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Fikrewold H. Bitew  
Daniel S. Telake

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## **Undernutrition among Women in Ethiopia: Rural-Urban Disparity**

Fikrewold H. Bitew

Daniel S. Telake

ICF Macro  
Calverton, Maryland, USA

November 2010

*Corresponding author:* Fikrewold H. Bitew, Ethiopian Public Health Association (EPHA), P.O. Box: 150 434, Addis Ababa, Ethiopia; E-mail: fikre.wold@gmail.com

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## ABSTRACT

The Millennium Development Goal of reducing maternal mortality by three-quarters between 1990 and 2015 (MDG 5) is highly related to women's nutritional status. Poor maternal nutrition is directly associated with mother's lack of resistance to infection and to maternal ill health during pregnancy and childbirth, particularly among the poor. Therefore, providing obstetric care alone is not enough unless poor women's nutritional status is also addressed. In-depth understanding of women's nutritional status is crucial to reducing maternal mortality and food insecurity. The percentage undernourished is higher in Ethiopia than in any other sub-Saharan African country. Thus this study focuses on undernutrition in Ethiopia to assess levels and socio-demographic differentials between rural and urban areas, and to analyze determinants.

The paper uses the population-level data sets from the 2000 and 2005 Ethiopian Demographic and Health Surveys (EDHS), comprising 13,057 and 5,677 non-pregnant and non-postpartum women age 15-49, respectively. Women's body mass index (BMI) ( $\text{kg/m}^2$ ) is used as a measure of women's nutritional status, and those with a BMI value less than 18.5 are considered to be at risk of chronic energy deficiency (CED). A logistic regression model was employed to identify important determinant factors of women's undernutrition.

The study finds that 30.5% of women in the 2000 EDHS and 26.9% of the women in the 2005 survey were undernourished, of whom in the 2000 survey 19.4% were moderately undernourished and 11.1% were severely undernourished. Similarly, in the 2005 survey 18.0% were moderately undernourished and 8.9% severely undernourished. The levels of undernutrition were almost 1.5 times higher for rural than urban women. There seems to be some improvement in women's undernutrition status between 2000 and 2005.

Age, marital status, religion, occupation, wealth index and region of residence were found to significantly affect chronic energy deficiency for women in 2000 survey year, while in 2005 religion and region of residence were no longer factors influencing women's undernutrition. In 2000 undernutrition in rural areas was significantly associated with age, marital status, occupation and region, while in 2005 marital status was no longer a determinant. In urban areas, marital status, education (in 2000 only), wealth and region were found to significantly affect women's level of undernutrition in the two survey years. Among the regions,

women in Tigray, Afar, Somali, Gambella and Ben-Gumuz were highly likely to be undernourished. In these regions more than one-third of women experience undernutrition.

In order to improve women's nutritional status, policy should focus on creating mechanisms and opportunities to increase agricultural productivity, particularly in Tigray, Afar, Gambella, Ben-Gumuz and Somali, and to promote health service provision in these regions. Policy also should emphasize women's education, particularly in rural areas, and seek job creation opportunities particularly in urban areas.

