

The Rising Overweight-obesity and Its Socio-Demographic Correlates in Addis Ababa, Ethiopia, 2000-2011

Yibeltal T¹, Charles T², Uriyoan C²

World Health Organization¹, George Washington University²
Correspondence: Yibeltal T. E-mail: ytebekaw@gmail.com

Abstract

This paper examines changes in the prevalence of underweight and overweight/obesity in non-pregnant women of reproductive age (ages 15-49), and their main socio-demographic correlates in Addis Ababa. The data used for this study were taken from 2000, 2005 and 2011 Ethiopia Demographic and Health Surveys. The prevalence of overweight/obesity rose significantly from 16.1% to 20.6%; while underweight decreased from 17.9% to 14.1% between 2000 and 2011. Overall, one-third (34.7%) of these women in this African political capital are malnourished. The multivariate odds ratios demonstrate that the women aged 30-49 are 5 times more likely to be overweight/obese as those 15-19, and women with secondary education are twice as likely as their uneducated counterparts. At the current rate of decline in underweight or increase in overweight/obesity, after ten years, nearly 40% of the women will be under this malnutrition trap, with serious health consequences that require new and comprehensive policies.

Key words: underweight, overweight, obesity, women

Introduction

As the developed world grapples with a growing burden of non-communicable diseases, developing countries and countries undergoing socioeconomic transition are experiencing a mixed epidemic of non-communicable and communicable diseases. Despite being the continent with the lowest proportion of its population residing in urban areas, Africa's cities are growing at more rapid, unprecedented rates [1, 2].

While many developing countries have been burdened with high levels of undernutrition, the increasing urbanization is also being accompanied by increasing rates of overweight and obesity

[1, 3, 4]. Obesity is a well recognized risk factor for various chronic diseases such as cardiovascular diseases, hypertension, and type-II diabetes mellitus. Obesity is a growing problem in urban Sub-Saharan Africa [1, 2, 5]. While undernutrition is clearly still a major concern, it is also decreasing, while there are increases in the number of overweight people respectively [6].

Over the past several decades, the prevalence of obesity has been increasing globally predominantly in urban areas [5]. Many developing countries are currently affected by high rates of overweight that in some cases surpass underweight as a public health nutrition problem [6]. It is estimated that as much as 20-50% of urban populations in Africa are classified as either overweight or obese, which is likely to affect the current reputation of the continent as undernourished [7]. The nutrition transition in low income countries is an emerging crisis [4]. It has also been documented that obesity was higher among women in West Africa region [5].

Once associated only with high income countries [8], overweight and obesity are now also prevalent in low and middle income countries. Unlike the overall situation in a predominantly rural country such as Ethiopia with much higher undernutrition (27%) than overnutrition (6%), the prevalence of overnutrition (overweight and obesity) is higher than underweight (undernutrition) in Addis Ababa [9, 10, 11]. Nevertheless, the determinants and correlates of this double face of women's malnutrition in the capital city is not yet well explored and brought to the attention of policy makers and practitioners.

This paper will examine changes over time in the prevalence of underweight, overweight and obesity among urban adult women in Addis Ababa Ethiopia between 2000 and 2011 (the time period of the three Demographic and Health Surveys-DHSs); and investigate the extent to which these changes vary by socio-economic and demographic status. The magnitude and the distribution patterns of both types of malnutrition must come into the attention of politicians, policy-makers, researchers and program designers so that resources can be channeled persuasively to public health nutrition.

Methods

The data from 2000, 2005 and 2011 nationally representative Ethiopian Demographic and Health Surveys (EDHS) were used. In the EDHS 2000, 2005 and 2011, interviews were completed for 1996, 815 and 1648 women in Addis Ababa with urban response rates of about 98%, 96% and 94% respectively. The size of the non-pregnant women for EDHS 2000, 2005 and 2011 who had anthropometric measurements and considered in this study for the capital city totals 4332 (that is 1936, 804 and 1592 women respectively).

