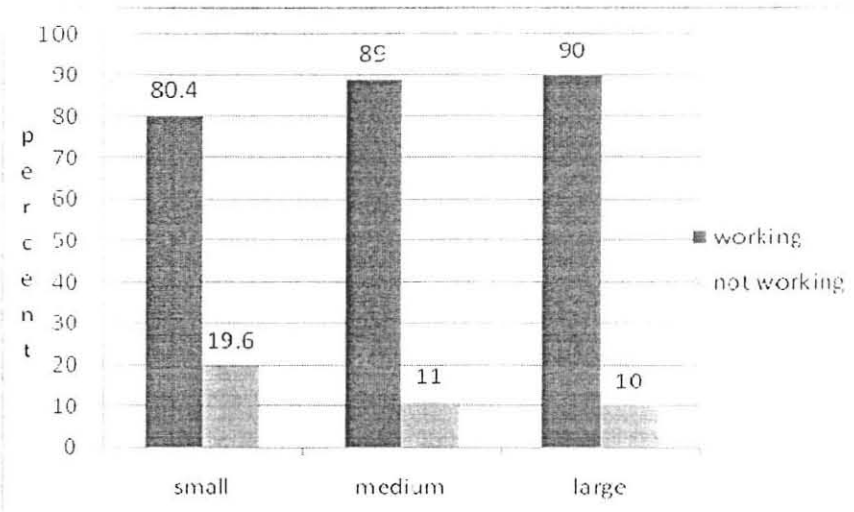


Source : EDHS 2005; computed by the author

Household size and nutritional status of women

The chi-square test indicated that there was significant association between household size and nutritional status of women living in female headed households (X^2= 13.9, P<0.05). Table 4.6 indicates that there was variation in nutritional status of women across different categories of household size. Among women living alone, 26.2 percent were undernourished and 18.5 percent were over weight/obese. Among women living in households with 2-3 members, 25.9 percent were undernourished. The prevalence of under nutrition was relatively high for women living in households with 4-5 members; about 32.2 percent of women were undernourished. However, the prevalence of under nutrition was low for women living in households having 6 or more members. This may be related with the increment of working household members as household size increased. Fig 4.4 depicts that as household size increases the percentage of household members in the working (active) category increases. Thus this may contribute positively to the nutritional status of women.

Fig 4.4: Percentage of working and not working female headed household members by household size



Source EDHS 2005; computed by the author

Table 4.6: Percentages of women in different categories of nutritional status by household size

		percentage of women			
house hold size	under nourished	Normal	overweight /obese	Total	X^2 value
1	26.2	55.4	18.4	100	13.9*
2-3	25.9	66.2	7.9	100	
4-5	32.2	62.1	5.7	100	
6+	18.1	76.7	5.2	100	
Total	26.4	66.5	7.1	100	

Source : EDHS 2005; computed by the author *P<0.05

Nutritional status of women by sex of household head

Sex of the household head was significantly associated with the nutritional status of the women (X^2= 5.55, P < 0.05). Table 4.7 indicates the nutritional status of women by sex of household head. According to this table 29.3% of women living in male headed households were undernourished. Similarly among women living in male headed households 4.7% were over weight/obese. And about 66% of women had normal nutritional status. Among women living in female headed households about 26.6% were undernourished whereas about 7% percent were over weight/obese. The rest had normal nutritional status. Thus the prevalence of chronic energy

Table 4.8: Number, mean BMI and percentage of women by nutritional status, place of residence, and region of residence

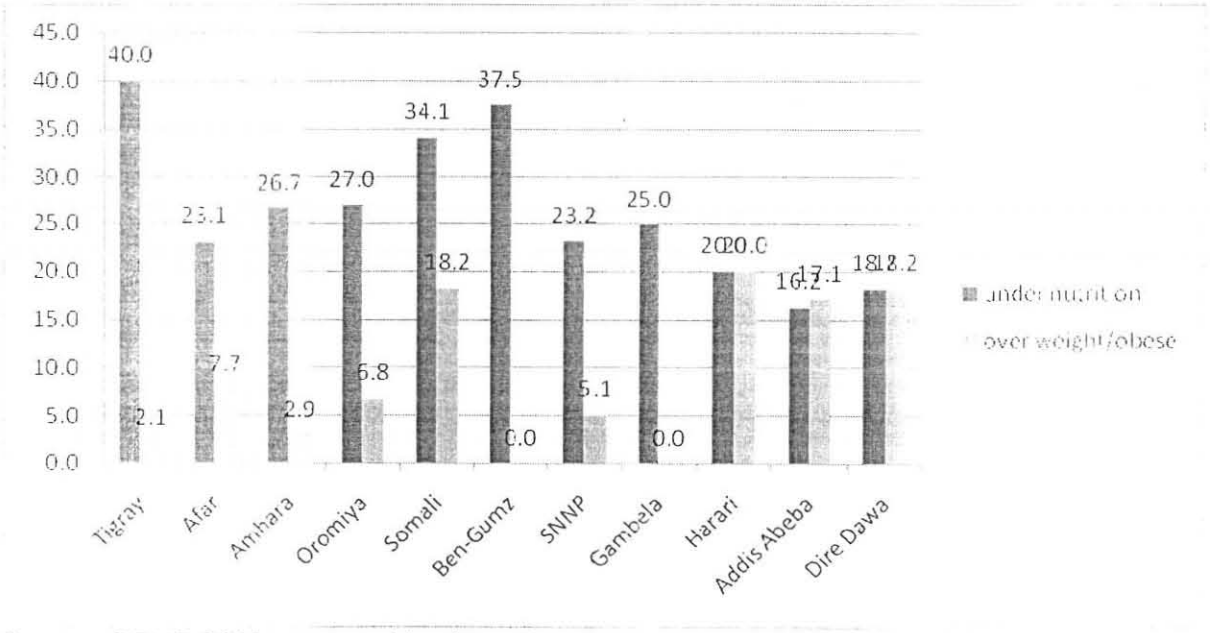
			Nutritional status				
Variable	Number of women	Mean BMI	Under nourished	Normal	Over weight /obese	Total	X^2 value
Type of residence							108.9***
Urban	732	21.7	19.8	64.7	15.5	100	
Rural	597	19.6	30.9	67.5	1.7	100	
Total	1329						
Region							78.9***
Tigray	124	19.3	40.0	57.9	2.1	100	
Afar	64	20.4	23.1	69.2	7.7	100	
Amhara	133	20.3	26.7	70.4	2.9	100	
Oromiya	157	20.5	27.0	66.2	6.8	100	
Somali	61	20.1	34.1	47.7	18.2	100	
Ben-Gumz	55	20.1	37.5	62.5	0.0	100	
SNNP	137	20.3	23.2	71.8	5.1	100	
Gambela	63	19.2	25.0	75.0	0.0	100	
Harari	110	21.1	20.0	60.0	20.0	100	
Addis Ababa	290	22.1	16.2	66.7	17.1	100	
Dire dawa	135	21.9	18.2	63.6	18.2	100	
Total	1329	20.5					