## INTRODUCTION

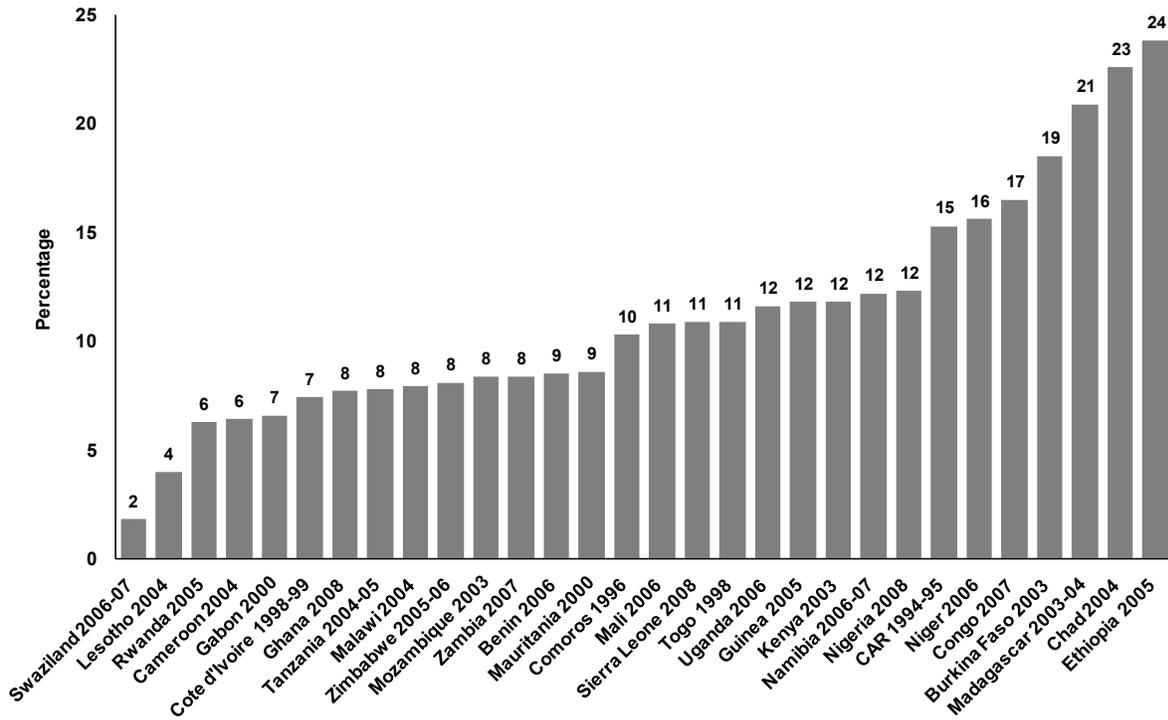
Undernutrition and poor health from preventable causes disproportionately affect the well-being of millions of people in the developing world. Factors at individual, household and community levels, or a combination of these factors, may contribute to poor nutrition and health status. In particular, malnutrition among women is likely to have a major impact on their own health as well as their children's health. More than 3.5 million women and children under age five in developing countries die each year due to the underlying cause of undernutrition (Robert et al., 2008).

Intensified actions to improve nutrition in these countries are needed to achieve the Millennium Development Goal of halving severe hunger by 2015 (MDG 1) and also to greatly increase the chances of achieving the Millennium Development Goal of reducing maternal mortality by three-quarters between 1990 and 2015 (MDG 5). In order to resolve the problem of maternal mortality, most researchers recommend the provision of emergency obstetric services by including the use of skilled birth attendants and effective referral systems (Ronsmans et al., 2008). Although providing improved obstetric care is very important, it alone cannot be enough to resolve the problem. Attending the nutritional needs of women in their childbearing age is an equally important aspect of improving women's/mother's survivorship.

According to the 2009 special report of the Crop and Food Security Assessment Mission to Ethiopia (FAO/WFP, 2009), 7.5 million persons are still chronically food insecure and were under the productive safety net programme (PSNP); an additional 4.9 million people are facing acute food insecurity, as of January to June 2009.

Undernutrition is a serious problem in Ethiopia, and women and children are the most affected segments of the population. One of every four (26%) women of reproductive age in Ethiopia is undernourished (Central Statistical Authority [Ethiopia] and ORC Macro, 2006), twice the sub-Saharan average of 13.3% (Mukuria et al., 2005). Comparing the nutritional status of Ethiopian women with that of women in 29 other sub-Saharan African countries, based on the most recent DHS conducted between 1998 and 2008, the prevalence of undernutrition in Ethiopia is higher than in any other country (Figure 1).

**Figure 1: Percentage of women whose BMI is less than 18.5 in sub-Saharan Africa: DHS 1998-2007**



Only limited research has been conducted on the levels and determinants of maternal nutritional status in Ethiopia (Lindet and Tadesse, 1997; Woldemariam and Timotiws, 2002; Teller and Yimer, 2000; Mulugeta et al., 2009). This may be due to lack of relevant data at the national level and to the limited number of researchers in the area. Some studies focus on only rural geographical settings (Lindet and Tadesse, 1997) to show intra-household correlations of nutritional status. Others focus on a particular region to show levels and determinants of malnutrition among young and adult women (Teller and Yimer, 2000). Still others examine a single older survey to show the determinants of malnutrition among women in Ethiopia (Woldemariam and Timotiws, 2002). A recent study on the nutritional status of adolescent girls from rural communities of Tigray, Northern Ethiopia (Mulgeta et al., 2009) has helped to close the research gap in the area, although it is still focused on a small geographic area and small populations. The present study, which looked at the levels, differentials and determinants of undernutrition by examining the associated rural-urban disparity, therefore is an important contribution to minimize the research gap.