Variables

Body mass index (BMI) was coded into underweight ($BMI < 18.5 \text{ kg/m}^2$), normal ($BMI = 18.5 - 24.9 \text{ kg/m}^2$), overweight ($BMI = 25 - 29.9 \text{ kg/m}^2$), or obese ($BMI > 30 \text{ kg/m}^2$), according to the World Health Organization criteria.

A wide range of predictor variables were considered in this study including woman's educational attainment, working status, age, marital status, parity, woman's relationship to head of household, sex of household head, age of household head and religion. Besides, selected socio-economic status variables were also included: source of drinking water, sanitation or type of toilet facility, and possession and or access to media (newspapers/magazines, television), electricity and type dwelling (main floor material main wall material and main roof materials). Wealth index was not considered in this study since the preliminary analysis shows that 94% and 98% of the study participants were in the richest (highest) category for 2005 and 2011 respectively. Partner's educational status, antenatal visit, and place of delivery were not included due to large missing values or lack of variability in the data.

Statistical analysis

Statistical Package for Social Sciences (SPSS) version 17.0 was used for statistical analysis. Individuals with missing values for BMI ($n=91$) or any of the other covariates were excluded. Chi-square values were used to test associations between BMI and risk factors. Binary logistic regression models were used to estimate the strength of association. BMI categories were then

divided into underweight (<18.5kg/m² vs. ≥18.5kg/m²) and overweight/obese (>25kg/m² vs. ≤25kg/m²). Six multivariate logistic regression models were fitted for each outcome for each one of the EDHS data (2000, 2005, and 2011). The multivariate models included variables that were significantly associated with BMI status (p-value<0.05) in the bivariate analyses and crude odds ratio.

Results

Descriptive analyses

The descriptive results show that, for Addis Ababa, the overall prevalence of overweight/obesity rose from 16.1% in 2000 to 20.6% in 2011. Table 1 also shows that the prevalence of urban obesity increased from 3.0% in 2000 to 4.3% in 2011. Hence, the percentage of women in the normal BMI range increased by only 0.5% between 2000 and 2005 and later on declined by about 1.6% between 2005 and 2011. In 2000, the prevalence of underweight (17.9%) was higher than overweight/obesity (16.1%) but in 2005 and 2011, the overweight/obesity prevalence (17.7% & 20.6%) surpassed the underweight prevalence (16.0% in 2005 & 14.1% in 2011). Generally, almost half (34.7%) of the non-pregnant women of 15-49 years in Addis Ababa are considered “trapped” by malnutrition (undernutrition and overnutrition).

Table 1: Changes over time in the prevalence of underweight, overweight and obesity of study participants in Addis Ababa, Ethiopia, 2000-2011

BMI levels	2000 (n=1936)	2005 (n=804)	2011 (n=1592)	(Percent change from 2000 to 2005)	(Percent change from 2005 to 2011)	(Percent change from 2000 to 2011)
Underweight	17.9	16.0	14.1	-10.2	-11.9	-20.9
Overweight/obesity	16.1	17.7	20.6	9.9	16.4	28.0
Overweight	13.1	13.6	16.3	3.3	20.5	24.5
Obesity	3.0	4.1	4.3	34.7	4.1	40.2
Statistical significance	P<0.001*					

*Chi-square p-value for changes in prevalence of underweight and overweight/obesity for the three surveys

The prevalence of overweight/obesity shows a progressive increment by age groups while that of underweight shows the reverse (Fig. 1). By individual survey year, the trend shows a marked increment between age categories. However by comparison, the highest increment was among

those 20-24 years (+60%) followed by those in the highest age group of 25-29 (+55%) between 2000 and 2011. On the other hand, the highest decline in the prevalence of underweight was observed in the age group of 30-49 (-46.0%) and 25-29 (-15.0%) (Chi-square $p < 0.05$).

