

**ADDIS ABABA UNIVERSITY  
COLLEGE OF HEALTH SCIENCES  
SCHOOL OF PUBLIC HEALTH**



**Trends and Magnitude of Women's Overweight and/or Obesity and its socio-demographic correlates among Urban Ethiopian women, urban Ethiopia; Evidence from EDHS, 2000 to 2011**

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## **Dedication**

This thesis work is dedicated to my mother W/ro Workinesh Abera who has been the source of inspiration, engine of courage, and the secret for all of my achievements through all aspect of my life and without her scarification I would not have been reached to this stage.

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## **List of Acronyms and Abbreviations**

BMI	Body Mass Index
CI	Confidence Interval
CWC	Commonwealth Countries
CSA	Central Statistical Agency
DALYs	Global Disability Adjusted Life Years
DHS	Demographic Health Survey
EDHS	Ethiopia Demographic Health Survey
Kg/m <sup>2</sup>	Kilogram per Meter Square
NCD	Non Communicable Diseases
OR	Odds Ratio
SES	Socioeconomic Status
PCA	Principal Component Analysis
PR	Prevalence Ratio
USA	United States of America
SNNPR	Southern Nations Nationalities and Peoples Region
WHO	World Health Organization

## Abstract

**Background:** Overweight and obesity are among the risks factors of various chronic diseases. In developing countries undergoing nutritional transition, overweight and/or obesity is becoming more prevalent among women. Though less attention is given to the problem of overweight and/or obesity in Ethiopia, its prevalence is on a rise among urban Ethiopian women (15% in 2011). Hence, documenting the magnitude of overweight and/or obesity and identifying its socio-demographic correlates will help to understand the scope of overweight and/or obesity among urban women.

**Objective:** To examine trends and magnitude of overweight and/or obesity and to identify its socio-demographic correlates among urban Ethiopian women aged 15-49, between 2000 and 2011.

**Methodology:** Cross sectional data from the three Ethiopian Demographic Health Surveys was used for this study. A total of 7,312 non pregnant urban women were included in this study. The main outcome of interest was overweight and/or obesity and the independent variables were age, wealth index, parity, occupation, region of residence, educational and marital status. Complex sample descriptive, bivariate and multivariate logistic regression was used to analyze the data.

**Results:** The prevalence of overweight and/or obesity among urban women was 10.7% in 2000, 14.0% in 2005 and 14.9% in 2011. The overall prevalence increased by 4% from 2000 to 2011 though it was not statistically significant: [from 10.7% with 95% CI; (9.8, 12.8) in 2000 to 14.9% with 95% CI; (12.4, 17.6) in 2011]. Particularly, the prevalence significantly increased over time among women who were older, 40-49 years: [from 15.6% with 95% CI; (11.6, 20.5), in 2000 to 32.2% with 95% CI; (25.4, 39.8), in 2011,  $\chi^2=25.7$  and  $p < 0.001$ ]. It was also significantly increased among those who were residents of the three Metropolis (Addis Ababa, Dire Dawa and Harari): [from 15.9% with 95% CI; (13.3, 17.7) in 2000 to 20.3% with 95% CI; (18.2, 22.50), in 2011,  $\chi^2=5.3$  and  $p < 0.05$ ].

Being older, 40-49 years, [OR=4.5 (95% CI; (2.2, 9.0)], attainment of secondary education or above, [OR= 2.5 (95% CI; (1.4, 4.7)] and living in the three metropolis [OR=5.8 (95% CI; (3.2, 10.4)] were significantly and positively associated with the condition of overweight and/or obesity in 2000.

Being older, 40-49 years, [OR=5.1 (95% CI; (2.3, 11.7))], resident of the three Metropolis, [OR=3.8 (95% CI; (1.4, 8.2))], in the richest quintile, [OR=2.2 (95% CI; (1.2, 4.1))], attainment of secondary education or above, [OR=2.2 (95% CI; (1.2, 4.3))] and being currently married [OR=2.5 (95% CI; (1.2, 5.3))], were found to be significantly and positively associated with being overweight and/or obese while women engaged in manual work were less likely to be overweight and/or obese, [OR=0.4 (95% CI; (0.2, 0.8))] in 2005.

The odds of being overweight and/or obese was significantly higher among women who were older, 40-49 years [OR=9.8 (95% CI; (5.1, 13.8))], resident of the three Metropolis [OR=2.2 (95% CI; (1.2, 4.2))], in the richest quintile, [OR=1.8 (95% CI; (1.1, 2.5))], currently married [OR=2.0 (95% CI; (1.2, 3.1))] and among those with secondary education or above [OR=2.0 (95% CI; (1.3, 3.1))].

**Conclusions and Recommendations:** the findings of this study have provided information on the prevalence and socio-demographic correlates of overweight and/or obesity among urban Ethiopian women. The findings also showed that the problem of overweight and/or obesity is on a rise among urban Ethiopia women. Hence, there is a need for policies and public health interventions which promote healthy lifestyle (consumption healthy diet and doing regular physical activity) to address the problem of overweight and/or obesity. These policies and interventions need to be age sensitive and need to target more urbanized cities and towns. However, the scope of such interventions can be broadened based on evidences from future researches.

## **1. Introduction**

### **1.1 Background**

Overweight specifically refers to an excessive amount of body weight that may come from muscles, bone, adipose (fat) tissue and water while obesity specifically refers to an excessive amount of adipose tissue [1].

Worldwide, 2.8 million people die each year as a result of being overweight and obese. An estimated 35.8 million (2.3%) of global disability adjusted life years (DALYs) are caused by overweight or obesity [2, 3].

In most regions of the world, overweight now exceeds underweight among women of reproductive age [4]. The rapid emergence of overweight and obesity in developing countries has been recognized as a major public health problem [5]. In low-income countries women's overweight and obesity showed the most dramatic increases and in 2008 were double those of men. In these low-income countries women's overweight doubled from 9% in 1980 to 18% in 2008 and obesity more than doubled from 2-5%. [6].

In Ethiopia, 6% of women were overweight or obese nationally in 2011; however, the prevalence of overweight or obesity was 14.9% in 2011 among urban Ethiopian women [7, 8]. In addition, few studies conducted on chronic diseases risk factors showed an increase in the prevalence of overweight and obesity (23.4%) [9].

A recent study (in 2009/10) from Addis Ababa showed that one third of female permanent commercial bank employees and public school teachers were either overweight or obese [10].

Thus, this study was intended to examine the changes in the overall magnitude of overweight and/or obesity between 2000 and 2011; and to identify the corresponding socio demographic correlates among women of child bearing age in urban Ethiopia.

## **1.2. Rationale of the study**

Although much is known about the prevalence, causes and medical impacts of overweight or obesity in developed countries, very little is known about its incidence and health effects in Africa including Ethiopia [11]. The main focus of research and investment in health is on communicable diseases in Ethiopian.

In developing countries undergoing nutritional transition, an ever-increasing overweight and/or obesity is found among women [12-14]. There is increased risk of co-morbidities for BMI in the range of 25.0 to 29.9 kg/m<sup>2</sup> and moderate to severe risk of co-morbidities for a BMI greater than 30 kg/m<sup>2</sup> [3]. This may be considered as an alarming sign for the future burden of chronic diseases in these countries [15].

Ethiopia has a responsible unit for non-communicable diseases (NCDs) under the Federal Ministry of Health. Risk factors for chronic diseases are not included in the national health reporting system which report cause-specific morbidity and mortality due to non-communicable diseases. There is no integrated or topic-specific action plan which is currently operational for overweight or obesity and other risk factors for chronic diseases [3].

Despite the increasing prevalence of overweight and/or obesity in Ethiopia [9, 10, 16-18], especially in urban setting and the policy relevance of ascertaining who is being affected and where it is more prominent; data on the prevalence of overweight and/or obesity is lacking in Ethiopia among the general population in general and among women of child bearing age in particular.

Hence, this study was conducted to provide evidence based information on the overall trend, magnitude and socio-demographic correlates of overweight and/or obesity among women of child bearing age in urban Ethiopia by using data from the three Ethiopian Demographic and Health Surveys; thereby generating useful insight to address the growing challenges in overweight and/or obesity and consequent chronic diseases in urban Ethiopia.

## 2. Literature Review

### 2.1. Magnitude of overweight and/or obesity

Body weight is affected by a set factors including: socio-demographic, behavioral, environmental, metabolic and genetic factors. Body mass index (BMI) which reflects an adult's weight in relation to his or her height and is often used as a measure of excess body weight. An adult with a BMI between 25 and 29.9 kg/m<sup>2</sup> and with BMI 30 kg/m<sup>2</sup> or higher is considered as overweight and obese respectively [1].

The worldwide prevalence of obesity has nearly doubled between 1980 and 2008. In 2008, 10% of men and 14% of women in the world were obese (BMI  $\geq$ 30 kg/m<sup>2</sup>), compared with 5% for men and 8% for women in 1980 [3]. In the 1990's, the percentage of obese women was 0.1% in South Asia, 2.5% in Sub-Saharan Africa, 9.6% in Latin America and the Caribbean, 15.4% in Central Eastern Europe (Commonwealth of Independent States), 17.2% in the Middle East and North Africa and 20.7% in the USA [19].

The prevalence of overweight and/or obesity is highest in the WHO region of the Americas (62% overweight for both sexes, and 26% obese) and lowest in the WHO region for South-East Asia (14% overweight for both sexes and 3% for obesity). In the WHO European region, the Eastern Mediterranean and the region for the Americas over 50% of women are overweight. In all WHO regions, women are more likely to be obese than men. In African, South-East Asian and Eastern Mediterranean Regions women had roughly double the obesity prevalence of men [3].

Though overweight and/or obesity are usually linked with only high income countries so far, low and middle income countries are not spared currently. Recent studies showed that the prevalence of obesity has accelerating among both the poor and the rich in developing countries [14, 20, 21]. Over the past several decades, the prevalence of overweigh and/or obesity has been increasing both in developed and developing countries, and more noticeably in urban areas [22, 23]. It is currently estimated that as much as 20-50% of urban populations in Africa are classified as either overweight and/or obese [23, 24] and by 2025, 75% of the overweight and/or obese population worldwide will be in non-industrialized countries [15]

In depth analysis of demographic and health surveys has shown an increase in the prevalence of overweight and/or obesity among women of child bearing age in far east (Bangladesh, Nepal, India) and Africa [25-27]. Adjusted prevalence of overweight and/or obesity increased by 2.4, 4.2, and 1.3 times between the first and last survey in Bangladesh, Nepal, and India respectively and was positively associated with age, increased relative to wealth (adjusted P-trend < 0.001) and urban residence. The prevalence of overweight and/or obesity was positively related to women's educational status in Bangladesh and India (adjusted P-trend < 0.001) but this pattern was not observed in Nepal. Analyses of the earliest surveys suggested that the strength of the association between education and overweight and/or obesity has weakened over time, whereas the positive relation with wealth has become stronger in Nepal [26].

Analysis of the 2003 Nigerian demographic and health survey showed that 14.3% and 5.5% of women were overweight and obese respectively and a clear socioeconomic distribution which underlie the patterns of nutritional status was found [27]. Similarly in depth analysis of the 1998 South Africa demographic and health survey showed that 56.6% of women were overweight and/or obese; obesity has been increased with age and higher levels of obesity were found in urban women [25].

In adjusted models, BMI was 2.32 units higher among women in the wealthiest quintile compared with women in the poorest quintile in the earlier surveys and was 3.00 units higher in the later surveys. The association between BMI and wealth was positive in 37 countries in the earlier round of surveys and in 36 countries in the later round. Patterns were similar for the prevalence of overweight [28].

The prevalence of obesity among women attending prenatal clinic in urban Tanzania rose steadily and progressively from 3.6% in 1995 to 9.1% in 2004 and is positively associated with age, parity, socioeconomic status and inversely with HIV infection [29]. Similarly a cross-sectional study among young adults (50.5% were women and 53.2% with urban residence) conducted in Uganda showed that the prevalence of overweight and obesity in women was 17.4% and 2.9% respectively [30].

## **2.2. Impact of Overweight and Obesity**

Obesity is a recognized risk factor for chronic diseases such as cardiovascular diseases, hypertension, stroke, type two diabetes mellitus and certain cancers [11, 31]. These conditions not only lead to reduced quality of life given their protracted nature, they also lead to premature death. Mortality rates increase with increasing degrees of overweight as measured by BMI. Overweight and obesity are related to morbidity and mortality from chronic diseases. [3].