Source : EDHS 2005; computed by the author ***P<0.001

Nutritional status of women by region of residence

Region of residence was one of the factors significantly related with the nutritional status of the women (X^2= 78.9, P<0.01). The prevalence of chronic energy deficiency was ranged from 16.2 to 40 percent among women living in the 11 regions. Figure 4.5 shows variations in the nutritional status of women living in different regions. According to this figure the prevalence of women malnutrition was lower in the most urbanized regions such as Addis Ababa and Dire Dawa, and it was higher in regions that were predominantly rural. In Tigray 40% of women were undernourished followed by Benishangul-Gumuz (37.5 percent) and Somali (34.1 percent) moreover the corresponding average BMI values were low (see table 4.8). In Addis Ababa 16.2% of women were undernourished followed by Dire Dawa (18.2%) and Harari (20%) and the respective mean BMI values were also higher as compared to other regions (see table 4.8). On the other hand the proportion of over weight/ obese women was higher in relatively urban regions. In Addis Ababa the proportion of over weight/obese women was 17.1% and in Dire Dawa it was 18.2 percent and it is relatively low in predominantly rural regions. For example, the proportion of over weight/ obese women in Tigray, Amhara, Gambella, SNNP, Benishangul-Gumz and Oromiya was 2.1, 2.9, 0, 5.1,0 and 6.8 respectively.

Fig 4.5: Percentage of under nourished and over weight/obese women by administrative regions.

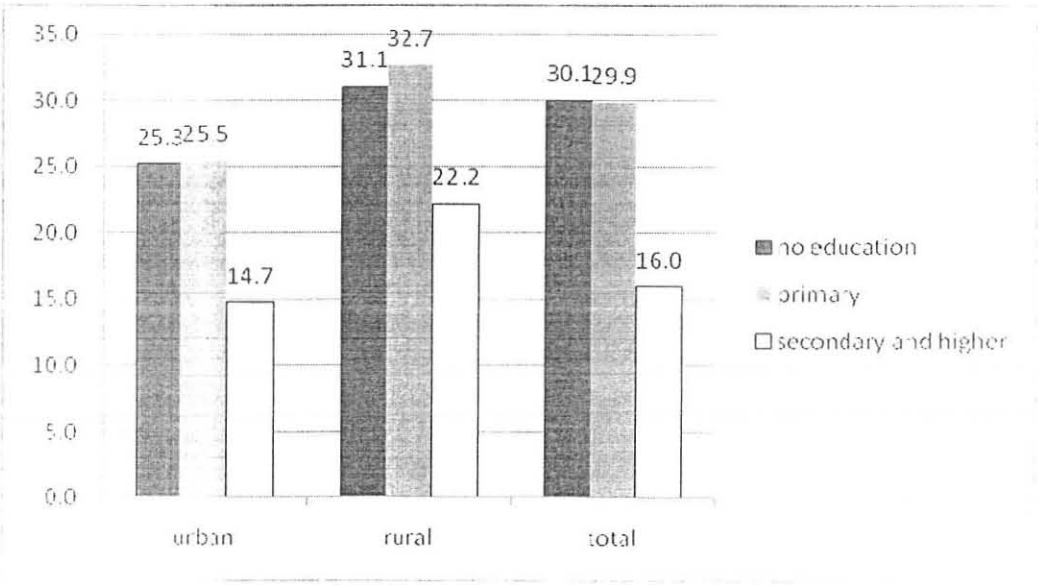


Source : EDHS 2005; computed by the author

Nutritional status of women by education

The chi-square test shows that education was significantly related with the nutritional status of women living in female headed households (X^2=52.5, P<0.001). The percentage of women with chronic under nutrition shows variations with different educational status. There was an inverse relationship between education and nutritional status of women living in female headed households. Figure 4.6 shows that almost the same percentages of women with no education (30.1%) and with primary education (29.1%) were undernourished. There was however a dramatic decrease in the percentage of chronic under nutrition for women having secondary and higher education. Moreover, there was also variation in nutritional status among women with different educational level by place of residence. Both in urban and rural areas the prevalence of chronic under nutrition was high for women having no education and primary education and low for women having secondary and higher education.

Fig 4.6: Percentage of undernourished women by educational status and by type of place of residence.



Source : EDHS 2005; computed by the author

Table 4.10: the percentage of women in different categories of nutritional status by availability of toilet facility

	percentage of women				
Availability of toilet	under nourished	normal	over weight/obese	Total	X^2 value
Have facility	21.2	67.3	11.5	100	85.4***
Do not have facility	33.4	64.4	2.2	100	

Source : EDHS 2005; computed by the author ***P<0.001

Waste management and nutritional status of women

There was variation in nutritional status among women by type of waste management. From table 4.11 the percentage of undernourished women was about 19.4 percent among women who lived in a household which properly managed wastes as well as the percentage of over weight women in these households were 15.9 percent. Where as the prevalence of chronic under nutrition was about 30.2 percent among women who lived in a household which did not manage wastes properly and the percentage of overweight women in this household was 3.7%. The chi-square test of association also indicated that there was significant association between type of waste management and nutritional status of women (X^2= 9.72, P<0.01) (see fig. 4.10).