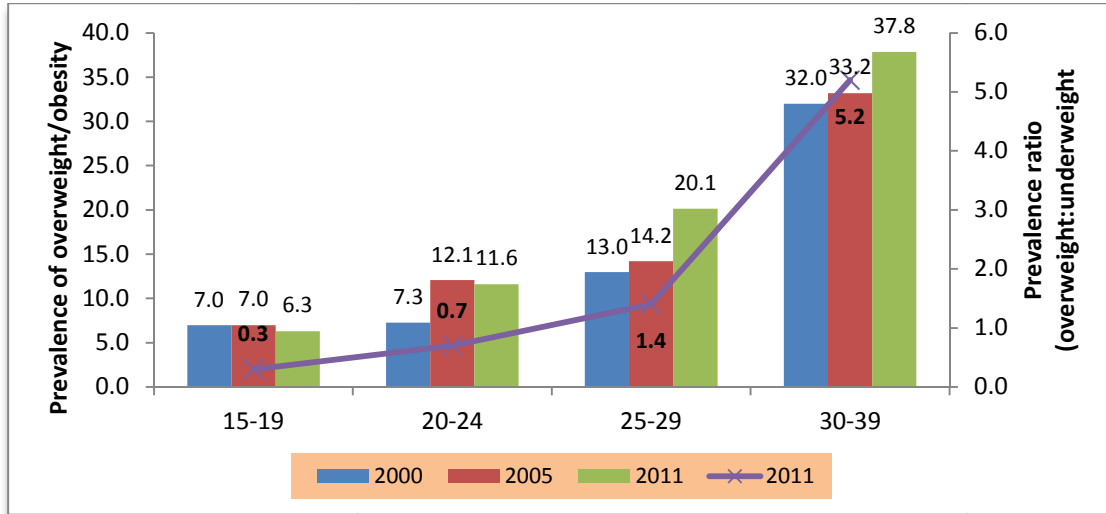


Fig. 1 Prevalence of overweight/obesity and prevalence ratio of overweight/obesity: underweight, 2000-2011

Figure 2 shows changes over time in overweight and obesity by educational attainment of respondents. Educational differences in trends of overweight/obesity showed a stronger divide in the level of underweight and overweight/obesity between 2000 and 2011. While the prevalence of underweight decreased by about 11.4%, the prevalence of overweight/obesity increased by about 29.2% between 2000 and 2011 among women with secondary or higher education. In contrast, the changes were even greater among non-educated women: underweight prevalence dropped down by 56.6% and overweight/obesity increased by 43.4 percent. Compared to the increase in overweight between the 2000 and 2011 surveys (+21.3%), the prevalence of obesity alone showed a huge increment among those with secondary and higher education (+59.5%, from 3.7% in 2000 to 5.9% in 2011). The variation between educational levels is statistically significant for overweight/obesity (2005) and underweight (2011) (Table 2).