More than 80% of people with diabetes are overweight or obese. People who have gained 11 to 18 pounds have twice the risk of developing type 2 diabetes when compared to individuals who have not gained weight. The incidence of heart disease is increased in overweight or obese individuals. The rate of high blood pressure among obese people is double that of people with a healthy weight. Obesity is associated with elevated triglycerides (blood fat) and decreased HDL cholesterol ("good cholesterol"). Risk of some cancers such as colon, gall bladder, prostate and kidney is increased among people who are overweight and obese [32].

Being overweight and/obese is associated with an increased risk of morbidity and mortality for both the mother and the infant from pregnancy and delivery related problems. Obese women who are pregnant are more likely to have gestational diabetes, to face problems with labor and delivery and being at increased risk of long term obesity. They suffer from increased risk of miscarriage (three-fold) and operative delivery (20.7 versus 33.8% in the obese and 47.4% in the morbidly obese group). In addition, they may suffer from irregular menstrual cycles and infertility. Women who are overweight and obese are at increased risk for breast cancer (in postmenopausal women) and endometrial cancer. Other risks to the mother include an increased risk of pre-eclampsia (3.9 versus 13.5% in the obese group) and thromboembolism (0.05 versus 0.12% in the obese group).

Infants born to obese women have a fourfold increase in perinatal mortality (5.7 per 1000 in the obese group versus 1.4 per 1000 for infants born from women with normal body weight) and nearly a two fold increase in birth weight (>90th centile ; 9% versus 17.5% in the obese group). In addition, they are more likely to be delivered via cesarean section and to suffer adverse consequences during delivery. An increased risk of birth defects, particularly neural tube defects such as spinal bifida is associated with pregnancy among obese women [33].

As the developed world struggles to deal with a proportionately high burden of chronic diseases developing countries and countries undergoing socioeconomic transition are experiencing a mixed epidemic of chronic and infectious diseases [34]. Therefore, tackling the problem of overweight and/or obesity has an important policy relevance given the existing burden of communicable diseases.

Deaths from infectious diseases, maternal and perinatal conditions; and nutritional deficiencies combined are projected to decline by 3% over the next 10 years, while at the same time deaths due to chronic diseases are projected to increase by 17%. As a result, it is estimated out of the projected 64 million deaths worldwide in 2015, 41 million (64%) will result from chronic diseases - unless urgent action is taken [15]. Hence, addressing overweight and/or obesity should be considered as one entry point to reverse or mitigate this problem.

### **2.3. Overweight or obesity in Ethiopia**

According to a cross-sectional survey conducted in the mid-1990s among 15–24-year-old young adults in Addis Ababa, Ethiopia, only 0.7% of men and 6% of women were obese [35].

Recent studies conducted in Ethiopia (three studies from Addis Ababa and one in wonji shoa sugar factory) showed considerably higher prevalence of overweight or obesity among women. The prevalence of overweight or obesity among women was 34.5% among bank workers and teachers[10]. Another study on nutritional status and household food security in Addis Ababa showed that 26.7% of women were overweight or obese[16]. A study on comparison of adiposity and cardiovascular risks in Addis Ababa showed that 20% of men and 38% of women were overweight and 10.8% of these women were obese [18]. A study in wonji sugar factory also showed that 37.1% of day workers and 31.4% of shift workers were overweight or obese[17].

A cross sectional study on risk factors for cardiovascular diseases among diabetic patients in southwest Ethiopia showed that the prevalence of obesity was 23.4% while the prevalence for physical in activity, hypertension, dyslipidemia, and current smoking was 55.1% , 46.5%, 63.5%, and 5.5% respectively [9].

In the last two decades there have been changes in lifestyle of urban people with significant population growth in Ethiopia. Being overweight and/or obese and subsequent chronic diseases are common in urban Ethiopia. In 2007, a study conducted at Tikur Anbessa specialized hospital in showed that cardio vascular diseases are the leading causes of mortality among diabetic patients [36, 37].

A study done in the mid 1990's among Ethiopian immigrants to Israel showed that they tend to develop diabetes mellitus when exposed to civilized living style. As civilization spreads, cardiovascular diseases become increasing health burden that require skillful and cost effective management [36, 38]. As urbanization is on a rise in Ethiopia, lifestyle changes which predispose to overweight and/or obesity and consequent chronic diseases are inevitable in the near future.

#### **2.4. Risk factors for overweight and or obesity**

Risk factors for overweight and/or obesity include: demographic factors such as age, gender; and socioeconomic status, urban residence, educational status, marital status, social and behavioral factors and diet related factors [22, 26, 27, 39-41].

Marked shifts in diet (changes in dietary patterns and composition of diets coupled with availability of processed foods); urbanization and lifestyle (increased motorization, reduced physical labor and increased mechanization of home production-related activities) that have been accompanied by economic development are considered to be the major drivers for the growing challenge of overweight and obesity [14, 42]. According WHO, obesity is considered as a major health problem in many developing countries, particularly in adult women.

Urbanization accompanied by access to energy dense foods and less strenuous jobs thereby resulting a positive energy balance which in turn increases the condition of overweight and/or obesity [15, 23, 43]. Despite being the least urbanized continent, Africa's population is becoming increasingly urban and its cities are growing at unprecedented rates. Africa's urban population was 15 % of the total population in 1950 and is projected to exceed the 50 % by 2030 [22, 44, 45]. The problem of overweight and/or obesity is more likely to increase in parallel in urbanization [22].

Globally, a one-quartile increase in wealth is associated with a 0.54 increase in BMI and a 33% increase in overweight in adjusted models. Although the strength of this association varied across countries, the association between wealth and overweight is positive in 96% (52 of 54) of the countries. The socio-economic status (SES) gradients tended to be greater in urban areas [41].

Socio economic status (SES) is most often measured by income and education [46]. Income primarily affects obesity in terms of the resources available to buy food and to participate in leisure time physical activities. Education is associated with the acquisition of beliefs and knowledge; and enables people to integrate healthy behaviors into a coherent lifestyle and gives them a sense of control over their health [47]. While low socioeconomic economic status and poor neighborhoods have been associated with a higher prevalence of obesity and chronic diseases in developed countries [48, 49], studies in Africa have demonstrated by contrast a strong positive relationship between obesity and high socioeconomic status [50, 51].

In very poor countries, such as in Sub-Saharan Africa, overweight and/or obesity is greatly concentrated among urban and higher educated women. However, in more developed countries, such as those in America and the Central Eastern Europe regions, obesity levels is more equally distributed in the general population [19]. A study in Ghana among women of child bearing age showed a higher prevalence of overweight and/or obesity among women with secondary education or above [40].

Studies conducted in Africa also showed the positive association of overweight and/or obesity with socio-demographic factors such as age, marital status and occupation among women of child bearing age [22, 27, 40]

Other factors that have been shown to be associated with a higher risk of overweight and/or obesity include genetic predisposition, metabolic disorders and physical and environmental factors [15, 24, 50, 52-54].

### **3. Objectives:**

#### **3.1. General objective**

To examine the trend and magnitude; and to identify socio demographic correlates of overweight and/or obesity among women in reproductive age group in urban Ethiopia using data from the three Demographic and Health Surveys conducted in Ethiopian, between 2000 and 2011.

#### **3.2. Specific objectives:**

- To examine the trend and magnitude of overweight and/or obesity among urban Ethiopian women between 2000 and 2011;
- To identify the socio demographic correlates of overweight and/or obesity.

## **4. Methodology**

### **4.1. Study design and Data Sources**

Data from nationally and sub nationally representative household surveys (EDHS) was used for this study. DHS employed multistage stratified cluster sampling design that provides cross-sectional data on a wide range of health indicators including nutritional status women, under five children and men (only 2011). Surveys are typically carried out every 5 year through well-described and standardized methodology and usually include women aged 15–49 years with anthropometric measurements and other health status indicators [7, 8, 55].

### **4.2 Study population and sample size**

#### **4.2.1. Source and study population**

A total of 9237 urban women were interviewed in the three surveys: 2,791 in 2000, 2,499 in 2005 and 3,947 in 2011 while weight and height measurements were available for 7662 urban women: 2765 in 2000, 1145 in 2005 and 3752 in 2011. That is, weight and height measurements were not available for 1575 urban women because some of them were not present while other refused and because no measurement was found in the household. After excluding pregnant women, those with extreme body mass index values and flagged cases. The final analytical sample was consisted of 7,312 non pregnant women with BMI value between  $12.00\text{kg/m}^2$  and  $50.00\text{kg/m}^2$ : 2591, 1119 and 3602 from the 2000, 2005 and 2011 surveys respectively [7, 8, 55].

#### **4.2.2. Inclusion and exclusion criteria**

Pregnant women (338) and those with outliers, BMI and  $>50.00\text{kg/m}^2$  and flagged cases (12) were excluded from this study.

### **4.3 Sample Selection and sampling procedure**

#### **4.3.1. Sampling frame**

The population enumeration areas (EAs) of the 1994 Census was used as a sampling frame for drawing the sample for the 2000 and 2005 EDHS [8, 55, 56], while the 2007 Population and Housing Census conducted by the CSA was used as a sampling frame from which the 2011 EDHS sample was drawn [7, 57].

### **4.3.2. Sampling technique and procedure**

In the census frame, each of the 11 administrative areas is subdivided into zones and each zone into weredas which then sub-divided into kebelas which are then further sub divided into convenient areas called census enumeration areas (EAs). Selected population census enumeration areas (EA) which were used as primary sampling unit and selected households were secondary sampling units whereas household members were observational or study units [7, 8, 55].

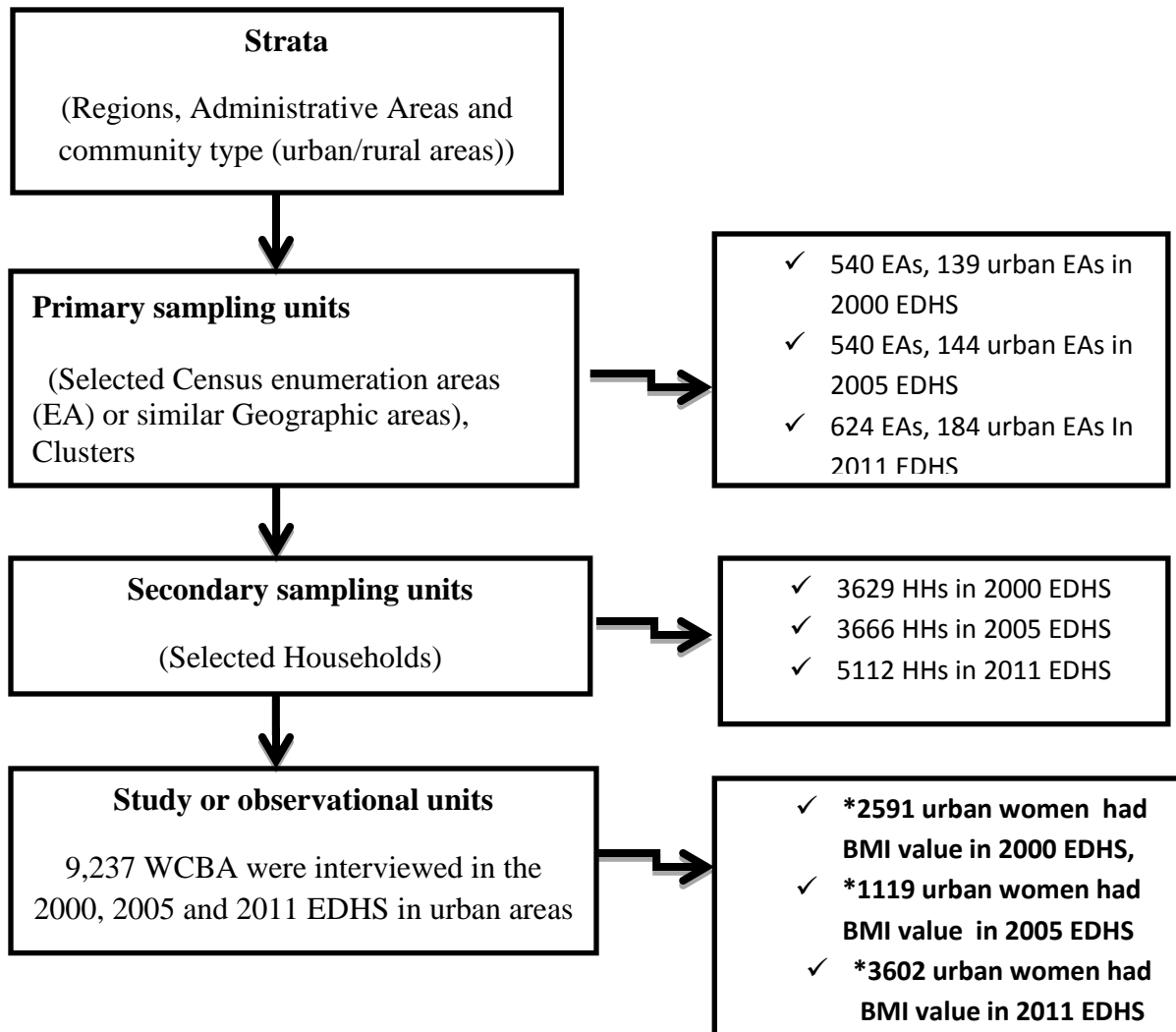
A complete household listing operation was carried out in all the selected EAs to provide a sampling frame for the second-stage selection of households. To avoid an uneven sample allocation among regions, the sample was allocated by region in proportion to the square root of the region's population size instead of proportional sample allocation since this procedure yielded a distribution in which 80 percent of the sample came from three regions alone [8, 55].