Table 4.11: The percentage of women in different categories of nutritional status by type of waste management

	percentage of women				
Waste management	under nourished	normal	Over weight/ obese	Total	X^2 value
Properly managed	19.4	64.7	15.9	100	9.7**
Not properly managed	30.2	66.12	3.7	100	

Source : EDHS 2005; computed by the author **P<0.01

CHAPTER FIVE

MULTIVARIATE ANALYSIS

From bivariate analysis type of place of residence, region, age, sex of household head, household size, parity, education, occupation, source of drinking water and availability of toilet facility were significantly associated with the dependent variable BMI ($P< 0.05$). The variable waste management is not included in the multivariate analysis because about 10% of the observations were not reported. Bivariate analysis may not show the net effect of the independent variable on the dependent variable because the influences of other variables are not controlled.

Hence multivariate analysis is used in order to examine the net effect of the explanatory variables on the dependent variable by controlling for the effects of all other variables. In this study four models were fitted to determine factors affecting the nutritional status of women living in female headed household in four different settings. Since there is difference in the type of food security variables in urban and rural areas and hence in order to identify determinants of malnutrition (CED) in these areas separate urban (model2) rural (model1) model is essential. The third model (model 3) was used to identify factors that determine the condition under nutrition for women at national level. Finally the fourth model (model 4) was used to compare the nutritional status of women living in female headed households and male headed households.

Before doing multivariate analysis by fitting a model, possible association between the independent variables, multicollinearity should be checked. When multicollinearity exists between independent variables it is difficult to measure the net effect of the independent variable on the dependent variable and the interpretation of the regression coefficients as measuring the change in the average value of the dependent variable for a unit change in the explanatory variable is no more applicable (Greene 2003). Therefore, the existence of multicollinearity should be checked using statistical procedures. If multicollinearity exists between two variables the variable important to our study would be included in the model and that are less important are excluded. However, if both variables are important the variables are included in the model turn by turn. In this study the existence of multicollinearity for all models was checked using

variance inflation factor (VIF). Higher value of VIF (VIF > 5) indicates the existence of high multicollinearity. The finding is that the VIF values of all the variables used in this study (table 2, Annex) are less than five hence there is no high correlation between the independent variables included in the model.

The value of the intra-class correlation coefficients (VPC) obtained from constant only model (Null model) constructed using: the data of women living in female headed house holds (model3, 0.023), model 2 (0.015), model 1 (0.018), and using the data of women living in male and female headed house holds, model 4 (0.07) are different from zero. Hence this indicates that the data are not analyzed using traditional estimation procedures such as ordinary least squares. Therefore this data are analyzed using multilevel methods (Goldstein 2003). In multilevel analysis the cluster level residuals are assumed to be normally distributed with mean zero and corresponding variances. Therefore these assumptions were checked by plotting the cluster level residuals with normal scores and this was done for all the four models. These plots follow a straight line pattern for all the models (fig.3-6, Annex). Hence the assumptions of normality for the cluster level residuals are satisfied.

The intra cluster variance, which measures the variation due to unobserved factors at cluster level are insignificant in all models. The variance partition coefficients (VPC) are 0.047, 0.017, 0.024 and 0.022 for model 1, model 2, model 3 and model 4 respectively. This indicated that 4.7%, 1.7%, 2.4% and 2.2% of the variation in nutritional status for women living in female headed households were attributable to differences between clusters. The existence of relation between nutritional status and independent variables included in the model were checked using joint chi-square test. The joint chi-square for all the models indicate that there was significant (P<0.001) regression relation between dependent variables and independent variables included in all the models (see table 5.1).

Table 5.1 estimates of intra cluster variance, VPC and joint X^2 values for all models

Random parameter	Model 1		Model 2		Model 3		Model 4	
	Estimate	S.E	Estimate	S.E	Estimate	S.E	Estimate	S.E
Intra cluster variance	0.16	0.64	0.06	0.35	0.08	0.37	0.07	0.22
Intra class correlation	0.04	0.07	0.02	0.08	0.02	0.07	0.02	0.05
Chi-square (X^2)	72.18***		155.3***		238.9***		535.6***	
Degrees of freedom	18		15		25		28	

Source: EDHS 2005; computed by the author *** P<0.001

5.1 Determinants of nutritional status (CED) among rural women living in female headed households

The rural model (model 1) helps in identifying the factors that were important in determining the nutritional status of women living in rural areas. According to the results obtained from the multivariate analysis age, parity, and toilet facility were the significant factors in explaining the nutritional status of women lining in rural areas. When the data are classified by regions the number and percentage of cases in some regions such as Addis Ababa, Dire Dawa and Harari are very small. Thus the variable region is excluded in this model.

Age

Table 5.1 indicates that women whose ages were between 15-19, 30-39 and 40-49 years were more than 4, 2 and 4 times more likely to be affected by chronic energy deficiency as compared to women whose ages were between 20-29 years respectively. Therefore women whose ages were between 15-19, 30-39 and 40-49 years and living in rural areas were more likely to be undernourished as compared to women whose ages were between 20-29 years.

Parity

The other demographic variable which was statistically significant in explaining the condition of under nutrition among women living in rural areas was parity. The results of the multivariate analysis indicates that women who had 1-2 children were more than 2 times more likely to be undernourished as compared to women who had zero parity.

Toilet facility

Toilet facility was found to be one of the important variables in determining the nutritional status of women living in rural areas. Rural women who did not have toilet facility were about 1.5 times more likely to be affected by chronic energy deficiency as compared to rural women who were living in a household which had toilet facility. Hence rural women living in households having toilet facility were less likely to be undernourished than women living in households which do not have toilet facility.