More considerably, the study has important policy implications from a global health perspective as well as a country-specific viewpoint. From a global health perspective it will help to evaluate the progress being made by countries towards achieving the Millennium Development Goals. At the country level, governments would be better informed about where to allocate their scarce resources in their effort to improve the nutritional and health status of their general population, and of women in particular. As this study aims to analyze DHS data from two time points (year 2000 and 2005), our analysis will provide trends at national and regional levels, which is crucial to monitor the impact of any intervention made so far. At the same time, the study will help to identify regions of Ethiopia where the problem of undernutrition is relatively severe.

## **DATA AND METHODS**

### **Data**

In this analysis we used data collected in the two rounds of the Ethiopia Demographic and Health Surveys (EDHS), which were carried out in 2000 and 2005. The surveys were designed to provide estimates for health and demographic variables for the following domains: Ethiopia as a whole; urban and rural areas of Ethiopia (each as a separate domain); and 11 geographic areas (nine regions and two city administrations), as follows: Tigray; Affar; Amhara; Oromia; Somali; Benishangul-Gumuz; Southern Nations; Nationalities and Peoples (SNNP); Gambela; Harari; Addis Ababa; and Dire Dawa. The response rates for eligible women age 15-49 were 98% in 2000 and 96% in 2005.

The indicator used to assess undernutrition among women is body mass index (BMI), also known as Quetlet index. The analysis for BMI is based on 18,734 (13,057 in 2000 and 5,677 in 2005) non-pregnant and non-postpartum women. The sampling design and implementation procedures for both surveys are described in detail in the two EDHS final reports (Central Statistical Agency [Ethiopia] and ORC MACRO, 2001 and 2006).

### **Measures**

Among four possible anthropometric indicators to assess women's chronic undernutrition—height less than 145 cm; body mass index (BMI) < 18.5 (thinness); weight less than 45 kg; and mid-arm circumference (MUAC) < 22.5 cm (Victoria Quinnin, 1999)—BMI was used as the outcome for this study. BMI is defined as weight in kilograms divided by height squared in meters ( $\text{kg}/\text{m}^2$ ). Weight was measured by using a solar-powered scale, called Uniscale, with an accuracy of  $\pm 100\text{g}$ , and height was measured with an adjustable wooden measuring board, called Shorr Height boards, measuring to the nearest 0.1cm. In order to avoid the impact of fetus and lactation on BMI, the study avoided pregnant women and women less than or equal to three months postpartum (women who had a birth in the three months preceding the survey).

## Methods

This study applied the WHO classifications for chronic undernutrition using BMI to assess nutritional status: normal  $\geq 18.5$ ; thin 17.0-18.4; moderately thin 16.0-16.9; and severely thin  $\leq 15.9$  (ACC/SCN, 1992 and 2000). Undernutrition in the analysis therefore refers to  $\text{BMI} < 18.5$ . The estimates to examine the differentials and relative risk factors among rural and urban areas were conducted by classifying women into urban/rural parts over the two consecutive DHS surveys (2000 and 2005). The demographic and socioeconomic variables used in the analysis were: age; parity; current marital status; education and occupation (of the respondents and their partners); place of residence; region of residence; wealth index; and religion, using different classifications<sup>1</sup>.

The study used univariate, bivariate, and multivariate analyses. Univariate analysis refers to simple descriptive statistics of all theoretically relevant variables. In the bivariate analysis trends over the two survey years were examined at different levels of undernutrition (thin, moderately thin and severely thin) by various independent variables. The association between the dependent variable (whether the women were undernourished or not)<sup>2</sup> and each of the explanatory variables were conducted using Pearson's chi square test. The relative regional differences in the undernutrition levels were described using a map of Ethiopia (see Figure 5). For the multivariate analysis we fitted logistic regression models to identify the relative contribution of selected independent variables in explaining the total variance in women's nutritional status. The svy set syntax was employed while running the logistic regression model to take into account sampling of the 2000 and 2005 surveys. Six different models were fitted to identify factors affecting the rural/urban/total women separately over the years. Stata 10 software was used for analysis.

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<sup>1</sup> Wealth index was classified into two categories; those in the lower wealth quintiles (1 to 4) were classified as non-rich; those in the highest quintile (5) were classified as rich.

<sup>2</sup> The dependent variable (undernutrition) was classified into two categories and coded as:  $\text{BMI} < 18.5$  and  $\geq 18.5$ .