In addition, design based weights specifically "survey weights" were applied in EDHS surveys to have a representative sample which provide unbiased estimate of the population parameter.

In the first EDHS, a total 14,642 households and 540 clusters (401 rural and 139 urban) were selected to select a systematic sample of 27 households per EA at the second stage of sampling in all the regions so that the sample size for each region included at least 700 households to provide statistically reliable estimates of key demographic and health variables. Fieldwork was successfully completed in 535 of the 540 clusters, with the 5 clusters not covered primarily due to reasons of inaccessibility [55].

In the 2005 EDHS, a representative sample of approximately 14,500 households from 540 clusters was selected. In the first stage, 540 weighted clusters (145 urban and 395 rural) were selected from the list of enumeration areas (EA) from the 1994 Population and Housing Census sample frame. As part of the second stage, a complete household listing was carried out in each selected clusters. The listing operation lasted for three months from November 2004 to January 2005. Between 24 and 32 households from each cluster were then systematically selected for participation in the survey [8].

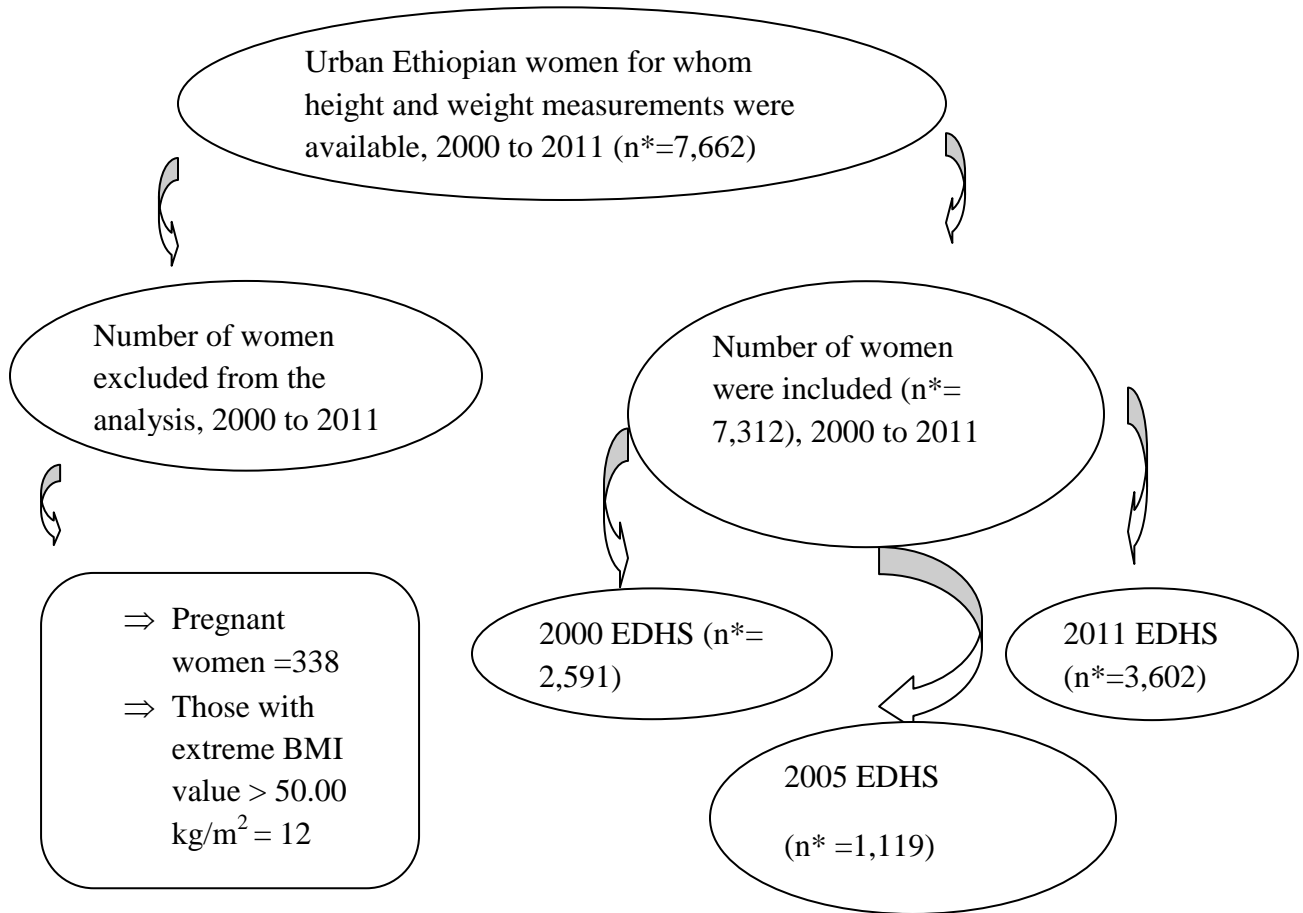
A representative sample of 17,817 households were selected for the 2011 EDHS, 624 EAs, 187 in urban areas and 437 in rural areas. A complete listing of households was carried out in each of the 624 selected EAs from September 2010 through January 2011. Sketch maps were drawn for each of the clusters, and all conventional households were listed [7].



\* =weighted count of non-pregnant women and those with BMI values between 12.00 kg/m<sup>2</sup> and 50.00 kg/m<sup>2</sup>.

**Figure 1: Schematic representation of the two stage stratified cluster sampling employed in the Ethiopia Demographic and Health Surveys (for urban sample)**

A total of 7,662 urban Ethiopian women had weight and height measurements from 2000 to 2011: 2,765 in 2000, 1,145 in 2005 and 3,752 in 2011, while a total of 7,312 non-pregnant women with BMI values between 12.00 kg/m<sup>2</sup> and 50.00 kg/m<sup>2</sup> were included of this study.



\*=weighted count of non-pregnant women and those with BMI values between 12.00 kg/m<sup>2</sup> and 50.00 kg/m<sup>2</sup>.

**Figure 2: Schematic representation of urban women included in this study, 2000 to 2011**

#### **4.4 Data Collection**

The data sets used for this study was obtained from measure DHS project ([www.measuredhs.com](http://www.measuredhs.com)).

The Response rate for the urban sample was 98.0% in 2000, 94.4% in 2005 and 94.2% in 2011.

Data were collected by visiting households and conducting face-to-face interviews to obtain information on demographic characteristics, wealth, nutritional and sexual behavior, among other data, in the respective data collection time for the three EDHS surveys.

Height and weight measurements were carried out on women age 15-49, men age 15-59, and Children under age 5 in all selected households. Weight measurements were obtained using lightweight, SECA mother-infant scales with a digital screen, designed and manufactured under the guidance of UNICEF. Height measurements were carried out using a measuring board [7, 8, 55].

#### **4.5 Variables**

##### **4.5.1. Outcome variable**

- Overweight or Obesity (Yes, No)

##### **4.5.1. Independent variables**

- Age,
- Wealth quintile, as a proxy measure of socio-economic status,
- Educational status of women,
- Parity,
- Occupation and
- Marital status.

#### 4.6. Operational Definitions

- **Body mass index (BMI):** Weight in kilograms divided by height in meters squared.
- **Overweight:** BMI  $\geq 25.00$  Kg/m<sup>2</sup> and  $\leq 29.99$  kg/m<sup>2</sup>
- **Obese:** BMI  $\geq 30.00$  Kg/m<sup>2</sup> and  $\leq 50.00$  kg/m<sup>2</sup>
- **Overweight or obese:** BMI  $\geq 25.00$  Kg/m<sup>2</sup> and  $\leq 50.00$  kg/m<sup>2</sup>
- **EA:** was either totally urban or rural and the EAs were grouped by administrative Woredas.
- **Working data:** subset of the data set which contains variable relevant to this study.
- **Trend:** to mean the change in prevalence of overweight or obesity over the three surveys.
- **Age group** was recorded as 15-19, 20-29, 30-39 and 40-49,
- **Educational attainment** was recorded as no education, primary and secondary or above,
- **Marital status** was recorded as never married, formerly married (widowed, divorced) and currently married (married and living with a partner) and,
- **Occupation** was recorded as not working, white collar work (managers and all office related jobs) and manual/ agricultural work (manual and agricultural works including household domestic worker) and
- **Region of residence** was recorded as the three Metropolis (Addis Ababa, Harari and Dire Dawa), Tigray, Amhara, Oromia, SNNPR and other regions (Affar, Benshangul-Gumuz, Gmbela and Somalie).

#### 4.7. Statistical Analysis

After data was checked for inconsistencies, missing values and outliers, analysis was performed using SPSS version 16.0 statistical software.

Variables were computed and recoded to fit the objective of this study. Weight and height measurements were computed. To obtain weight in kilogram v437 (weight of women with one decimal place but recorded in the data set as whole number) was divided by 10. To obtain height in centimeter v438 (height of women with one decimal place but recorded in the data set as whole number) was divided by 10 which was then divided again by 100 to obtain height in meter. Then the anthropometric index, body mass index (BMI) was computed as follows: weight in kilogram divided by height in meter squared. Underweight was defined as BMI <18.5 kg/m<sup>2</sup>, normal weight as BMI 18.5-24.9 kg/m<sup>2</sup>, overweight as >=25.0 kg/m<sup>2</sup> and <=29.9 kg/m<sup>2</sup> and obesity as BMI >=30.0 kg/m<sup>2</sup> [12, 52]. Wealth index quintiles were constructed using principal component analysis.

Complex sample analysis was used to analyze the data. First the individual women sample weight was calculated by dividing v005 by 1,000,000. Then plan for analysis was prepared by putting the strata, primary sampling units and sample weight for each data set since the complex sample analysis requires preparation of plan for analysis for the data set before conducting the analysis. The complex sample command in SPSS was used to declare the strata, primary sampling unit and sample weight. This was done so that SPSS would not assume that the data came from simple random sampling, ignores the stratification and clustering which increases the significance and decreases the standard error of point estimates. It is worth noting that the point estimates are similar whether complex sample analysis is used or not in stratified cluster sampling.

Absolute counts, percentages and odds ratios presented in this study were all weighted for the sampling probabilities.

The data sets were analyzed in two ways. First the whole data set was analyzed using the case selection SPSS command. Then working data file was prepared for each data set which contains variables relevant to this study. Similar results were obtained. Hence, the first method was used to analyze each survey independently.

Frequencies and proportions were computed for description of the study population in relation to selected socio-demographic variables using complex sample frequency and descriptive analysis. The results were presented in the form of tables and figures.

To see the association of overweight and/or obesity and selected socio-demographic variables [age, wealth index (quintiles), marital and educational status, parity, region of residence and occupation], complex sample bivariate and multivariate logistic regression model was used. Results were presented in the form of odds ratios (OR) with 95% confidence intervals.

Each survey was analyzed independently to ascertain whether the socio-demographic correlates of overweight or obesity had changed over time.

Trend for the overall prevalence of overweight and/or obesity was examined over the period 2000-2011 using  $\chi^2$  for linear trend. Statistical significance was defined at a p-value of 0.05.

#### **4.8. Data Quality Control and Management**

After accessing the data sets the data was explored to examine missing values and outliers. Body mass index was calculated from the individual women's height and weight measurements and compared with the already calculated BMI and similar results were found.