Table 5.2: Estimates of parameters, their standard errors and odds ratio from multilevel logistic regression model for women living in female headed households of rural Ethiopia. Model1

Variables	B	S.E	Exp(β)
Age			
15-19	1.426	0.384	4.162***
20-29(R)			
30-39	0.712	0.385	2.038*
40-49	1.405	0.413	4.075***
Household size			
Small(R)			
Medium	0.138	0.227	1.147
Large	-0.263	0.274	0.768
Parity			
0(R)			
1-2	0.808	0.417	2.243*
3-5	-0.233	0.473	0.792
6+	0.072	0.485	1.074
Education			
No education	0.119	0.265	1.126
educated (R)			
Occupation			
Not working	-0.173	0.239	0.841
Agriculture(R)			
Non-agriculture	-0.255	0.293	0.774
Economic status			
Very poor	-0.628	0.493	0.533
Poor	-0.059	0.308	0.942
Rich(R)			
Access to land			
No access(R)			
Have access	-0.266	0.328	0.766
Access to farm animals			
No(R)			
Yes	-0.214	0.405	0.807
Source of drinking water			
Improved(R)			
Non improved	-0.066	0.202	0.936
Toilet facility			
Have toilet(R)			
Don't have toilet	0.38	0.222	1.462*

(R) Reference category * P<0.1 ** P<0.05 ***P<0.001

Source : EDHS 2005; computed by the author

Hence, the fitted model is given by:-

$$\log it(\pi_{ij}) = -1.42 + 1.426Age_{15-19} + 0.712Age_{30-39} + 1.405Age_{40-49} + 0.808Parity_{1-2} + 0.38Toiltfacility$$

Where π_{ij} the probability that the ith woman in the jth cluster was undernourished

$$\ln\left(\frac{\pi_{ij}}{1-\pi_{ij}}\right) = -1.42 + 1.426Age_{15-19} + 0.712Age_{30-39} + 1.405Age_{40-49} + 0.808Parity_{1=2} + 0.38Toilet\ facility$$

This is equivalent to

$$\left(\frac{\pi_{ij}}{1-\pi_{ij}}\right) = e^{-1.42 + 1.426\ Age_{15-19} + 0.712\ Age_{30-39} + 1.405\ Age_{40-49} + 0.808\ Parity_{1-2} + 0.38\ Toilet\ facility}$$

Hence the probability that the ith woman in the jth cluster was undernourished is given by

$$\pi_{ij} = \frac{e^{-1.42+1.426\,Age_{15-19}+0.712\,Age_{30-39}+1.405\,Age_{40=49}+0.080\,Parity_{1-2}+0.38Toilet\ facility}}{1+e^{-1.42+1.426\,Age_{15-19}+0.702\,Age_{30-39}+1.405\,Age_{40-49}+0.808\,Parity_{1-2}+0.38Toilet\ facility}}$$

Therefore the probability is computed by substituting the values of the dummy variables.

The fitted models and probabilities of the rest models are computed in a similar way.

5.2 Determinants of nutritional status (CED) among urban women living in female headed households

The factors that were significant in explaining the variation in nutritional status for urban women are shown in the table 5.2. The factors such as Age, economic status and toilet facility were found to be important factors in explaining the variation in chronic energy deficiency. Again in this model the variable region is also excluded due to small number and percentage of observations in most of the regions except Addis Ababa, Dire Dawa and Harari.

Age

Age is one of the factors which found to be an important variable in determining the nutritional status of urban women. According to the multivariate analysis, women whose ages were between 15-19 years were more than 1.5 times to be undernourished as compared to women whose ages were between 20-29 years. Thus urban women whose ages were between 15-19 years were more likely to be undernourished as compared to women between 20-29 years of age.

Economic status

The economic condition of the household is one of the predictors which were important in determining the nutritional status. It was observed that the prevalence of under nutrition varies significantly according to the household's economic status.

Women living in very poor and poor households were more likely to be affected by chronic energy deficiency as compared to women living in rich households. From the table 5.2 women living in very poor and poor households were more than 1.8 and 1.7 times more likely to be undernourished respectively as compared to women living in rich house holds.

Toilet facility

Toilet facility is one of the health related environmental variables which were found to be significantly associated with the nutritional status of women living in urban areas. Women who were living in a household which did not have toilet facility were about 2.1 times more likely to be undernourished as compared to women living in a household which had toilet facility. Thus women living in a household which had toilet facility were less likely to be affected by chronic energy deficiency as compared to women living in a household which did not have toilet facility.

Table 5.3: Estimates of parameters, their standard errors and odds ratio from multilevel logistic regression model for women living in female headed households of urban Ethiopia. Model 2

Variables	B	S.E	Exp(β)
Age			
15-19	0.446	0.262	1.562*
20-29(R)	-	-	
30-39	-0.121	0.366	0.886
40-49	-0.011	0.449	0.989
Household size			
Small(R)			
Medium	-0.062	0.250	0.939
Large	-0.409	0.279	0.664
Parity			
0(R)			
1-3	-0.093	0.335	0.911
4+	0.038	0.483	1.038
Education			
No education	-0.053	0.313	0.948
Primary(R)			
Secondary and above	-0.016	0.258	0.984
Occupation			
Not working (R)			
Working	-0.3	0.208	0.740
Economic status			
Very poor	0.594	0.319	1.811*
Poor	0.554	0.238	1.740**
Rich (R)			
Sources of drinking water			
Improved(R)			
Non improved	-0.001	0.565	0.999
Toilet Facility			
Have facility(R)			
Do not have toilet	0.775	0.298	2.170***

(R) Reference category * P<0.1 ** P<0.05 ***P<0.001 ****P<0.0001

Source : EDHS 2005; computed by the author

5.3 Determinants of nutritional status (CED) among women living in female headed household both in urban and rural area

The factors that were significant in explaining the variation of nutritional status among women living in female headed households are shown in table 5.3. The factors important in explaining the nutritional status of women are age, household size, occupation, toilet facility and region. In the model the regions Benishangul-Gumz and Gambella, and Somali and Afar are grouped together due to the small percentage of observations in these regions.

Age

Table 5.3 shows that age of the woman was found to be significantly associated with the nutritional status of the women. According to the results of the multivariate analysis, women whose ages were between 15-19 years and 40-49 years were more likely to be undernourished as compared to women whose ages were between 20-29 years. Women whose ages were between 15-19 years were at least 2 times more likely to be undernourished than women whose ages were between 20-29 years. Similarly women whose ages were between 40-49 years were at least1.7 times more likely to be undernourished as compared to women whose ages were between 20-29 years.

Household size

Household size is also one of the variables which were found to be significantly associated with the nutritional status of women living in female headed households. As shown in table 5.3 as household size increases the likelihood of being undernourished decreases at the time of the survey. Women who were living in female headed household having 6 or more members were about 41% less likely to be undernourished as compared to women who were living in households having 1-3 members. This may be related with the proportional increment of labor force (productive members) as household size increases.