## RESULTS

### Characteristics of the Respondents

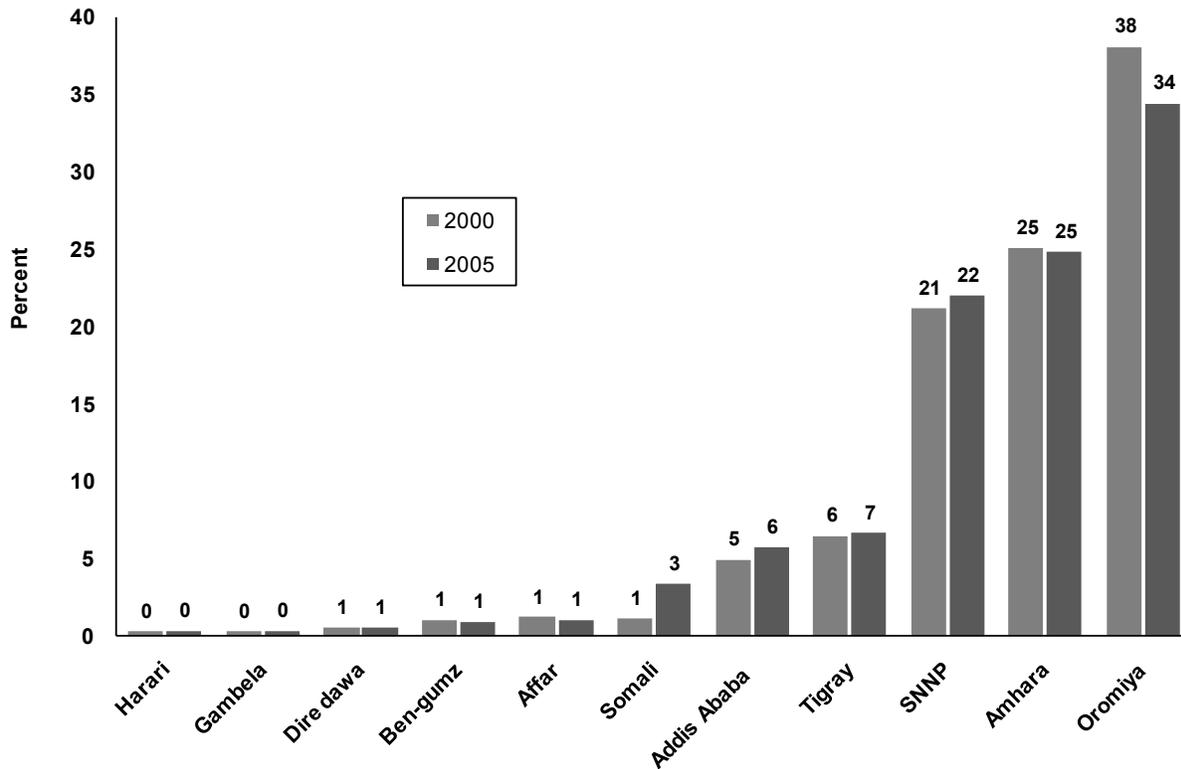
Table 1 presents the percentage distribution of non-pregnant and non-postpartum women age 15-49 according to the selected demographic and socioeconomic characteristics. The distribution of women by background characteristics looks similar over the years (2000 and 2005). In our sample a large proportion (80.7%) of women were selected from rural areas and 19.3% from urban areas over the two years. Regionally (Figure 2), the majority of the samples were selected from Oromia region (38.1% for 2000 and 34.4% for 2005), followed by Amhara (25.0% and 24.8%) and SNNP (21.2% and 21.0%). The rest of the regions contributed less than 10% of the total sample. The majority of the women (73.7% for 2000 and 63.2% for 2005) had no education, while most others (16.6% and 23.8%) had completed primary education. The rest (9.7% and 13.0%) had secondary education or higher. Most of the women (51.3% in 2000 and 49.9% in 2005) were Orthodox Christians, while about a quarter (28.4% and 28.4%) were Muslims and most others (15.7% and 18.1%) were Protestants. Women with other religions were less than 5%. Women who engaged in agricultural activity were 47.1% of the sample in 2000 and 23.0% in 2005. In 2000, 36.3% were in the unemployed/missing and don't know categories, while in 2005 the comparable figure was 63.4%. Another 16.6% in 2000, and 13.6% in 2005, were in non-manual/professional jobs, mostly in urban areas. Three fourths of the women (74.5% in 2000 and 73.0% in 2005) were in the non-rich category and the rest (25.5% and 27.0%) were classified as rich. Almost all of the non-rich (98.9% and 98.3%) were from rural areas and most of the rich (72.5% and 66.5%) were from urban parts of the country (Table 1).