The data quality control and management employed in the surveys is well documented in the EDHS full reports. Briefly, data were collected by visiting households and conducting face-to-face interviews using pretested questionnaire after intense training has been given for data collectors. Weight was measured by using a solar-powered scale with an accuracy of  $\pm 100$  g and height was measured with an adjustable wooden measuring board that is designed to provide accurate measurements (to the nearest 0.1 cm) in the context of a developing-country field situation [7, 8, 55].

#### **4.9. Ethical Considerations**

The study was conducted after obtaining ethical clearance from Addis Ababa University, School of Public Health and consent from Measure DHS project. As this thesis is based on secondary data, the letter of permission to access the data sets was obtained from measure DHS project (ORC Macro) and is attached in annex 4.

#### **4.10. Dissemination of results**

The results of this study will be disseminated to School of Public Health, College of Health Science, and Addis Ababa University as partial fulfillment of Master's degree in public health. It will also be communicated to the Ethiopian Federal Ministry of Health and Measure Demographic and Health Survey project. Finally it will be sent for publication in peer reviewed journals and effort will also be made to disseminate findings in scientific conferences.

## 5. Results

### 5.1. Socio demographic characteristics of the study population (urban sample) in the three surveys

A total of 7,312 non pregnant women aged 15-49 were included in this study: 2,591(35.4%) from the 2000, 1,119 (15.3%) from 2005 and 3,602 (49.3%) from 2011 surveys. Regarding the age of the study population, women aged 20-29 years were 944 (36.5%) in 2000, 420 (37.5%) in 2005 and 1,438 (39.9%) in 2011. The mean age was  $26.6 \pm 0.3$  in 2000 while it was  $26.5 \pm 0.4$  and  $26.4 \pm 0.2$  in 2005 and 2011 respectively.

Concerning region of residence of the study population, more than half of the women were residents of Oromia, Amhara, SNNPR regions. The proportion of women who were residents of those regions was 1,526 (58.9%) in 2000 while it was 611 (54.6%) in 2005 and 2,227 (61.8%) in 2011. In terms of socio economic status, as measured by wealth index quintiles, 667 (25.7%) in 2000, 222 (19.8%) in 2005 and 709 (19.7%) in 2011 of women were in the richest quintile.

In terms of their educational status, 1,074 (41.5%) in 2000, 571 (51.0%) in 2005 and 1,279 (35.5%) in 2011 of women attended secondary education or above. The proportion of women who had no child was 1,237 (47.7%) in 2000, 585 (52.3%) in 2005 and 1,726 (47.9%) in 2011. Out of the study population 1,087 (42.0%), 519 (46.4%) and 1,523 (42.3%) of women were never married in 2000 in 2005 and in 2011 respectively. In terms of occupation, 1119 (43.2%) in 2000, 640 (57.2%) in 2005 and 1,509 (41.9%) in 2011 of women were not working. Regarding religion, 1,701 (65.7%) in 2000, 812(72.6%) in 2005 and 2,370 (65.8%) in 2011 of women were orthodox followers (Table 1).

**Table 1: Distribution of urban Ethiopian women, by selected socio-demographic variables, 2000 to 2011 EDHS surveys, (N<sup>w</sup>= 2591(2000), 1119 (2005), 3602 (2011))**

Variables	Women of child bearing age (15-49)		
	2000 (N, %)	2005 (N, %)	2011 (N, %)
<b>Age Group</b> †			
15 -19	776 (29.9)	328(29.3)	996 (27.7)
20 -29	944 (36.5)	420(37.5)	1438 (39.9)
30 -39	531 (20.5)	223(20.0)	783 (21.7)
40 -49	340 (13.1)	148 (13.2)	385(10.7)
<b>Region of Residence</b>			
Tigray	226 (8.7)	89 (8.0)	280 (7.8)
Three Metropolis	734 (28.3)	356 (31.8)	886 (24.6)
Amhara	450 (17.4)	176 (15.7)	893 (24.8)
Oromia	817 (31.5)	342 (30.6)	857 (23.8)
SNNPR	259 (10.0)	93 (8.3)	477 (13.2)
Other Regions	105 (4.1)	63 (5.6)	209 (5.8)
<b>Wealth Quintile</b>			
Poorest	498 (19.2)	226 (20.2)	798 (22.1)
Poorer	934 (36.1)	211 (18.9)	674 (18.7)
Middle	182 (7.0)	238 (21.3)	712 (19.8)
Richer	310 (12.0)	222 (19.8)	709 (19.7)
Richest	667 (25.7)	222 (19.8)	709 (19.7)
<b>Educational Status</b>			
No Education	889 (34.3)	263 (23.5)	781 (21.7)
Primary	628 (24.2)	285 (25.5)	1542 (42.8)
Secondary+	1074 (41.5)	571 (51.0)	1279 (35.5)
<b>Parity</b>			
No child	1237 (47.7)	585 (52.3)	1726 (47.9)
1-4 children	901 (34.8)	393(35.1)	1485 (41.2)
5+ children	453 (17.5)	141 (12.6)	391(10.9)
<b>Marital status</b>			
Never Married	1087 (42.0)	519 (46.4)	1523 (42.3)
Currently Married	1027 (39.6)	411 (36.7)	1602 (44.5)
Formerly Married	477 (18.4)	189 (16.9)	477 (13.2)
<b>Occupation</b>			
Not working	1119 (43.4)	640 (57.2)	1509 (41.9)
White-collar Work	942 (36.6)	358 (32.0)	1450(40.3)
Manual Work	515 (20.0)	120 (10.7)	619 (17.1)
DK/other	15(0.6)	1(0.1)	24 (0.7)

N<sup>w</sup>= weighted count excluding pregnant women and women with extreme BMI values (<12.00 kg /m<sup>2</sup> and > 50.00 kg /m<sup>2</sup>).

DK=Don't Know

† = age classification used in EDHS reports (2005 and 2011) under maternal nutritional status section.

Source: 2000 - 2011 EDHS

### 5.1.1. Nutritional status of urban Ethiopian women

The prevalence of overweight was 242 (9.3%) in 2000, 132 (11.8%) in 2005 and 435 (12.1%) in 2011. The prevalence of obesity was 1.4% in 2000, 2.2% in 2005 and 2.8% in 2011. A total of 970 non pregnant urban women aged 15-49 were overweight or obese: 279 (10, 8%) in 2000, 157 (14.0%) in 2005 and 534 (14.9%) in 2011 (Table 2).

The mean BMI of urban Ethiopian women was 20.8 Kg/m<sup>2</sup>±0.1 in 2000, 21.5 Kg/m<sup>2</sup>±0.2 in 2005 and 21.4 Kg/m<sup>2</sup>±0.1 in 2011, which was within the internationally accepted normal range [52].

**Table 2: Nutritional status of urban Ethiopian women by year of survey, 2000 to 2011, data from EDHSN <sup>w</sup>=2591 (2000), 1119 (2005) and 3602 (2011)**

Nutritional Status	Number and Percentage of women by year of survey		
	2000 N (% , With 95% CI)	2005 N (% , With 95% CI)	2011 N (% With 95% CI)
Under weight	594 [23.0 ; (20.1, 26.1)]	214 [19.1 ; (16.1, 22.5)]	718 [19.9 ; 16.8, 23.4]
Normal	1718 [66.3 ; (63.5, 69.0)]	748 [66.9 ; (63.1, 70.5)]	2350 [65.2; 61.9, 68.5]
Overweight	242 [9.3; (7.8 ,11.1)]	132 [11.8; (8.9, 15.5)]	435 [12.1; (10.1, 14.4)]
Obese	37 [1.4; (1.0, 2.1)]	25 [2.2; (1.6, 3.2)]	99 [2.8; (2.1, 3.6)]
Overweight and/or obese	279 [10.7, (9.0,12.8)]	14.0 [ 14.0; (11.0, 17.7)]	534 [ 14.9; (12.4, 17.6)]
Total	2591 (100.0)	1119 (100.0)	3602 (100.0)

N <sup>w</sup> = weighted count excluding pregnant women and women with extreme BMI values (<12.00 kg /m<sup>2</sup> and > 50.00 kg /m<sup>2</sup>)

Source: 2000- 2011 EDHS

## **5.2. The prevalence of overweight and/or obesity by selected socio demographic variables**

### **5.2.1. Prevalence of overweight and/or obesity among urban Ethiopian women by selected socio demographic variables (2000 EDHS)**

Of the total sample, 10.7% of subjects were classified as overweight and/or obese. Fifty three (15.6%) of women aged 40–49 and 93 (14%) of women in the richest quintile were overweight and/or obese. The proportion of overweight and/or obese women was 117 (15.9 %) among residents of the three Metropolis (Addis Ababa, Dire Dawa and Harari).

In addition, 150 (14.0%) of women with secondary education or above and 145 (14.1%) of currently married women were overweight and/or obese. The prevalence of overweight and/or obesity was 116 (12.9%) among women who had 1 to 4 children. In terms of occupation, 132 (14.0%) of women who were engaged in white-collar work and 37 (7.2%) of women who were engaged in manual work were overweight and/or obese (Table 3).

**Table 3: Mean BMI, number and percentage of overweight and/or obese urban women by selected socio- demographic variables, urban Ethiopia (data from 2000 EDHS) (N<sup>w</sup> =2591, N<sup>OW/O</sup> =279)**

Variables	Mean BMI (Kg/m <sup>2</sup> )	Overweight or obese N, (%)		
		Yes (%) (with 95% CI)	No	Total
<b>Age Group</b> †				
15 -19	20.3	46 [(5.9; ( 4.0, 8.6)]	730 (94.1)	776
20 -29	20.9	98 [(10.4 ; (7.8, 13.8)]	846 (89.6)	944
30 -39	21.2	82 [(15.4; (11.9, 19.8)]	449 (84.6)	531
40 -49	21.0	53 [(15.6; (11.6, 20.5)]	287 (82.4)	340
<b>Region of Residence</b>				
Three Metropolis	21.6	117 [(15.9; (13.3, 17.7)]	617 (84.1)	734
Tigray	19.7	6 [(2.7; (1.4, 4.8)]	220 (93.3)	226
Amhara	19.9	34 [(7.6; (4.6, 12.0)]	416 (94.4)	450
Oromia	20.9	87 [(10.6; (7.0, 15.8)]	730 (89.4)	817
SNNPR	21.2	27 [(10.4; (3.6, 26.7)]	232(89.6)	259
Other Regions	19.9	8 [(7.6; (5.9, 10.9)]	97 (92.4)	105
<b>Educational Status</b>				
No education	20.5	64 [(7.2; (5.1, 10.1)]	825(92.8)	889
Primary	20.9	65 [(10.4; (6.7, 15.5)]	563(89.6)	628
Secondary +	21.1	150 (14.0; 11.1, 17.4)	924 (86.0)	1074
<b>Wealth quintiles</b>				
Poorest	20.2	36 [7.2; (4.7, 10.8)]	462 (92.8)	498
Poorer	20.7	87 [9.3; (6.3, 13.5)]	847 (90.7)	934
Middle	21.3	31 [17.0; (13.3, 22.0)]	151 (83.0)	182
Richer	21.1	32 [10.3; (6.6, 15.4)]	278 (89.7)	310
Richest	21.3	93 [14.0; (10.6, 18.3)]	574 (86)	667
<b>Parity</b>				
No child	20.7	104 [(8.4; (6.6, 10.6)]	1133 (91.6)	1237
Have 1-4 children	21.0	116 [(12.9; (10.2, 16.1)]	785 (87.1)	901
Have 5+ children	20.9	59 [(13.0; (9.4, 17.9)]	394 (87.0)	453
<b>Marital status</b>				
Never married	20.6	87 [(8.0; (6.0, 10.7)]	1000 (92.0)	1087
Currently Married	21.2	145 [(14.1; (10.5,18.6)]	882(85.9)	1027
Formerly Married	20.7	47 [(9.9; (6.5, 14.7)]	430 (90.1)	477
<b>Occupation</b>				
Not working	20.6	109 [(9.7; (7.5, 12.7)]	1010 (90.3)	1119
White-collar work	21.3	132 [(14.0; (11.3, 17.3)]	810 (86.0)	942
Manual work	20.4	37[ (7.2; (4.3, 11.5)]	478 (92.8)	515
Total	20.8	278 [(10.8; (9.0, 12.9)]	2298 (89.2)	2576

N<sup>w</sup>=Total weighted count excluding pregnant women and women with extreme BMI values (<12.00 kg /m<sup>2</sup> and > 50.00 kg /m<sup>2</sup>).

N<sup>OW/O</sup>= Weighted number of overweight or obese women(>=25.00 kg /m<sup>2</sup> and <50.00 kg /m<sup>2</sup>)

† = age classification used in EDHS reports (2005 and 2011) under maternal nutritional status section.