Occupation

The other factor which was significantly associated with the nutritional status of women in explaining the variation in under nutrition was the occupational status of the woman. As it is shown from table 5.3 the condition of under nutrition was less likely among women whose occupation were non-manual (professional & technical, sales, services and clerical). The likelihood of being undernourished for these women was at least less by 42% as compared to women whose occupation was agriculture.

Toilet facility

One of the health related environmental variables which were statistically significant in explaining the variation in the condition of nutritional status of women was availability of toilet facility. Women who were living in households which did not have toilet facility were 1.5 times more likely to be undernourished as compared to women living in household which had toilet facility. Thus women living in households which did not have toilet facility were more likely to be undernourished as compared to women who had toilet facility.

Region

Region is one of the higher level (second level) variables that operate at the cluster level to cause variation between clusters in terms of nutritional status. From table 5.3 it is indicated that, there was variation in nutritional status by region of residence. The condition of under nutrition in Amhra region was at least less by 43% as compared to Tigray and it is also less by 37% and 47% in Oromiya and SNNP respectively as compared to Tigray. Thus women living in Amhara, Oromiya and SNNP regions were less likely to be undernourished as compared to women living in Tigray regions.

Table 5.4: Estimates of parameters, their standard errors and odds ratio from multilevel logistic regression model for women living in female headed households. Model3

Variables	B	S.E	Exp(β)
Age			
15-19	0.777	0.211	2.175***
20-29(R)			
30-39	0.125	0.266	1.133
40-49	0.558	0.300	1.747*
Household size			
Small(R)			
Medium	-0.192	0.174	0.825
Large	-0.527	0.210	0.590***
Parity			
0(R)			
1-2	0.163	0.263	1.177
3-5	-0.202	0.318	0.817
6+	0.288	0.355	1.334
Education			
No education(R)			
Primary	-0.066	0.198	0.936
Secondary and above	-0.073	0.214	0.929
Occupation			
Not working	-0.207	0.215	0.813
Agriculture(R)			
Manual	-0.303	303	0.738
Non-manual	-0.531	0.258	0.588**
Source of drinking water			
Improved (R)			
Non-improved	-0.073	0.178	0.929
Availability of toilet facility			
Have toilet(R)			
Not have toilet	0.401	0.188	1.493**

Continued from the previous table

Place of residence			
Urban (R)			
Rural	0.161	0.215	1.175
Region			
Tigray(R)			
Amhara	-0.547	0.283	0.578*
Oromiya	-0.457	0.272	0.633*
SNNP	-0.632	0.308	0.531**
Harari	-0.206	0.340	0.813
Addis Ababa	-0.290	0.301	0.748
Dire Diwa	-0.047	0.326	0.954
Afar and Somali	-0.260	0.294	0.771
B.Gumuz and Gambella	-0.017	0.285	0.983

(R) Reference category * P< 0.1 ** P< 0.05 *** P< 0.01

Source : EDHS 2005; computed by the author

5.4 Comparison of nutritional status of women living in female headed households with that of women living in male headed households

The variable sex of household head is dichotomous i.e. male and female. From the multilevel logistic regression model the coefficient for the category female is insignificant. Thus this indicated that there was no significant difference in nutritional status among women living in male and female headed households.

Table 5.5: Estimates of parameters, their standard errors and odds ratio from multilevel logistic regression model for women living in male and female headed households, Model4

Variables	B	S.E	Exp(β)
Sex of house hold head			
Male (R)			
Female	-0.039	0.089	0.962
Age			
15-19	0.484	0.11	1.622****
20-29(R)			
30-39	0.161	0.141	1.174
40-49	0.350	0.158	1.419***
Household size			
Small(R)			
Medium	0.092	0.112	1.096
Large	0.093	0.112	1.097
Parity			
0(R)			
1-2	-0.050	0.138	0.951
3-5	-0.051	0.157	0.950
6+	-0.003	0.175	0.997
Education			
No education(R)			
Primary	0.012	0.103	1.012
Secondary and above	0.006	0.130	1.006
Occupation			
Not working	-0.050	0.120	0.951
Agriculture(R)			

Continued from the previous table

Manual	-0.262	0.204	0.769
Non-manual	-0.353	0.153	0.702***
Source of drinking water			
Improved (R)			
Non-improved	0.038	0.087	1.038
Availability of toilet facility			
Have toilet(R)			
Not have toilet	0.307	0.106	1.359***
Place of residence			
Urban (R)			
Rural	0.294	0.137	1.341**
Region			
Tigray	0.529	0.192	1.697***
Afar	0.152	0.261	1.164
Amhara	0.128	0.182	1.136
Oromiya	-0.089	0.171	0.914
Somali	0.410	0.226	1.506*
Benishangul –Gumuz	0.410	0.219	1.506818*
SNNP	0.013	0.177	1.013
Gambella	0.638	0.206	1.892****
Harari	0.020	0.200	1.020
Addis Ababa (R)			
Dire Dawa	0.483	0.194	1.620***

(R) Reference category * P<0.1 ** P<0.05 ***P<0.001 ****P<0.0001

Source : EDHS 2005; computed by the author

CHAPTER SIX

DISCUSSION OF RESULTS

Nutritional status is an outcome of several processes in a given society. The contribution of several developmental sectors is required for ensuring better nutritional status. The societal processes that operate at different levels as described in the conceptual frame work must work adequately. Food security may not necessarily imply nutrition security. Because individuals living in a food secured household may be malnourished. Nutrition security includes not only food security but also it includes access to health and care. Hence determinants of nutritional status include food security, access to health care together with socio-economic determinants such as employment, education, better economic status and access to infrastructural services such as sanitary toilet facility, safe drinking water and proper waste management. In this study the the results out lined in the previous chapters are discussed as follows:-

Age

Age is one of the demographic variables which affect the nutritional status of the women. All the results of the bivariate and multivariate analysis shows that age was one of the factors which affected the nutritional status of women. From the multivariate analysis it was found that women in the age group 15-19 and 40-49 were more likely to be undernourished as compared to women in the group 20-29. Hence under nutrition is more prevalent for the older and younger age groups. The impact of age on nutritional status is consistent with other studies (Timotiwos and woldemariam 2002, Nabinta, et al 2007, DHS 2005). This may be due to the high requirement of nutrient of young rapidly growing adolescents and in some households food good in quality and quantity is allocated to household members who contribute to household income through some activities such as to male members. And food less in quality and quantity is allocated to household members who contributed less to household income such as to women in the age group 15-19 years old. Moreover the adolescent woman as well as the community is less aware of the health and nutritional requirement of her body. The possible explanation for poor nutritional status of women in the last age category is due to maternal depletion. Women in the older age category are likely to experience a number of pregnancies possibly closely spaced, abortions, and delivery. And older women have no education this could have negatively influenced their knowledge of nutrition obtained from various foods.