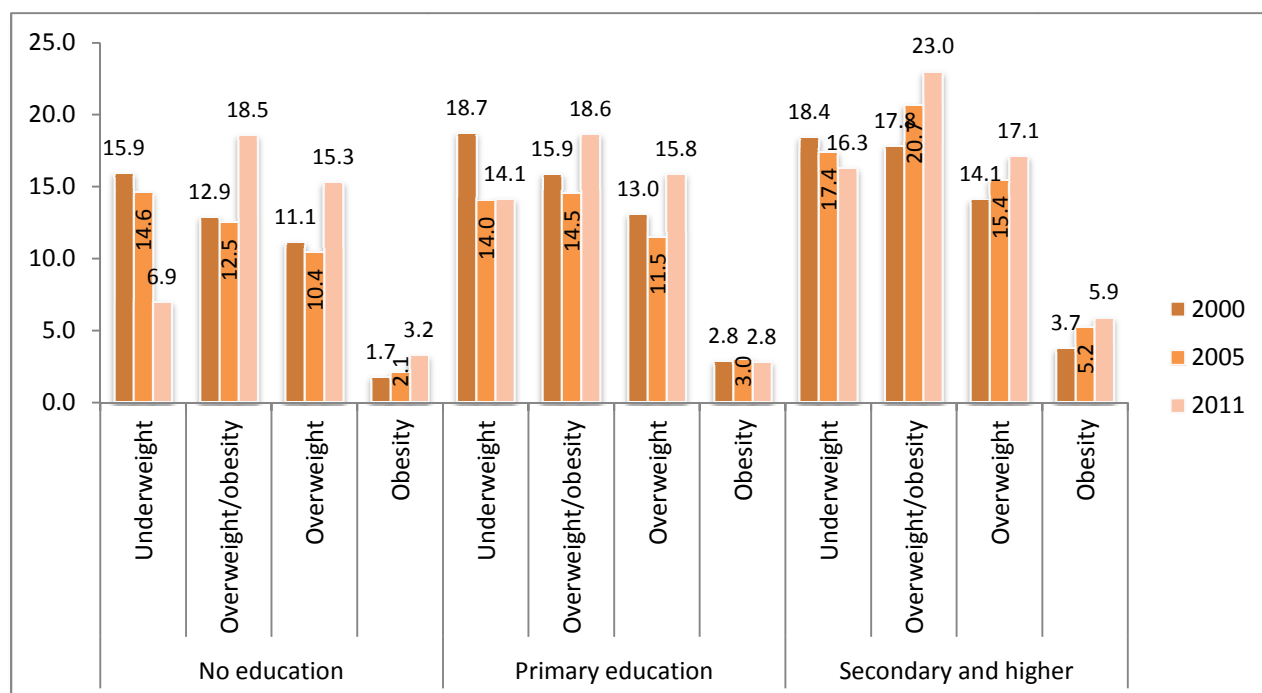


Fig. 2 Trends in overweight and obesity by educational attainment in Addis Ababa, 2000-2011

Table 2 shows bivariate analysis of selected socio-demographic characteristics in their association to underweight and overweight prevalence. Underweight status was associated with younger age (15-19), never being married, never having children born nor living at home, not having improved sources of drinking water, being a daughter and having a younger head of household, as well as being Orthodox Christian religiously.

Being overweight was also associated with being the head of the household, having improved toilet facilities, improved drinking water facilities, having four or more children. While overweight/obesity increased slightly among those who were not working by nearly 27.3% (from 14.3% in 2000 to 18.2% in 2011), it showed a relatively lower rate of rise (by nearly 23.4%) in the same period among the working women (not statistically significant).

The prevalence of underweight was significantly higher among those who do not have access to improved water. The occurrence of overweight/obesity was significantly higher among those who have access to improved drinking water source (18.3% for 2000 and 21.9% for 2011) and with improved sanitation (toilet facility) (17.0% for 2000 and 22.2% for 2011). The highest

proportion of underweight was recorded among Orthodox Christians (18.2% in 2000) followed by Protestant/Catholic/Traditional and others all together (17.6% in 2005). Chi-square p-value levels are indicated with asterisks in Table 2.

Table-2: Socio-demographic characteristics and prevalence and means of BMI, Addis Ababa, Ethiopia, 2000-2011