Source: 2000 EDHS

### **5.2.2. Prevalence of overweight and/or obesity among urban Ethiopian women (2005)**

Out of the total the total sample, 14.0% of women were overweight and/or obese. More than a quarter (28.4%) of women in the older age group (40-49) was overweight and/or obese. The prevalence of overweight and/or obesity was 17.4% and 14.0% among women who were residents of the three Metropolis and Oromia region respectively. In addition, it was 17.2% among women with secondary education or above and 14.6% among women in the richest quintile. The prevalence of overweight and/or obesity was 20.7% among currently married women and 9.7% among those who had no child while one out five women who were engaged in white collar work was overweight and/or obese (Table 4).

**Table 4: Mean BMI, number and percentage of overweight and/or obese urban women in each category of selected socio demographic variables, urban Ethiopia (data from the 2005 EDHS) (N<sup>w</sup> =1119, N<sup>OW/O</sup>=157)**

Variables	Mean BMI (Kg/m <sup>2</sup> )	Overweight or obese N, (%)		
		Yes (%) (with 95% CI)	No	Total
<b>Age Group<sup>†</sup></b>				
15 -19	20.6	22 (6.7, 4.1, 10.4)	306 (93.3)	328
20 -29	21.2	45 (10.7;7.6, 14.7 )	375 (89.3)	420
30-39	22.2	48 (21.5; 14.8, 30.4)	175 (78.5)	223
40-49	22.9	42 (28.4; 20.5, 38.5)	106 (71.6)	148
<b>Region of Residence</b>				
Three Metropolis	22.0	62 (17.4; 14.6, 20.3)	294 (82.6)	356
Tigray	19.9	4 (4.5; 1.7, 11.2)	85 (95.5)	89
Amhara	21.4	20 (11.4; 5.0, 23.4)	156 (88.6)	176
Oromia	21.4	48 (14.0; 7.3, 25.5)	294 (86.0)	342
SNNPR	21.3	9 (9.7; 5.2, 19.7)	84 (90.3)	93
Other Regions	21.7	14 (22.2; 14.9, 30.5)	49 (77.8)	63
<b>Educational Status</b>				
No education	21.2	29 (11.0; 6.7, 18.8)	234 (89.0)	263
Primary	21.1	30 (10.5; 6.5, 16.6)	255 (89.5)	285
Secondary+	21.7	98 (17.2; 13.9, 20.9)	473 (82.8)	571
<b>Wealth Quintiles</b>				
Poorest	20.4	17 [7.5; (4.2, 13.3)]	209(92.5)	226
Poorer	21.1	18 [ 8.5; (5.3, 14.9)	193 (91.5)	211
Middle	21.7	35 [ 14.7; (9.7, 21.4)]	203 (85.3)	238
Richer	22.1	45 [ 20.3 ;(14.8, 26.6)]	177 (79.7)	222
Richest	22.0	42 (18.9; (13.6,25.5)	180 (81.1)	222
<b>Parity</b>				
No child	20.9	57 (9.7; 6.8, 13.5)	529 (90.3)	586
Have 1-4 children	22.1	75 (19.1; 14.8, 24.3)	318 (80.9)	393
Have 5+ children	21.8	25 (17.9; 11.2, 27.8)	115 (82.1)	140
<b>Marital Status</b>				
Never married	20.7	43 (8.3; 5.9, 11.7)	476 (91.7)	519
Currently Married	22.4	85 (20.7; 15.5, 26.9)	326 (79.3)	411
Formerly Married	21.5	29 (15.3; 10.0, 22.6)	160 (84.7)	189
<b>Occupation</b>				
Not Working	21.2	75 (11.8; 9.4, 14.6)	565 (88.2)	640
White –collar Work	22.1	75(21.0; 14.6, 29.2)	282(79.9)	357
Manual Work	21.0	6 (5.0; 2.2, 10.8)	114(95.0)	120
Total	21.5	156(14.0;10.9, 17.7)	961 (86.0)	1117

N<sup>w</sup> = Total weighted count excluding pregnant women and women with extreme BMI values (<12.00 kg /m<sup>2</sup> and > 50.00 kg /m<sup>2</sup>).

N<sup>OW/O</sup>= Weighted number of overweight or obese women (>=25.00 kg /m<sup>2</sup> and <50.00 kg /m<sup>2</sup>).

† = age classification used in EDHS reports (2005 and 2011) under maternal nutritional status section.

Source: 2005 EDHS

### **5.2.3. Prevalence of overweight and/or obesity among overweight and/or obese urban Ethiopian women (2011 EDHS)**

Among the total sample, 14.9% of women were overweight and/or obese. Nearly one-third (32.2%) of women in the older age group (40-49) and one out of 5 women who were residents of the three Metropolis and SNNPR region were overweight and/or obese. In terms of educational status and wealth quintiles,(18.0%) of women with secondary education or above, 13.0% women with primary education and 19.6% of women in the richest quintile were overweight and/ or obese. The proportion of women who were overweight and/or obese was 22.0% among currently married and 7.3% among never married women. In addition, the prevalence of overweight and/or obesity was 8.3% among women who had no child. Concerning occupation type, 17.8% of women who were engaged in white collar work and 11.0% women who were engaged in manual or agricultural work were overweight and/or obese (Table 5).

**Table 5: Mean BMI, number and percentage of overweight and/or obese urban women in each category of selected socio demographic variables, urban Ethiopia (data from the 2011 EDHS) (N<sup>w</sup>=3602, N<sup>OW/O</sup>=534)**

Variables	Mean BMI (Kg/m <sup>2</sup> )	Overweight or obese		
		N, (%)		Total
		Yes (%) (with 95% CI)	No	
<b>Age group<sup>†</sup></b>				
15 -19	20.1	44 (4.4; 3.0, 6.4)	952 (95.6)	996
20 -29	21.3	183 (12.7; 10.1, 15.9)	1255 (87.3)	1438
30 -39	22.3	183 (23.4;18.5, 29.2)	600 (76.6)	783
40 -49	23.0	124 (32.2; 25.4, 39.8 )	261 (67.8)	385
<b>Region</b>				
Three Metropolis	22.21	180 (20.3; 18.2, 22.5)	706 (79.7)	886
Tigray	20.27	24 (8.6; 4.8, 15.3)	256 (91.4)	280
Amhara	20.61	72 (8.1; 4.4, 14.3)	821 (91.9)	893
Oromia	21.35	121 (14.1; 8.9, 21.7)	736 (85.9)	857
SNNPR	21.83	97 (20.3; 12.9, 30.5)	380 (79.7)	477
Other regions	21.83	40 (19.1;13.9, 26.0)	169 (80.9)	209
<b>Educational Status</b>				
No education	21.28	103 (13.2; 9.3, 18.3)	678 (86.8)	781
Primary	21.11	202 (13.1; 11.0, 15.6)	1340 (86.9)	1542
Secondary /Higher	21.78	229 (17.9; 14.5, 22.0 )	1050 (82.1)	1279
<b>Wealth Index</b>				
Poorest	20.9	84[ 10.5; (7.5, 14.6)]	714 (89.5)	798
Poorer	21.8	105 [ 15.6; (12.0, 20.1)	569 (84.4)	674
Middle	21.8	140 [19.7; (14.7, 26.1)	572 (80.3)	712
Richer	20.6	66 [(9.3; (5.9, 14.2)]	643 (80.4)	709
Richest	21.8	139 [(19.6; 15.0, 25.1)]	570 (83.9)	709
<b>Parity</b>				
No child	20.7	143 (8.3;6.6, 10.4)	1583 (91.7)	1726
Have 1-4 children	22.1	312 (21.0; 16.7, 26.2)	1173 (79.0)	1485
Have 5+ children	21.8	79 (20.2; 15.1, 26.4)	312 (79.8)	391
<b>Marital status</b>				
Never married	20.5	111 (7.3; 5.8, 9.1)	1412 (92.7)	1523
Currently Married	22.2	351 (21.9; 17.0, 27.8)	1251 (78.1)	1602
Formerly Married	21.5	72 (15.1; 10.9, 20.6)	405 (84.9)	477
<b>Occupation</b>				
Not working	21.1	206 (13.7; 10.9, 17.0)	1303 (86.3)	1509
White-Collar work	21.8	258 (17.8; 14.2, 22.0)	1192 (82.2)	1450
Manual Work	20.9	68 (11.0; 7.1, 16.7)	551 (89.0)	619

N<sup>w</sup> = Total weighted count excluding pregnant women and women with extreme BMI values (<12.00 kg /m<sup>2</sup> and > 50.00 kg /m<sup>2</sup>).

N<sup>OW/O</sup>= Weighted number of overweight or obese women (>=25.00 kg /m<sup>2</sup> and <50.00 kg /m<sup>2</sup>).

† = age classification used in EDHS reports (2005 and 2011) under maternal nutritional status section.

Source: 2011 EDHS

### 5.3. Overall trends in the prevalence of overweight and/or obesity among urban Ethiopian women, 2000 -2011

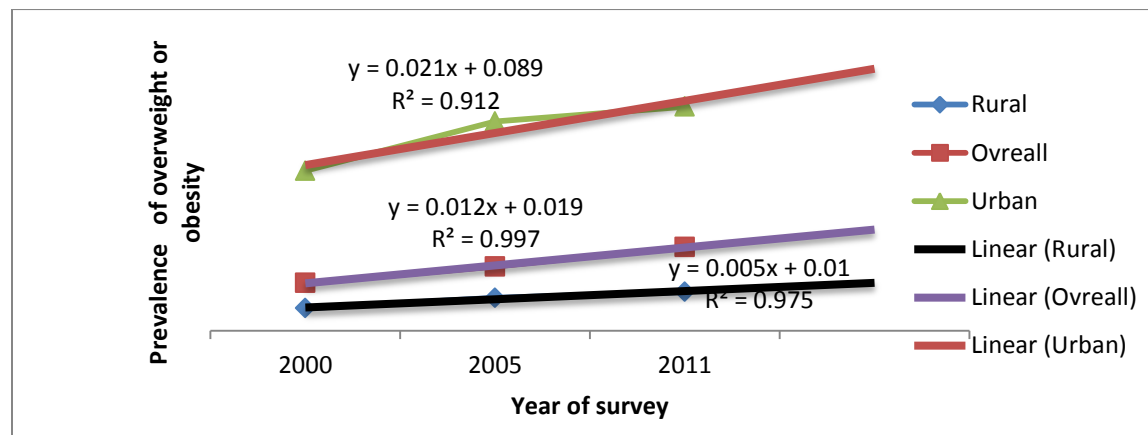
Based on the evidence available, the prevalence of overweight and/or obesity was estimated to show a 4 % increase from 2000 to 2011 among urban Ethiopian women with  $\chi^2=20.8$  and p value  $< 0.01$  (Table 6).