Household size

Household size is also found to be one of the variables which affected the nutritional status of women living in female headed households. The descriptive analysis showed that about 18 percent of women living in a household having 6 or more members were undernourished whereas 26 percent of women living in households having 1 member were undernourished. The multivariate analysis indicates that as family size increased the odds of being undernourished decreased. This might be as household size increased in female headed households labor force (number of productive members) might also increased. Thus this may contributed for the betterment of the nutritional status of the woman.

Occupation

The socio-economic variable which affected the nutritional status of women was the type of occupation engaged by women. The bivariate and multivariate analysis indicates that there was difference in nutritional status of women living in female headed households by type of occupation. From the bivariate analysis 31% of agricultural women, 28.4% of not working women and 26.5% of women engaged in manual work was malnourished whereas 20.5 % and 11.5% of women engaged in non-manual and professional activities respectively were undernourished. The multivariate analysis also indicates that the risk of under nutrition was less likely for women whose occupation was non manual (professional, services, sales and clerical) as compared to women whose occupation was agriculture. The result of this study is consistent with the findings of Edmundson WC and Edmundson SA (1988) and Timotiwos and Woldemariam (2002). This may be due to women whose occupation were agriculture were likely to be rural resident and illiterate and hence sanitation coverage as well as access to safe drinking water is very low. These expose women to different infections which in turn affects the nutritional status of women. Female farmers have to do both agricultural and domestic chores this causes time constraints to women. Consequently, it may be difficult for a woman to access social services such as health and to participate in other off-farm activities to increase her earnings. Hence the health status as well as the income of the woman becomes low which results in poor nutritional status of the woman. Moreover the high energy demand of agricultural activity combined with reproductive roles of women deteriorates the nutritional status of women.

household. Therefore, these might be the possible reasons for the existence of better nutritional status for women living in Amhara, Oromiya and SNNP regions as compared to women living in Tigray regions.

Parity

There is no significant association between parity and nutritional status of women living in female headed households at national level. This might be that parity may not accurately indicate or measure the impact of reproductive stress since it does not take in to consideration miscarriages, abortions or still births, birth intervals and hence it does not capture the great impacts of overlapping pregnancy and lactation (Adams et al 1998).

The result obtained from rural data indicates that rural women who have 1-2 parity were affected by chronic energy deficiency as compared to women having zero parity. This result is consistent with other findings (Okwu, et al 2007). This is probably due to 1-2 parity women living in rural areas are likely to give birth at early ages. This affects the nutritional status of women because there will be a competition for food between the growing fetus and her body therefore, the women may not get sufficient nutrient. Utilization of maternal health services by these young women in rural areas are low due to socio-cultural reasons hence this might also affect the nutritional status of women.

Economic status

Economic status for the rural model (model 1) is insignificant. However the economic status of the household was important in determining the nutritional status of women living in urban area. The multivariate analysis indicates that women living in poor and very poor households were much more likely to be undernourished as compared to women living in rich households. The result of this study is consistent with the result of other studies (Adams 1998, Haseen 2004). This is possibly due to inadequate food intake, little or no access to health facilities, less prepared in overcoming seasonal food shortages, poor sanitation (absence of toilet facility), and lack of caring practices in poor and very poor households.

CHAPTER SEVEN

CONCLUSIONS AND RECOMMENDATIONS

7.1 Conclusions

This study attempted to identify various individual, household, societal and environmental factors that significantly affect the condition of under nutrition for women living in female headed household using data obtained from 2005 EDHS.

The results obtained from this study showed that 26.6 % of women living in female headed households were undernourished. The prevalence of under nutrition was highest among women living in rural areas (30.9 %) than their urban counterparts (19.8 %). Variation in nutritional status was also observed according to some demographic, socio-economic, regional and environmental factors.

Multilevel logistic regression model is used to determine the most important factors that affected the nutritional status of women. Among the variable included in the national model (model 3) age of the woman, household size, occupation and availability of toilet facility were identified as the factors that significantly affect the condition of under nutritional for women in female headed households. Among the variables included in the urban model (model 2) age of women, economic status and availability of toilet facility were the factors that affect the nutritional status of women living in urban areas. However age, parity and toilet facility were identified as the most important factors that affect nutritional status of women in rural areas. The result of the study indicated that the level of under nutrition was highest for women living in female headed households whose ages were between 15-19 and 40-49 years old, having small family size, whose occupation was agriculture, and living in a household which did not have toilet facility.

There was association between nutritional status of women and region of residence. Women in female headed households living in Amahara, Oromiya and SNNP had better nutritional status as compared to women living in Tigray regions.

From the urban model (model 2), women living in very poor or poor households were affected by chronic energy deficiency (under nutrition); and under nutrition is high for women whose ages were between 15-19 years old. However from the rural model (model1) under nutrition was

high for women having small parity (1-2), whose ages were between 15-19, 30-39, and 40-49 years old.

The comparison of the nutritional status of women living in female headed and male headed households showed no significant difference.

7.2 Recommendations

The following recommendations are suggested based on the findings of this study:-

- ✓ The findings of the study showed that under nutrition was higher among adolescent women and older women (40-49 years). Therefore, it may be important to create awareness about the importance of health and nutrition to adolescents and women between 40-49 years. And it may be necessary to create awareness about the disadvantages of closely spaced and frequent pregnancies and hence having many children as well as not to give birth at older ages particularly in the rural areas. Moreover it is necessary to create better access to health services (including maternal health), awareness about the importance of health services, and implement programs that distributes micronutrients. These can be achieved through nutrition and health education to the women in particular and the family and community in general.