Variables	2000			2005			2011		
	Mean BMI	Underweight (%)	Overweight /obese (%)	Mean BMI	Underweight (%)	Overweight /obese (%)	Mean BMI	Underweight (%)	Overweight /obese (%)
Age 5-year groups									
15-19	20.5	23.7*	7.0*	20.8	19.7***	7.0*	20.8	20.5*	6.3*
20-24	21.0	17.3	7.3	21.3	19.0	12.1	21.2	17.0	11.6
25-29	21.6	16.8	13.0	21.4	16.2	14.2	22.2	14.2	20.1
30-39	23.1	13.4	32.0	23.8	10.7	33.2	24.2	7.3	37.8
Marital status									
Never married	20.9	21.2*	9.4*	21.1	19.3**	9.5*	21.2	18.8*	11.3*
Married	22.8	13.8	28.4	23.7	10.1	33.0	23.8	8.5	32.9
Others	21.9	14.6	15.6	22.4	14.8	20.0	23.1	9.3	28.0
Woman's education									
No education	21.5	15.9	12.9	21.7	14.6	12.5***	22.7	6.9**	18.5
Primary education	21.6	18.7	15.9	21.8	14.0	14.5	22.0	14.1	18.6
Secondary and higher	21.7	18.4	17.8	22.1	17.4	20.7	22.4	16.3	23.0
Respondent currently working									
No	21.2	21.1	14.3	21.5	19.3	14.1	22.0	14.7	18.2
Yes	22.1	14.0	18.4	22.7	11.7	22.6	22.5	13.7	22.7
Total children ever born									
0	21.0	20.6*	10.3*	21.0	19.4***	9.1*	21.3	18.3*	11.6*
1-3	22.0	15.6	18.2	23.2	10.2	30.7	23.6	9.4	31.9
4+	23.1	12.1	32.7	23.9	12.5	30.8	24.2	5.1	36.2
Number of living children									
0	21.0	20.4**	10.3	21.1	19.4**	9.6	21.3	18.1	11.8
1-3	22.0	16.3	18.8	23.1	10.3	29.1	23.6	9.5	32.4
4+	23.3	11.0	33.9	24.1	12.0	32.6	24.1	4.9	34.4
Source of drinking water									
Improved source	21.9	15.7*	18.3*	22.4	14.8	21.3*	21.9	14.0	21.9***
Unimproved source	21.1	22.4	11.7	21.1	18.9	9.4	22.4	14.2	16.9
Type of toilet facility									
Improved source	21.7	17.2*	17.0**	22.2	14.5*	20.2**	21.7	17.7***	22.2**
Unimproved source	21.1	22.4	10.6	21.4	19.3	11.9	22.5	12.9	16.0
Relationship to HH head									
Head	22.2	18.6*	21.9*	22.9	13.1*	26.9*	23.2	11.7*	28.6*
Wife	22.9	13.1	29.2	23.9	9.2	34.7	23.6	7.6	31.0
Daughter	20.8	22.7	10.7	20.8	25.1	10.4	21.2	22.8	14.3
Other	21.2	16.5	8.5	21.4	14.1	8.5	21.6	14.0	12.8
Age of HH head									
13-24	20.9	18.5*	4.9	20.4	30.8***	10.3	21.4	20.2***	12.8***
25-34	21.5	18.2	13.4	21.6	13.0	12.2	22.2	10.6	16.2
35-44	21.8	17.8	17.8	22.5	14.7	23.9	22.6	12.8	24.8
45-54	21.7	19.2	19.6	22.3	14.9	20.4	22.6	17.6	23.6
55+	21.5	16.4	14.5	21.6	17.8	13.4	22.1	14.0	19.3
Religion									
Orthodox Christian	21.6	18.2*	16.1	22.0	17.2***	18.3	22.3	14.2	21.0
Muslim	21.5	17.5	15.4	22.4	7.3	18.8	21.8	15.1	15.9
Protestant/Catholic/Traditional/Others	21.9	15.6	17.7	21.3	17.6	12.1	22.8	12.4	24.8
Total/Average	21.6	17.9	16.2	22.0	16.0	17.7	22.3	14.1	20.6

*P-value<0.0001, **P-value<0.01, P-value<0.05 for chi-square tests within categories

Multivariate model

The six logistic regression models fitted for each of the 2000, 2005 and 2011 EDHS data identified some of the important determinant factors for women's underweight and overweight/obesity. Age of respondent, educational attainment and source of drinking water were among those variables with significant association across the different models. Educational attainment showed positive significant association with overweight/obesity for the 2000 and 2005 models. Hence, women with secondary or higher education were over twice as likely to be overweight or obese compared to their counterparts with no education (OR=2.36; 95% CI 1.60, 3.50) for 2000 and (OR=1.95; 95% CI 1.04, 3.67) for 2005 respectively. With regard to the demographic covariates, Table 3 shows that in the 2000 model, women in the age ranges of 30-49 were 5.1 and 4.9 times more likely to be overweight/obese compared to their youngest counterparts (15-19) (OR=5.07; 95% CI 2.95, 8.69) for 2000 and (OR=4.89 95% CI 2.74, 8.74) for 2011 models respectively. Marital status didn't maintain its significance in the binary logistic regression unlike the bivariate statistics.

In this multivariate model, variables indicating household characteristics of the study participants were included. Women without access to improved source of drinking water were 1.6 times more likely to be underweight (2000 model) compared to those with access to improved source of drinking water. Age of household head, relationship to household head and religion are also among the determining factors.