**Table 6: The overall magnitude and trends of overweight and/or obesity among urban Ethiopian women, urban Ethiopian, from 2000-2011 EDHS**

Year of survey	Overweight or obesity (N, %)		Total	P value (Test for Trend)
	Yes	No		
2000	279 (10.7)	2312 (89.3)	2591 (100.0)	
2005	157 (14.0)	962 (86.5)	1119 (100.0)	0.004
2011	534 (14.9)	3068 (85.1)	3602 (100.0)	0.001

Source: 2000 to 2011 EDHS

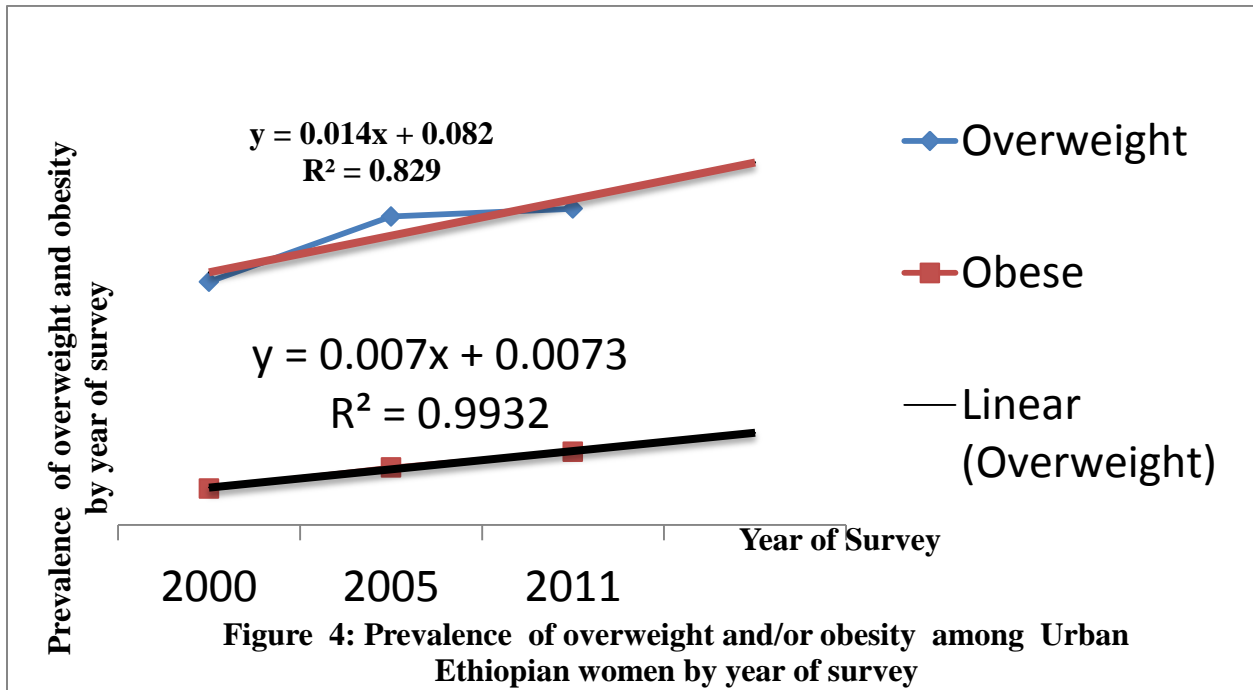
The overall prevalence of overweight and/or obesity among urban Ethiopian women was 10.7% in 2000 and 15% in 2011 (Figure 3).



**Figure 3: Prevalence of overweight and/or obesity among urban Ethiopian women, urban Ethiopian, 2000-2011.**

Source: 2000 to 2011 EDHS

Overweight is more common than obesity among urban Ethiopian women (Fig 4).



Source: 2000 to 2011 EDHS

### 5.3.1 Magnitude and trends of overweight and/or obesity among urban women by selected socio-demographic variables, 2000- 2011 EDHS.

Based on the available data, the prevalence of overweight and/or obese was changed over time, from 15.6% in 2000 to 32.2% in 2011 with  $\chi^2= 25.7$  and  $p$  value  $<0.01$ ) among urban Ethiopian women aged 40-49. It was also changed over time among women with secondary education or above, from 14.0% in 2000 to 18.0 in 2011, with  $\chi^2=6.3$  and  $p <0.05$ . Similarly, it was also increased among women in the richest quintile, from 14.0% in 2000 to 19.6% in 2011, with  $\chi^2=7.5$  and  $p < 0.01$ . In addition, similar pattern was observed among currently married from 14.1% in 2000 to 22% in 2011, with  $\chi^2=23.2$  and  $p <0.01$  and among women who were not working, from 9.7% in 2000 to 13.7% in 2011, ( $\chi^2= 9.3$  and  $p < 0.01$ ) (Table7).

**Table 7: Overall magnitude and trends of overweight and/or obesity among urban women by selected socio- demographic variables, urban Ethiopia, 2000- 2011 Ethiopian DHS.**

Variables	Overweight and/or obese (N, %)			P value
	2000	2005	2011	
<b>Age Group<sup>+</sup></b>				
15 -19	46 (5.9)	22 (6.7)	44 (4.4)	0.131
20 -29	98 (10.4)	45 (10.7)	183 (12.7)	0.070
30 -39	82 (15.4)	48 (21.5)	183 (23.4)	0.0006
40 -49	53 (15.6)	42 (28.4)	124 (32.2)	0.0001
<b>Region of Residence</b>				
Three Metropolis	117 (15.9)	62 (17.4)	180 (20.3)	0.020
Tigray	6 (2.7.3)	4 (4.50)	24 (8.6)	0.004
Amhara	34(7.6)	20 (11.4)	72 (8.1)	0.944
Oromia	87 (10.6)	48 (14.0)	121 (14.1)	0.037
SNNPR	27 (10.4)	9 (9.7)	97 (20.3)	0.0002
Other Regions	8 (7.6)	14(22.0)	40 (19.1)	0.022
<b>Educational Status</b>				
No education	64 (7.2)	29 (11.0)	103 (13.2)	0.0006
Primary	65 (10.4)	30 (10.5)	202 (13.1)	0.06
Secondary +	150 (14.0)	98 (17.2)	229 (17.9)	0.01
<b>Wealth Index</b>				
Poorest	36 (7.2)	17 (7.5)	84 (10.5)	0.036
Poorer	87 (9.3)	18 (8.5)	105 (15.6)	0.0001
Middle	31 (17.0)	35 (14.7)	140 (19.7)	0.185
Richer	32 (10.3)	45 (20.3)	66 (9.3)	0.150
Richest	93 (14.0)	42 (18.9)	139 (19.6)	0.006
<b>Parity</b>				
No child	104 (8.40)	57 (9.7)	143 (8.3)	0.812
Have 1-4 children	116 (12.9)	75 (19.1)	312 (21.0)	0.0001
Have 5+ children	59 (13.0)	25 (17.9)	79 (20.2)	0.005
<b>Marital Status</b>				
Never married	87 (8.0)	43 (8.3)	111 (7.3)	0.461
Currently Married	145(14.1)	85 (20.7)	351 (21.9)	0.0001
Formerly Married	47 (9.9)	29 (15.3)	72 (15.1)	0.018
<b>Occupation</b>				
Not working	109(9.7)	75 (11.8)	206 (13.7)	0.002
White-Collar work	132 (14.0)	75 (21.0)	258 (17.8)	0.032
Manual work	37(7.2)	6 (5.0)	68 (11.00)	0.020

Source: 2000 to 2011 EDHS

## **5.4. Predictors of Overweight and/or Obesity**

### **5.4.1. Predictor variables of overweight and/or obesity in 2000 EDHS**

#### **5.4.1.1. Bivariate Analysis**

During bivariate analysis, age group, region of residence, wealth index, and attainment of secondary education or above, parity and being married were found to be associated with the condition of being overweight and/or obese.

The odds of being overweight and/or obese was higher among the older women, [OR= 2.9; (95% CI (1.6, 5.1))] for women aged 30-39 and [OR= 3.0; (95% CI (1.6, 5.3))] compared with their younger counterparts (15-19). Similarly, women with secondary education or above were more likely to be overweight and/or obese, [OR= 2.1; (95% CI (1.3, 3.5))], than those with no education. In addition, the likelihood of being overweight and/or obese was higher among women in the richest quintile, [OR= 2.1; (95% CI (1.3, 3.5))], than their poorest counter parts and among currently married women [OR= 1.9; (95% CI (1.2, 3.0))], compared with those who were never married.

Similarly, the odds of being overweight and/or obese was higher among residents of the three Metropolis, [OR= 7.1; (95% CI (3.8, 13.6))], among residents of Amhara region, [OR= 3.0; (95% CI (1.3, 6.9))], among residents of Oromia region, [OR= 4.5; (95% CI (2.0, 9.8))] compared with women in Tigray region. It was also higher among women in other regions (Afar, Benshangul-Gumuz, Gambela and Somale Regions), [OR= 3.3; (95% CI (1.6, 6.8))] than those in Tigray region, (Table 8).

#### 5.4.1.2. Multivariate Analysis

From the multivariate logistic regression analysis age, educational status and women's region of residence were significant predictors of being overweight and/or obese in 2000. Compared to the younger women (15-19), the elder women (40-49) were 4.5 times more likely, [OR= 4.5; (95% CI; (2.2 to 9.0)] to be overweight or obese.

The likelihood of being overweight and/or obese was 2.5 times higher, [OR= 2.5; (95% CI; (1.4 to 4.7)] among women with secondary education or above and approximately 2 times higher, [OR= 1.8; (95% CI; (1.1 to 2.9)] among those with primary education compared with their non-educated counterparts. Similarly, the odds of being overweight and/or obese was significantly higher among residents of the three Metropolis, [OR= 5.8; (95% CI; (3.2 to 10.4))], among residents of Amhara region, [OR=3.1 (95% CI; (1.5, 6.8))] and Oromia region residents [OR= 5.0(95% CI; (2.3, 10.8))] compared to those living in Tigray region. It was also higher among residents of other regions, [OR= 3.8 (95% CI; (1.9, 7.9)] (Table 8).

**Table 8 Crude and adjusted effects (Odds ratios) of selected variables on the likelihood of overweight or obese among urban Ethiopian women, 2000 EDHS**

Variables	Overweight or obesity	
	Crude OR (95% CI)	Adjusted OR (95% CI)
<b>Age Group</b> †		
(15 -19)	1	1
20 -29	1.8 (1.1, 3.1)*	1.5 (0.8, 2.7)
30 -39	2.9 (1.6, 5.1)*	2.8 (1.6, 5.0)*
40 -49	3.0 (1.6, 5.3)*	4.5 (2.2, 9.0)*
<b>Region of Residence</b>		
(Tigray)	1	1
Three Metropolis	7.1 (3.7,13.6)*	5.8 (3.2, 10.4)*
Amhara	3.0 (1.3,6.9)*	3.1 (1.5, 6.8)*
Oromia	4.5 (2.0, 9.8)*	5.0 (2.3, 10.8)*
SNNPR	4.4(1.2,16.1)*	3.9 (1.0, 14.9)
Other Regions	3.3 (1.6, 6.8)*	3.8 (1.9, 7.9)*
<b>Wealth Index</b>		
(Poorest )	1	1
Poorer	1.3 (0.7, 2.4)	1.2 (0.7, 2.2)
Middle	2.7 (1.5, 4.8)*	2.0 (1.03, 3.9)
Richer	1.5 (0.8, 2.7)	1.2 (0.6, 2.3)
Richest	2.1 (1.3, 3.5)*	1.5 (1.0, 2.3)
<b>Educational Status</b>		
(No education)	1	1
Primary	1.5(0.9, 2.4)	1.8 (1.1, 2.9)*
Secondary+	2.1 (1.3, 3.5)*	2.5 (1.4, 4.7)*
<b>Parity</b>		
(No child)	1	1
Have 1-4 children	1.6 (1.1,2.3)*	0.9 (0.5, 1.6)
Have 5+ children	1.6(1.0, 2.5)	0.7 (0.4, 1.4)
<b>Marital status</b>		
(Never married)	1	1
Currently Married	1.9(1.2, 3.0)*	1.8 (0.9, 3.4)
Formerly Married	1.3 (0.8,2.3)	1.3 (0.5, 3.0)
<b>Occupation</b>		
(Not working)	1	1
White-collar work	1.5 (1.0 , 2.2)	1.4 (0.9, 2.1)
Manual Work	0.7(0.4, 1.2)	0.7 (0.4,1.2)

\* = significant at p value <0.05

† =age classification used in EDHS reports (2005 and 2011) under maternal nutritional status section.

## **5.4.2. Predictors of overweight or obesity in the 2005 EDHS**

### **5.4.2.1. Bivariate Analysis**

During bivariate analysis age group, region of residence wealth index, attainment of secondary education or above, parity, marital status and occupation were significantly associated with being overweight and/or obese in 2005.

The odds of being overweight and/or obese was higher among the older women, [OR= 3.9; (95% CI (2.2, 7.0))] for women aged 30-39 and [OR= 5.7; (95% CI (3.3, 9.8))] compared with their youngest counterparts (15-19) and it was also higher among residents of the three Metropolis, [OR= 4.4; (95% CI (1.6, 11.9))] compared with those in Tigray region.

Similarly, being in richest quintile was associated with being overweight and/or obese, [OR= 2.8; (95% CI (1.4, 5.7))], than being in the poorest quintile and having 1-4 children was also associated with higher odds of being overweight or obese, [OR= 2.2; (95% CI (1.6, 3.1))] than those who had no child. In addition being currently married women was also associated with being overweight and/or obese [OR= 2.9; (95% CI (2.0, 4.2))] compared with their never married counter parts. Women who were engaged in white-collar work were more likely to be overweight or obese, [OR= 2.0; (95% CI (1.3, 3.1))] while those engaged in manual work were less likely to overweight or obese, [OR= 0.4; (95% CI (0.2, 0.9))] compared with those who were not working, (Table 9).

#### 5.4.2.2. Multivariate Analysis

From the multivariate logistic regression analysis age, region of residence, attainment of secondary education or above, being currently married were found to be significantly and positively associated with being overweight and/or obese while women with manual work were significantly less likely to be overweight and/or obese in 2005.