- ✓ In rural areas a 1-2 parity women are affected by chronic energy deficiency. These women might be adolescents since in rural areas early marriage, sexuality and hence early childbearing is common. Therefore, Government organizations and NGO's must work to reduce early marriage, sexuality and adolescent motherhood through education, by providing youth friendly family planning services and by promoting the importance of utilization of maternal health services.

- ✓ Improve environmental sanitation in general; this could be done particularly by helping the community in the construction of toilets.

- ✓ Measures should be taken to improve the economic status of very poor and poor households. These measures should include access to vocational training, increasing women's access to paid employment in the modern sector of the economy, access to credit and targeting poor women as direct beneficiaries of the government's developmental policies (such as small industry) specifically in urban areas.

- ✓ Measures should be taken to reduce the work load of women living in female headed households and whose occupation is agriculture. Therefore strategies must be developed to increase productivity of women per unit of time so that women can have time for accessing social services such as health. Introduce appropriate labor saving technology which can increase productivity and reduce time constraints and access to financial services (including loans) so that women can buy this technology and productivity enhancing tools and equipment such as agricultural inputs, fertilizers and improved seeds and seedlings. In addition off-farm employment opportunities should be promoted (blacksmithing, tailoring, sewing and weaving).

- ✓ In this study as household size increased the nutritional status of women was also improved. This might be as household size increased the number of productive household members may also increase. This suggested that as working individuals increase in female headed households the burden to the woman decrease because she can share some of the works. This indicates the importance of labor in households. Therefore, it is advisable for these women to strengthen their social network i.e. a network of friends, families so that these networks provide women direct access to labor, information as well as the provision of financial assistance.

- ✓ Since this study includes both de jure and de facto female heads a study about the nutritional status of women living in de jure female headed households should be conducted.

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Annex

Table 1: index for preference of terminal digits by Myers' Blended Method

	Starting at age							
terminal digit	20+a	30+a	Column1	column2	number	percent	deviation	abs. of deviation
0	194	108	1	9	1166	15.68	5.68	5.68
1	64	36	2	8	416	5.59	-4.41	4.41
2	78	46	3	7	556	7.48	-2.52	2.52
3	79	35	4	6	526	7.07	-2.93	2.93
4	69	34	5	5	515	6.92	-3.08	3.08
5	157	110	6	4	1382	18.58	8.58	8.58
6	77	40	7	3	659	8.86	-1.14	1.14
7	72	46	8	2	668	8.98	-1.02	1.02
8	100	59	9	1	959	12.89	2.89	2.89
9	59	41	10	0	590	7.93	-2.07	2.07
Total					7437			34.31
							Summary index	17.16

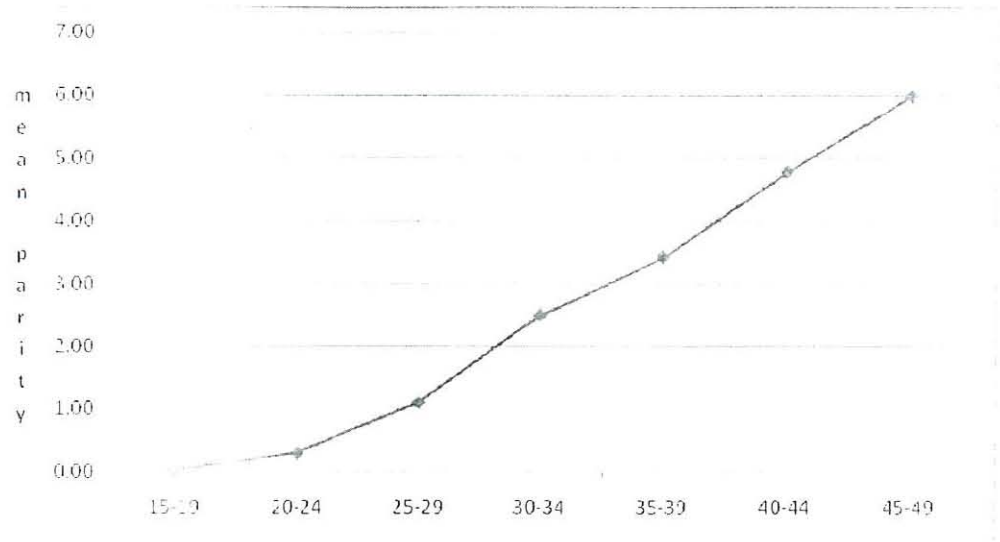
Source : EDHS 2005; computed by the author

Table 2: variance inflation factors (VIF) of the variables included in all models

	Variance inflation factor			
Variables	Model 1	Model 2	Model 3	Model 4
Age	3.25	2.18	2.99	3.127
House hold size	1.17	1.11	1.05	1.141
Parity	3.1	2.30	3.28	3.354
Sex of house hold head	-	-	-	1.135
Education	1.48	1.27	1.83	1.837
Occupation	1.06	1.10	1.12	1.098
Economic status	2.54	1.28	-	-
Access to land	1.29	-	-	-
Access to herds	1.96	-	-	-
Source of drinking water	1.08	1.04	1.39	1.252
Availability of toilet	1.17	1.15	1.69	1.635
Place of residence	-	-	2.28	2.379
Region of residence	-	-	1.1	1.466