Table 3 Determinants of underweight and overweight/obesity among women of 15-49 in Addis Ababa, 2000-2011 (adjusted odds ratios & 95% confidence intervals)

Variables	Underweight			Overweight/obesity		
	2000	2005	2011	2000	2005	2011
Age 5-year groups						
15-19	1	1	1	1	1	1
20-24	0.69 [0.49, 0.97]*	0.86 [0.50, 1.46]	0.86 [0.57, 1.28]	0.95 [0.57, 1.59]	1.33 [0.65, 2.71]	1.68 [0.97, 2.89]
25-29	0.67 [0.45, 1.00]	0.89 [0.47, 1.67]	0.81 [0.49, 1.33]	1.69 [1.02, 2.82]*	1.12 [0.51, 2.49]	2.97 [1.70, 5.17]***
30-39	0.57 [0.34, 0.94]*	0.74 [0.35, 1.56]	0.45 [0.24, 0.82]**	5.07 [2.95, 8.69]***	2.37 [1.08, 5.20]	4.89 [2.74, 8.74]***
Woman's education						
No education			1	1		1
Primary education			1.51 [0.85, 2.70]	1.58 [1.06, 2.35]*	1.42 [0.72, 2.82]	1.56 [1.03, 2.37]
Secondary and higher			1.67 [0.92, 3.05]	2.36 [1.60, 3.50]***	1.95 [1.04, 3.67]*	1.92 [1.24, 2.97]
Source of drinking water						
Improved	1			1	1	1
Unimproved	1.56 [1.18, 2.06]**			0.65 [0.46, 0.91]	0.38 [0.23, 0.65]	0.82 [0.59, 1.13]
Type of toilet facility						
Improved	1	1	1	1	1	1
Unimproved	1.15 [0.79, 1.68]	1.50 [0.99, 2.29]	1.53 [1.11, 2.10]**	0.79 [0.48, 1.29]	0.66 [0.40, 1.09]	0.76 [0.55, 1.06]
Relationship to HH head						
Head	1	1	1	1	1	1
Wife	0.65 [0.37, 1.15]	1.11 [0.41, 3.01]	0.71 [0.37, 1.35]	1.02 [0.61, 1.71]	0.91 [0.44, 1.88]	0.90 [0.58, 1.39]
Daughter	0.76 [0.42, 1.37]	3.06 [1.28, 7.29]***	1.49 [0.76, 2.93]	0.68 [0.35, 1.29]	0.70 [0.33, 1.46]	0.64 [0.35, 1.15]
Other	0.54 [0.32, 0.92]*	1.12 [0.51, 2.47]	0.83 [0.44, 1.55]	0.75 [0.43, 1.33]	0.51 [0.25, 1.06]	0.85 [0.50, 1.45]
Age of HH head						
13-24	1	1	1	1		1
25-34	1.26 [0.64, 2.49]	0.37 [0.15, 0.93]*	0.70 [0.37, 1.35]	1.57 [0.52, 4.74]		0.63 [0.31, 1.26]
35-44	1.26 [0.63, 2.49]	0.30 [0.12, 0.74]*	0.86 [0.43, 1.71]	1.59 [0.53, 4.75]		1.01 [0.49, 2.06]
45-54	1.37 [0.68, 2.78]	0.25 [0.10, 0.62]***	0.94 [0.46, 1.90]	1.97 [0.65, 5.97]		1.18 [0.56, 2.47]
55+	1.07 [0.52, 2.21]	0.28 [0.11, 0.73]*	0.60 [0.29, 1.25]	1.84 [0.59, 5.71]		1.42 [0.65, 3.09]
Religion						
Orthodox	1	1		1		
Muslim	0.94 [0.65, 1.36]	0.30 [0.13, 0.68]***		1.17 [0.77, 1.77]		
Protestant/Catholic/Traditional/Others	0.82 [0.54, 1.26]	0.86 [0.47, 1.58]		1.04 [0.67, 1.62]		

*P-value<0.05, **<0.01, ***<0.001 and no asterisk>=0.05

Discussion and conclusions

We found that prevalence of overweight and obesity have been on a continuous increase in the capital of Ethiopia, while underweight prevalence has decreased, but continues to burden women who are younger and have decreased access to drinking water and toilet facilities and live in a household where the head is young. Addis Adaba, being the capital of a country that is still continuously impacted by both chronic stunting and acute food shortage emergencies [9, 10, and 11], it may seem as a misplaced priority to assess the extent of overweight/obesity in Addis Ababa. However, our data suggests that while many are still suffering from low BMI (undernutrition), others are moving from normal BMI to overweight/obesity.