The older women (40-49) were significantly more likely to be overweight and/or obese, [OR= 10.3; (95% CI (8.4, 16.6))] compared with their youngest counterparts (15-19). Similarly, being overweight and/or obese was significantly higher among women in the richest quintile [OR= 2.2; (95% CI; (1.2 to 4.1))] and those with secondary education or above [OR= 2.2; (95% CI; (1.2 to 4.3))] than their poorest and non-educated counterparts respectively. In addition, it was also nearly 4 times higher among residents of the three Metropolis [OR= 3.8; (95% CI; (1.4 to 8.2))] and among residents of other regions, [OR= 6.4; (95% CI; (2.2 to 11.0))] compared with their counterparts in Tigray region. similar pattern was observed among currently married women, [OR 2.5; (95% CI (1.2, 5.3))] compared with their never married counterparts. However, women who were engaged in manual work were 60% less likely, [OR 0.4 ;( 95% CI (0.2, 0.8))] to be overweight and/or obese than those who were not working, (Table 9).

### **5.4.3. Predictors of overweight or obesity in the 2011 EDHS**

#### **5.4.2.1. Bivariate Analysis**

During bivariate analysis age, region of resident, wealth index, parity and marital status were significantly associated with being overweight or obese in 2011.

Older age was associated with being overweight and/or obese, [OR= 6.7; (95% CI (4.3, 10.5))] for women aged 30-39 and [OR= 10.3; (95% CI (8.4, 16.6))] for women aged 40-49 compared with their youngest women (15-19). Similarly, being overweight and/or obese was higher among residents of the three Metropolis, [OR= 2.7; (95% CI (1.4, 5.1))] and among residents of other regions, [OR= 2.5; (95% CI (1.2, 5.3))] compared with those in Tigray region. It was higher among women in the richest quintile, [OR= 2.1; (95% CI (1.3, 3.3))], than their poorest counterparts and among women who had 1-4 children, [OR= 3.0; (95% CI (2.1, 4.1))] than those who had no child. Similarly it was higher among currently married women [OR= 3.6; (95% CI (2.5, 5.1))], compared with those who were never married, (Table 9).

#### **5.4.3.2. Multivariate Analysis**

From the multivariate logistic regression analysis age, region of residence, wealth index, attainment of secondary education or above and being currently married were found significantly and positively associated with being overweight and/or obese in 2011.

Being older, 40-49 years was significantly associated with the condition of being overweight and/or obese, [OR= 9.8 (95% CI; (5.1, 13.8))]. The odds of being overweight and/or obese was higher among residents of the three Metropolis [OR= 2.2 (95% CI; (1.2, 4.2))] and among residents of other regions, [(OR= 2.5; 95% CI; 1.1 to 5.4)] compared with being resident of Tigray. Similarly it was also higher among those with secondary education or above [OR= 2.0 (95% CI; (1.3, 3.1))], among women in the richest quintile, [OR= 1.8 (95% CI; (1.1, 2.5))] and currently married women [OR= 2.0 (95% CI; (1.2, 3.3))], (Table 9).

**Table 9: Crude and adjusted effects (Odds ratios) of selected variables on the likelihood being of overweight and/or obese among urban Ethiopian women, 2005 and 2011 EDHS**

Variables	Overweight or obesity			
	2005		2011	
	Crude (95% CI)	Adjusted (95% CI)	Crude (95% CI)	Adjusted (95% CI)
<b>Age Group †</b>				
(15-19)	1	1	1	1
20 -29	1.7 (1.0, 2.9)	1.2 (0.6, 2.2)	3.2 (2.0, 5.0)*	2.3 (1.4, 3.9)*
30 -39	3.9 (2.2, 7.0)*	2.8 (1.4, 5.4)*	6.7 (4.3, 10.5)*	5.0 (2.9, 8.8)*
40 -49	5.7 (3.3, 9.8)*	5.1 (2.3, 11.7)*	10.3 (8.4, 16.6)*	9.8 (5.1, 13.8)*
<b>Region</b>				
(Tigray)	1	1	1	1
3 Metropolis	4.4 (1.6, 11.9)*	3.8 (1.4, 8.2)*	2.7 (1.4, 5.1)*	2.2 (1.2, 4.2)*
Amhara	2.7 (0.7, 9.9)	3.8 (1.0, 13.1)	0.9 (0.4, 2.3)	0.9 (0.3, 2.4)
Oromia	3.5 (1.0, 11.8)	3.4 (1.04, 11.1)	1.7 (0.8, 3.9)	1.5 (0.6, 3.2)
SNNPR	2.4 (0.7, 8.4)	2.4 (0.7, 7.9)	2.7 (1.2, 6.2)*	2.6 (1.2, 5.8)*
Others	5.9 (2.0, 17.2)*	6.4 (2.2, 11.0)*	2.5 (1.2, 5.3)*	2.5 (1.1, 5.4)*
<b>Wealth Quintiles</b>				
(Poorest)	1	1	1	1
Poorer	1.2 (0.5, 2.9)	1.0 (0.4, 2.5)	1.6 (1.0, 2.4)	1.1 (0.7, 1.8)
Middle	2.1 (1.0, 4.5)	1.5 (0.7, 3.1)	2.1 (1.2, 3.8)*	1.6 (0.9, 2.9)
Richer	3.1 (1.5, 6.2)*	2.1 (1.0, 4.6)	0.9 (0.5, 1.6)	0.9 (0.5, 1.6)
Richest	2.8 (1.4, 5.7)*	2.2 (1.2, 4.1)*	2.1 (1.3, 3.3)*	1.8 (1.1, 2.5)*
<b>Educational Status</b>				
No education	1	1	1	1
Primary	0.9 (0.6, 1.6)	1.6 (0.9, 2.9)	1.0 (0.7, 1.4)	1.5 (1.0, 2.3)
Secondary+	1.6 (0.9, 2.8)	2.2 (1.2, 4.3)*	1.4 (0.9, 2.2)	2.0 (1.3, 3.1)*
<b>Parity</b>				
(No child)	1	1	1	1
Have 1-4	2.2 (1.6, 3.1)*	0.7 (0.3, 1.4)	3.0 (2.1, 4.1)*	1.1 (0.7, 1.7)
Have 5+	2.1 (1.3, 3.4)*	0.5 (0.2, 1.5)	2.8 (1.9, 4.2)*	0.7 (0.4, 1.3)
<b>Marital status</b>				
(Never married)	1	1	1	1
Currently Married	2.9 (2.0, 4.2)*	2.5 (1.2, 5.3)*	3.6 (2.5, 5.1)*	2.0 (1.2, 3.3)*
Formerly Married	2.0 (1.2, 3.2)*	1.8 (0.8, 4.2)	2.3 (1.5, 3.5)*	1.2 (0.6, 2.3)
<b>Occupation</b>				
Not working	1	1	1	1
White-collar work	2.0 (1.3, 3.1)*	1.6 (1.0, 2.4)	1.4 (0.9, 1.9)	1.0 (0.7, 1.4)
Manual Work	0.4 (0.2, 0.9)*	0.4 (0.2, 0.8)*	0.8 (0.5, 1.3)	0.8 (0.5, 1.2)

\* = significant at p value <0.05

† =age classification used in EDHS reports (2005 and 2011) under maternal nutritional status section.

Source: 2005 to 2011 EDHS

## 6. Discussion

Identifying modifiable risk factors for chronic disease such as overweight and/or obesity and recording the magnitude of overweight and/or obesity is very crucial to address the emerging overweight and/or obesity and subsequent chronic diseases particularly in urban areas. This study presents the magnitude of overweight and/or obesity and the corresponding socio demographic correlates among urban Ethiopian women by using cross-sectional data from the EDHS.

There is a general belief that overweight and/or obesity are problems of developed countries alone. However, recent studies showed high prevalence of overweight or obesity, especially among women of child bearing age in urban Africa [22],[19],[25] and [27, 40]. A number of studies conducted on risk factors for chronic disease[10, 18]and other studies on food security and nutritional status [16]; and on assessment of overweight or obesity and hypertension [17] also documented considerable prevalence of overweight or obesity in our country. This indicates that overweight or obesity is on the rise in parallel with urbanization and the growing socio economic status discrepancies, deserving considerable attention.

The findings of this study showed that the overall prevalence of overweight and/or obesity was 10.7% in 2000 and 14.9%in the year 2011 among urban Ethiopian women. This corresponds with an increase in the overall prevalence by 4.0% overtime. It also showed that the prevalence was higher among older women, women with secondary education, among women in the richest quintile and married women. It also showed that overweight or obesity was more prevalent among women in the three Metropolis (Addis Ababa, Dire Dawa and Harari),

In the regression model, being older, currently married resident of the metropolis and attainment of secondary education or above were found to be significant predictors of overweight and/or obesity.

The overall prevalence of overweight or obesity was comparable with similar studies in Nigeria [27] and Malawi [22]. This may be the result of rapid urbanization and subsequent life style changes which may possibly increase the likelihood of being overweight or obese among urban residents. However, it was lower than similar study conducted in urban Africa from 7 African countries (31%) [22]. This difference might be due to dietary and life style differences between the countries.

In contrast, it was lower compared to figures from South Africa, (56.6% vs. 15.0%) [25] which might be explained by the differences in the level of urbanization and economic development.

It is also lower compared with findings of other researches conducted in south west Ethiopia (23.4%) [9], in Addis Ababa (34.5%), [10], 26.7% [16] and [38.0% ([18])], in wonjishoa sugar factory, 37.1 % [17].

This difference might be due to the differences among study subjects, sampling method used and the study area. Three were institution based: one study was conducted among diabetic patients while the other two were restricted among factory workers and teachers and bank workers. Three were from the capital city where women are more like to get energy dense food and may possibly be exposed to sedentary life than other urban settings in the country due to the effect of urbanization.

However, the prevalence of overweight and/or obesity among Addis Ababa residents in this study was comparable with the one of the studies in Addis Ababa [16] and the study in south west Ethiopia.

Consistent with the findings of other studies, the results of this study demonstrated that the prevalence was significantly higher among the elder women, [26] [27], (54), [28] and [17].

Similarly, the condition of overweight and/or obesity was significantly higher among the women in the richest quintile which was consistent with studies from Addis Ababa and wonji shoa sugar factory [16, 17] and with studies from abroad [22, 26], [27], [28], [41].

Intra uterine growth retardation (IUGR) which predispose to overweight and/or obesity later in adulthood coupled with increasing wealth (which may affect disposable income which in turn increasing the purchasing power for food thereby influencing the type of foods consumed and the intake of pre prepared or processed food) might be the possible explanation.

In agreement with findings from other studies, the prevalence of overweight or obesity was higher among women with secondary or above,[22, 26, 27, 41]. It was also comparable with similar study in Ghana [40].In line with these studies attainment of secondary or above was one of the predictors of being overweight or obese. This may be the result of shifts from manual labor to more sedentary occupations and the related decline in physical activity.

Like in other studies overweight and/or obesity was common among married women [22, 27], [40]. The relationship between parity and overweight and/or obesity might be one possible explanation since married women are more likely to have children than unmarried women. In addition, it is more likely that married women (or those in a relationship) may have more social obligations and/or eat more regular meals leading to weight gain. It is also possible that these changes occur through a reduction in physical activity in marriage and cohabitation.

### **Strengths of the study**

- This study used national and sub nationally representative data.
- This study used three data sets which facilitated comparison.
- The analysis method used considers the complex stratified cluster sampling method employed by EDHS.

### **Limitations of the study**

- The use of secondary data which has limited the analysis to the variables collected by the survey.
- Only body mass index (BMI) was used to classify study subjects as overweight and/or obese since the survey did not collect data on indicators of central obesity (for example, waist and abdominal circumferences (waist to hip circumference)).
- Lack of data on important predictors of overweight or obesity such as physical activity and total energy intake (nutritional history).
- The surveys did not collect data on household income or expenditure, the traditional indicators used to measure wealth. The assets based wealth index used here is only a proxy indicator for household economic status.
- Since, pregnant women were excluded from this study, the results this will apply to non-pregnant women.
- The data may not show the actual trend.