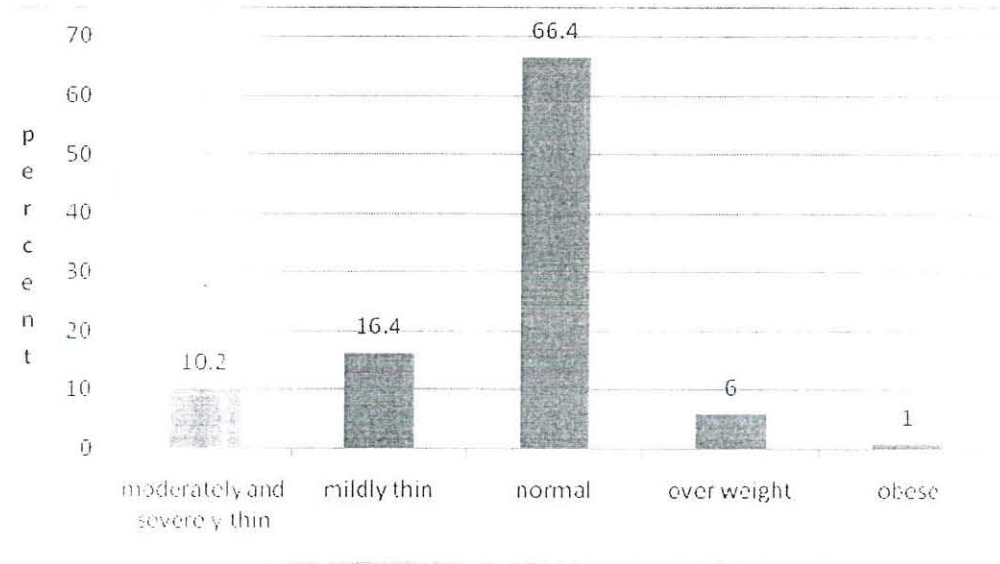
Source : EDHS 2005; computed by the author

Figure 1: graph showing the average parity of women by five year age group of women



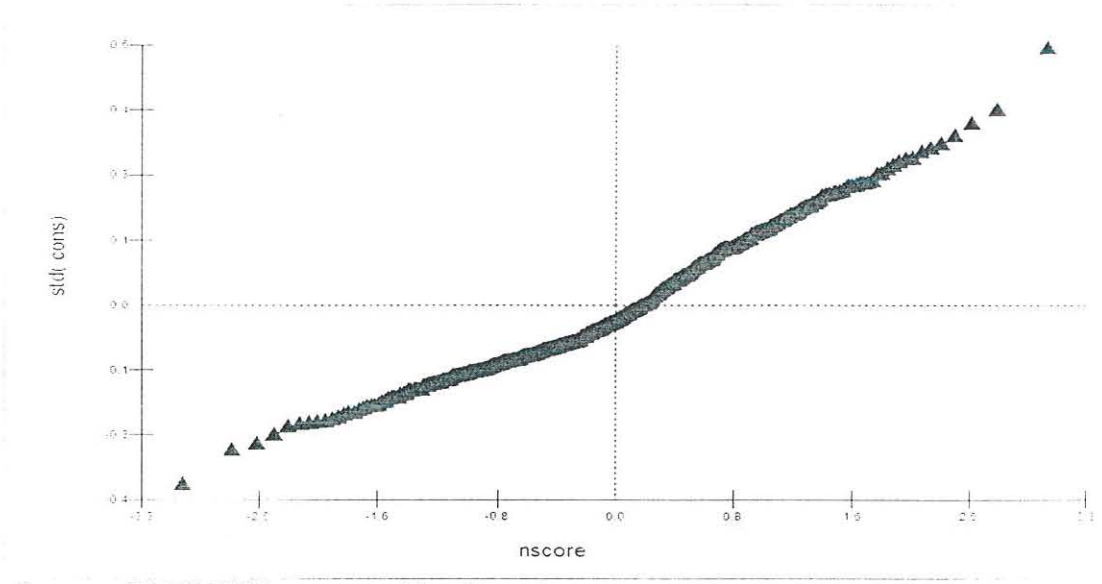
Source EDHS 2005; computed by the author

Figure 2: Percentage of women in different categories of nutritional status.



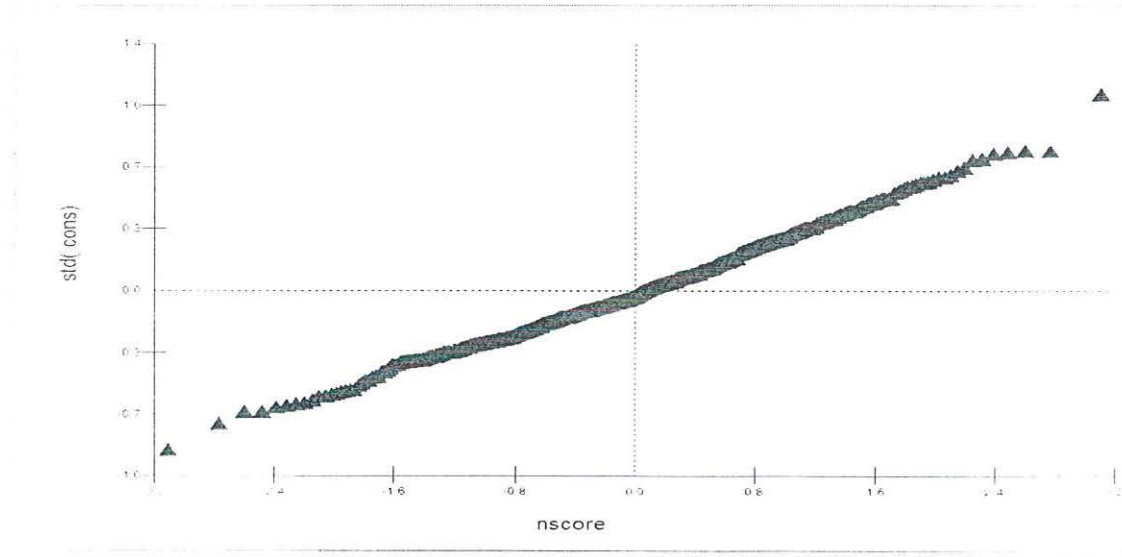
Source EDHS 2005: Computed by the author

Figure 5: plot of normal scores against level2 standard residual for model3



Source : EDHS 2005; computed by the author

Figure 6: plot of normal scores against level2 standard residual for model4



Source : EDHS 2005; computed by the author

Declaration

The thesis is my original work, has not been presented for a degree in any other university and that all sources of material used for the thesis have been duly acknowledged.

Kassahun Abere		29/10/2001
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I confirm that this thesis has been submitted with my approval as the supervisor of the same.

Assefa Hailemariam		2/2/09
Advisor	Signature	Date