Addis Ababa is not the only urban area with rising overweight-obesity. Post-hoc analyses performed by the first author reveal that two other major urban areas (i.e., city-Regions) that were statistically sampled also saw the prevalence of overweight/obesity with a steady increment: 9.8% to 14.1% in Harari, 13.0% to 17.7% in Dire Dawa, as compared to 16.1% to 20.6% in Addis Ababa. Moreover, the rural-urban gap in overweight-obesity in Ethiopia is enormous, with rural areas at 2.6% vs. 14.9% in all urban areas, or almost six times as high.

This study documented changes over time in the prevalence of overweight and obesity among adult women in Addis Ababa using DHS data collected in 2000, 2005 and 2011; and examined the degree to which these changes vary by some socio-demographic characteristics at individual and household levels. The overweight/obesity prevalence has now surpassed the underweight prevalence in Addis Ababa at a faster rate especially between 2005 and 2011. Similar study finding indicates that 25 out of 33 countries in Sub Sahara Africa had lower (14.5%) underweight and higher (19.75) overweight adult female populations [12]; the same was reported from Bangladesh, India and Indonesia [15, 13].

Our data shows that women of ages 30-39 are at increased risk of overweight/obesity compared to younger women. This is consistent with the body of literature in other African countries that are experiencing a rise in [6]. While overweight/obesity is highest among women above age 30, by comparison, the highest increase in this 11-year period was among those 20-24 years (+60%)

followed by those in the age group of 25-29 (+55%). Overall, in the bivariate analyses, women of better socio-economic status, including better educated women and improved source of drinking water, were more likely to be overweight/obese than their poorer counterparts. This is holding true for urban women in developing countries, which is unlike findings from other more developed nations where the poor [6] and less educated [14, 15] are more subjected to overweight/obesity. The continuous existence of underweight in both educated and uneducated might also indicate that the socio-economic transition in Ethiopia is not benefiting all citizens, even the better educated.

This study also found that younger, never-married and zero-parity women were more likely to be underweight; a result in line with another finding reported from findings in urban Africa, Poland and Iran [6, 14, 15, & 16]. Similarly, mean BMI and prevalence of overweight/obesity increased consistently with parity. This finding is consistent with previous similar evidence from different urban Africa [6]. Possibly, such increase with parity may be attributed to weight gain following increased food intake, reduced physical activity, or both among the multipara women. This study also indicated that currently married women were more overweight/obese than never-married ones as was the case in other study results too [16, 17, & 18].

The researchers fear that increased overweight/obesity is creating conducive environment for increased morbidity of women related to chronic, non-communicable diseases. Prevalence of metabolic syndrome and diabetes in Ethiopia has been on the rise [19]. The double burden mortality analyses suggests that non-communicable diseases are the leading cause of death among adults in Addis Ababa, while the health care system is still focusing on communicable diseases [20, 21]. Similarly, the future of malnutrition is ominous in Addis Ababa since the traditional interventions to reduce undernutrition might not also prevent overnutrition. Moreover, while the prevalence of overweight in children under-five is still quite low (2.5%) in Addis Ababa, compared to 6.4% underweight, this balance may also swing in the same direction as their mothers in the near future.

In conclusion, the data presented here unambiguously dictate the increasing threat of overweight or obesity, added to the historic underweight prevalence among younger women in Addis Ababa.

Hence, it is possible to count nearly 200, 000¹ overweight/obese non-pregnant women in Addis Ababa as of 2011. The very fast rise in the prevalence of obesity, especially in the most recent six year period (between 2005 and 2011) in particular is a threatening alarm towards the entry point of chronic, non-communicable diseases in the capital. Further quantitative and qualitative research on the socio-economic, cultural, dietary and life style causes are vital to document process of change in overweight/obesity over time.