## 7. Conclusions and Recommendations

### 7.1. Conclusions:

- ❖ The overall prevalence of overweight and/or obesity was increased by 4.0% from 2000 to 2011 though it was not statistically significant.
- ❖ However, the magnitude of overweight and/or obesity was increased significantly among older women and women who were residents of the three Metropolis.
- ❖ In the adjusted model, being older, living in the three Metropolis, Amhara, and Oromia regions and attainment, primary and secondary education or above were significant predictors of overweight and/or obesity in 2000. Older age, being residents of the three Metropolis, being in the richest quintile and currently married and attainment of secondary education or above were significantly and positively associated with being overweight and/or obese while those women with manual work were less likely to be overweight and/or obese in 2005.
- ❖ In the adjusted model, being older, in the richest quintile, attainment of secondary or above, living in the three Metropolis and SNNPR and being currently married were positively and independently associated with higher odds of being overweight and/or obese in 2011.
- ❖ One striking finding in this study was the positive increment of overweight or obesity among residents of the three Metropolis and Tigray region (Tables 3-5).
- ❖ This study witnessed that overweight and/or obesity was prevalent, among residents the three Metropolis (Addis Ababa, Dire Dawa and Harari). This indicates that modifiable risk factors such as overweight and/or obesity could be one explanation for the emerging burden of chronic diseases especially in more urbanized cities and towns of the country.
- ❖ Most diseases associated with overweight and/or obesity are chronic in nature which demand high cost of treatment. Which in turn will increase the cost of our health care system given the existing burden of communicable diseases.
- ❖ Hence, the problem of overweight and/or obesity and other risk factors for chronic diseases need to be considered as a public health problem in our country.

## 7.2. Recommendations:

Based on the findings the following recommendations are forwarded:

### ➤ **To Policy makers/program managers**

- ⇒ It is appropriate time to design policies and strategies and to implement public health interventions which promote healthy life style so as to manage the growing problem of overweight or obesity and subsequent chronic disease in urban Ethiopia. Policies that promote access to healthy diet and physical activity may be helpful. Such policies and public actions need to be age sensitive and more urbanized towns and cities of the country need to be targeted.
- ✓ Allocating fund for treatment and control, prevention and health promotion; and surveillance, monitoring and evaluation of risk factors for chronic diseases including overweight or obesity, especially in urban setting.
- ✓ Including overweight or obesity in the national health reporting system which report cause-specific morbidity and mortality due to non-communicable diseases which is important to get service level statistics on its burden.
- ✓ Introducing topic-specific operational action plan for overweight or obesity or integrated plan for all risk factors of chronic diseases especially in urban areas.
- ✓ Arranging training opportunities on diet and physical activity for teachers, health extension workers and other health professionals.
- ✓ Collect and make available data on overweight and obesity, physical activity levels, dietary intake.

### ➤ **To Community**

- ✓ Awareness creation on the advantages of life style changes including regular physical activity, food and dietary management and on the risks of sedentary life style and consuming energy dense food items.
- ✓ Eating more fruits and vegetables helps the overweight or obese women
- ✓ Similarly, an increase in physical activity with adequate energy and protein intake contributes to a healthy body composition.

➤ **For further research**

- ✓ The analysis of determinant factors was constrained by the lack of information on important dietary and lifestyle/physical activity characteristics of respondents in all DHS surveys. Hence, it is important that future surveys account for these limitations.
- ✓ The household wealth measure used in this study might not detecting changes in household wealth over time as household assets and characteristics may not change in the short period of time. Further research using other measures of wealth (e.g. income or expenditures) might help to better understand the changes in overweight or obesity over time by socioeconomic status.
- ✓ Further, community based and prospective studies which include the full array of risk factors and all indicator measurements of overweight or obesity need be conducted.

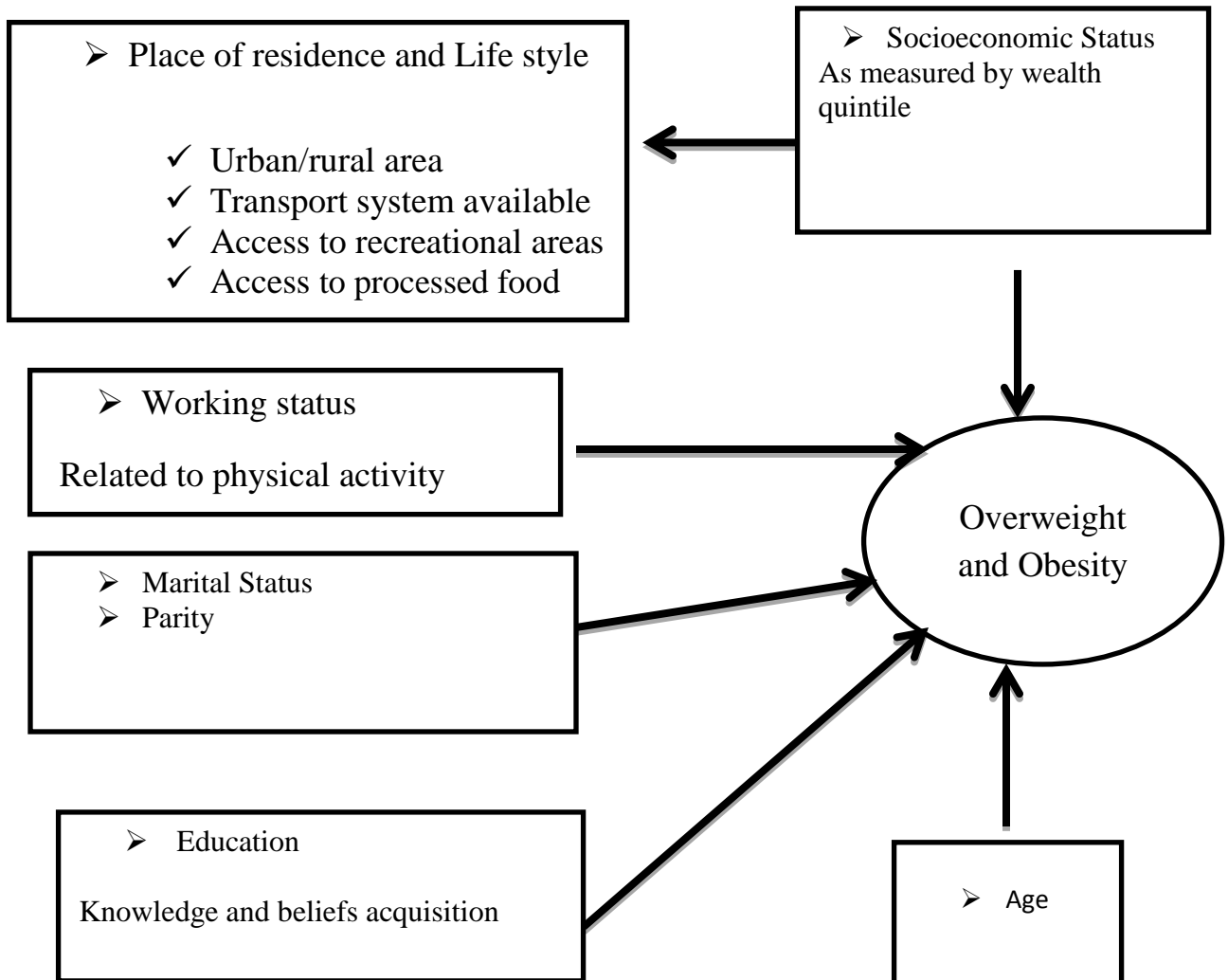
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**Annex 1: Conceptual Framework**



**Figure 5: Conceptual framework depicting socio demographic correlates of overweight and obesity among women of reproductive age group**

## Annex 2: Variable Coding summary

Variable	Original code	New code
Age Group*	15-19	15-19
	20-24	20-29
	25-29	30-39
	30-34	40-49
	35-39	
	40-44	
Region of Residence	45-49	
	Harari Addis Ababa Dire Dawa	The three Metropolis
	Tigray	Tigray
	Amhara	Amhara
	Oromia	Oromia
	SNNPR	SNNPR
Educational status	Afar ,Somalia Benishangul-Gumuz and Gambela	Other Regions
	0= No Education	0= No Education
	1= primary	1= primary
	2= Secondary	2= Secondary + Higher
	3= Higher	9= missing
	9= missing	
Marital status	0= Never Married	0= Never Married
	1= Married	1=Currently Married (1,2)
	2= Living with Partner	2= Formerly Married (3,4,5)
	3= Widowed	9=missing
	4= Divorced	
	5= Not longer living together/separated	
Parity	9=missing	
	Total Number of children	0= No child
		1= 1-4 children
Wealth Index		2= 5+ children
	1=Poorest	0=1-4
	2=Poorer	1=5
	3=Middle	
	4=Richer	
Religion	5=Richest	
	1= orthodox	1= Christian (1,2,3)
	2=catholic	2= Muslim
	3=protestant	3=Other (5.6)
	4=Muslim	
	5=Traditional	

	6=other	
	0= Not Working	0= Not working
	1=Professional/Technical/ Managerial	1= White-collar work (1,2,3,7)
	2= Clerks	2= Agricultural/Manual including household and domestic work (4,5,6,8,9)
	3=Sales	99= missing
	4= Agricultural-self employed	
	5=Agricultural-employee	
	6= House hold and Domestic work	
Occupation	7= Service	
	8= Skilled Manual	
	9= Un skilled Manual	
	98/96= Do not know/Other	
	99= Missing	

**\*= EDHS age classification under women nutritional status section (2000 and 2011).**

**Annex 3: The International Classification of adult underweight, overweight and obesity according to BMI**

Classification	BMI(kg/m <sup>2</sup> )	
	Principal cut-off points	Additional cut-off points
Underweight	<18.50	<18.50
Severe thinness	<16.00	<16.00
Moderate thinness	16.00 - 16.99	16.00 - 16.99
Mild thinness	17.00 - 18.49	17.00 - 18.49
Normal range	18.50 - 24.99	18.50 - 22.99
		23.00 - 24.99
Overweight	≥25.00	≥25.00
Pre-obese	25.00 - 29.99	25.00 - 27.49
		27.50 - 29.99
Obese	≥30.00	≥30.00
Obese class I	30.00 - 34.99	30.00 - 32.49
		32.50 - 34.99
Obese class II	35.00 - 39.99	35.00 - 37.49
		37.50 - 39.99
Obese class III	≥40.00	≥40.00

Source: WHO, 1995, WHO, 2000 and WHO 2004.

#### **Annex 4: Letter of permission from measure dhs project website to access the data set.**

You have been authorized to download data from the Demographic and Health surveys (DHS) on-line archive. This authorization is for unrestricted countries requested on your application.

All DHS data should be treated as confidential, and no effort should be made to identify any household or individual respondent interviewed in the survey.

The data sets must not be passed on to other researchers without the written consent of DHS. Users are requested to submit a copy of any reports/publications resulting from using the DHS data files. These reports should be sent to the attention of the DHS Data Archive: [archive@measuredhs.com](mailto:archive@measuredhs.com).

To begin downloading datasets, please login at [http://www.measuredhs.com/data/dataset\\_admin/login\\_main.cfm](http://www.measuredhs.com/data/dataset_admin/login_main.cfm). Once you are logged in, you may also edit your contact information, change your email/password, request additional countries or Edit/Modify an existing Description of Project.

Some resources to help you analyze DHS data efficiently are available at: <http://measuredhs.com/data/Using-Datasets-for-Analysis.cfm>

The files you will download are in zipped format and must be unzipped before analysis.

Following are some guidelines:

After unzipping, print the file with the .DOC extension (found in the Individual/Male Recode Zips). This file contains useful information on country specific variables and differences in the Standard Recode definition.

Please download the DHS Recode Manual: <http://measuredhs.com/publications/publication-dhsg4-dhs-questionnaires-and-manuals.cfm>

The DHS Recode Manual contains the documentation and map for use with the data. The Documentation file contains a general description of the recode file, including the rationale for recoding; coding standards; description of variables etc. The Map file contains a listing of the standard dictionary with basic information relating to each variable.

It is essential that you consult the questionnaire for a country, when using the data files.

Questionnaires are in the appendices of each survey's final report:

<http://measuredhs.com/publications/publications-by-type.cfm>.

We also recommend that you make use of the Data Tools and Manuals:

[http://www.measuredhs.com/accesssurveys/technical\\_assistance.cfm](http://www.measuredhs.com/accesssurveys/technical_assistance.cfm).

DHS statistics can also be obtained using the STAT compiler tool:

<http://www.statcompiler.com>. This tool allows users to select countries and indicators to create customized tables. It accesses nearly all of the indicators that are published in the final reports. Authorization is not needed to use the STAT compiler.

If you have any questions or need assistance, please send an email to: [archive@measuredhs.com](mailto:archive@measuredhs.com).

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