¹ The denominator was the total number of women 15-49 years of age group for Addis Ababa from the Ethiopian 2007 Census.

References

1. Boutayeb A & Boutayeb S (2005) The burden of non-communicable diseases in developing countries. *International Journal for Equity in Health*. 4: 2.
2. World Bank (2011) *The growing danger of non-communicable diseases: acting now to reverse course*. Conference edition. The World Bank Human Development Network.
3. Abergauenny RD (2005) Number of overweight women in developing countries is increasing: news. *BMJ* V 330, pp. 620.
4. Popkin BM (2010) Recent dynamics suggest selected countries catching up to US obesity. *Am J Clin Nutr* (Supply): 284S-8S.
5. Abubakari AR, Lauder W, Agyemang C et al. (2008) Prevalence and time trends in obesity among adult West African populations: a meta-analysis. *Obes Rev* 9(4):297-311.
6. Ziraba AK, Fotso JC & Ochako R (2009) Overweight and obesity in urban Africa: A problem of the rich or the poor? *BMC Public Health* 2009, 9:465
7. Martorell R, Khan LK, & Hughes ML (2000) Grummer-Strawn LM: Obesity in women from developing countries. *Eur J Clin Nutr* 54(3):247-252.
8. Caballero B (2005) A Nutrition Paradox-Underweight and Obesity in Developing Countries. *N ENGL J MED* 352; 15.
9. Central Statistical Agency [Ethiopia] and ORC Macro (2001) *Ethiopia Demographic and Health Survey 2005*. Addis Ababa, Ethiopia and Calverton, Maryland, USA.
10. Central Statistical Agency [Ethiopia] and ORC Macro (2006) *Ethiopia Demographic and Health Survey 2005*. Addis Ababa, Ethiopia and Calverton, Maryland, USA.
11. Central Statistical Agency [Ethiopia] and Inner City Fund International (2012) *Ethiopia Demographic and Health Survey 2011*. Addis Ababa, Ethiopia and Calverton, Maryland, USA: Central Statistical Agency and ICF International.
12. Fogelman A (2009) *The Changing Shape of Malnutrition: obesity in sub-Saharan Africa*. Issues in brief. no. 11. The Frederick S. Pardee Center for the Study of the Longer-Range Future.
13. World Food Programme-Ethiopia (2009) *Food security and vulnerability in Addis Ababa, Ethiopia: Vulnerability Assessment and Mapping (VAM)*. Addis Ababa, Ethiopia.

14. Lipowicz A, Gronkiewicz S & Malina RM (2002) Body mass index, overweight and obesity in married and never-married men and women in Poland. *American Journal of Human Biology* 14: 468-475.
15. Khan MMH & Kraemer A (2009) Factors associated with being underweight, overweight and obese among ever-married non-pregnant urban women in Bangladesh. *Singapore Med J* 50(8): 804.
16. Villamor E, Msamanga G, Urassa W et al. (2006). Trends in obesity, underweight, and wasting among women attending prenatal clinics in urban Tanzania, 1995-2004. *Am J Clin Nutr*, 83(6):1387-1394.
17. Caballero B (2007) The global epidemic of obesity: an overview. *Epidemiol Rev*; 29:1-5.
18. Doak CM, Adair LS, Monteiro C et al. (2000) Overweight and underweight coexist within households in Brazil, China and Russia. *J Nutr*; 130: 2965-71.
19. Nigatu T (2012) Epidemiology, complications and management of diabetes in Ethiopia: a systematic review. *J Diabetes*. 4(2): 174-180.
20. Tran A, Gelaye B, Girma S. et al. (2011) Prevalence of metabolic syndrome among working adults in Ethiopia. *Int J Hypertens*. P. 193719.
21. Misganaw A, Mariam DH, & Araya T (2012) The double mortality burden among adults in Addis Adaba, Ethiopia, 2006-2009. *Preve Chronic Dis*; 9: E84.