**Table 1: Percent distribution of women age 15-49 by background characteristics in Ethiopia: urban, rural and total, EDHS 2000 and 2005**

Background Characteristics	2000			2005		
	Urban	Rural	Total	Urban	Rural	Total
<b>Age</b>						
15-19	30.5	25.1	26.1	29.6	25.2	26.1
20-29	35.9	31.9	32.7	37.2	32.3	33.3
30-39	20.2	22.8	22.3	19.6	23.6	22.9
40-49	13.4	20.2	18.9	13.5	18.8	17.8
<b>Parity</b>						
0	49.1	32.0	35.3	53.6	30.7	35.1
1-2	20.9	18.4	18.9	22.5	17.0	18.1
3-4	12.7	15.1	14.7	11.4	16.9	15.9
5+	17.2	34.5	31.1	12.5	35.3	30.9
<b>Marital Status</b>						
Never married	43.1	24.2	27.8	47.5	24.9	29.2
Married /Living together	38.3	63.3	58.4	35.1	64.3	58.7
Widowed/Divorced/Separated	18.6	12.6	13.7	17.4	10.8	12.1
<b>Education</b>						
No education	34.0	83.3	73.7	23.1	72.8	63.2
Primary education	24.6	14.6	16.6	25.6	23.4	23.8
Secondary and above	41.5	2.1	9.7	51.3	3.8	13.0
<b>Religion</b>						
Orthodox	65.4	47.9	51.3	73.2	44.4	49.9
Muslim	21.3	30.1	28.4	14.8	31.7	28.4
Protestant	11.2	16.7	15.7	10.4	19.9	18.1
Others	2.2	5.3	4.7	1.6	4.0	3.6
<b>Occupation</b>						
Agricultural/Manual(Skilled/unskilled)	20.3	53.5	47.1	10.9	25.9	23.0
Non-manual/Professional	36.2	11.9	16.6	32.2	9.1	13.6
Unemployed/Missing and don't know	43.6	34.6	36.3	56.9	65.0	63.4
<b>Wealth Index</b>						
Non-rich	4.4	91.3	74.5	6.5	88.8	73.0
Rich	95.6	8.7	25.5	93.5	11.2	27.0
<b>Partner's Education</b>						
No education	18.0	55.4	48.2	14.2	50.3	43.3
Primary	11.8	15.6	14.9	10.4	19.3	17.6
Secondary and above	26.2	4.1	8.4	27.1	4.9	9.2
Missing and don't know	44.0	24.9	28.6	48.2	25.5	29.9
<b>Partner's Occupation</b>						
Unemployed	0.6	0.4	0.4	1.3	0.6	0.7
Agricultural	9.7	68.8	57.4	7.6	69.3	57.5
Manual	16.6	2.0	4.8	13.5	1.4	3.7
Non-manual/Professional	29.0	4.5	9.3	28.6	3.4	8.3
Missing and don't know	44.1	24.3	28.1	48.9	25.3	29.8
<b>Total</b>	19.3	80.7		19.3	80.7	
<b>Number of Cases</b>	2,526	10,531	13,057	1,094	4,584	5,677

Note: Higher proportion of missing cases happened for Partner's characteristics since only women who have been ever married are asked about their partners.

**Figure 2: Percent distribution of women by region of residence, EDHS 2000 and 2005**



### Levels of Undernutrition

Table 2 presents the mean BMI scores and BMI scores among women at different levels of undernutrition (severely thin; moderately thin; and thin) by important background characteristics, including rural or urban residence and region of the country. Mean BMI scores showed very small progress between the two surveys, from 19.8 in 2000 to 20.3 in 2005. In line with this the level of undernutrition (BMI <18.5) showed a decline from 30.5% to 26.9%. Women residing in rural areas constituted the majority of the proportion undernourished (85% in 2000 and 86% in 2005). Considering the degrees of undernutrition, most of the women were in the mildly thin category, BMI=17-18.4 (19.4% in 2000, 18.0% in 2005), followed by moderately thin (6.8%, 5.4%) and severely thin (4.3%, 3.5%), among all chronically under-nourished women. As mentioned, the majority of the undernourished women were in rural areas, of which group most were mildly thin (20.5%, 19.5%), while others were moderately thin (6.8%, 5.4%) or severely thin (4.3%, 3.5%).

Among the regions, women in Somali, Ben-Gumuz, Amhara, Tigray and Gambella were most affected by chronic undernutrition. Regions with the highest prevalence of severely thin women include Somali (8.6%, 8.5%), Afar (7.8%, 5.08%), Tigray (4.7%, 5.6%) and Gambella (5.9%, 5.3%). Also, never-married women and women with no children (parity 0) were most affected by severe undernutrition (see Table 2).

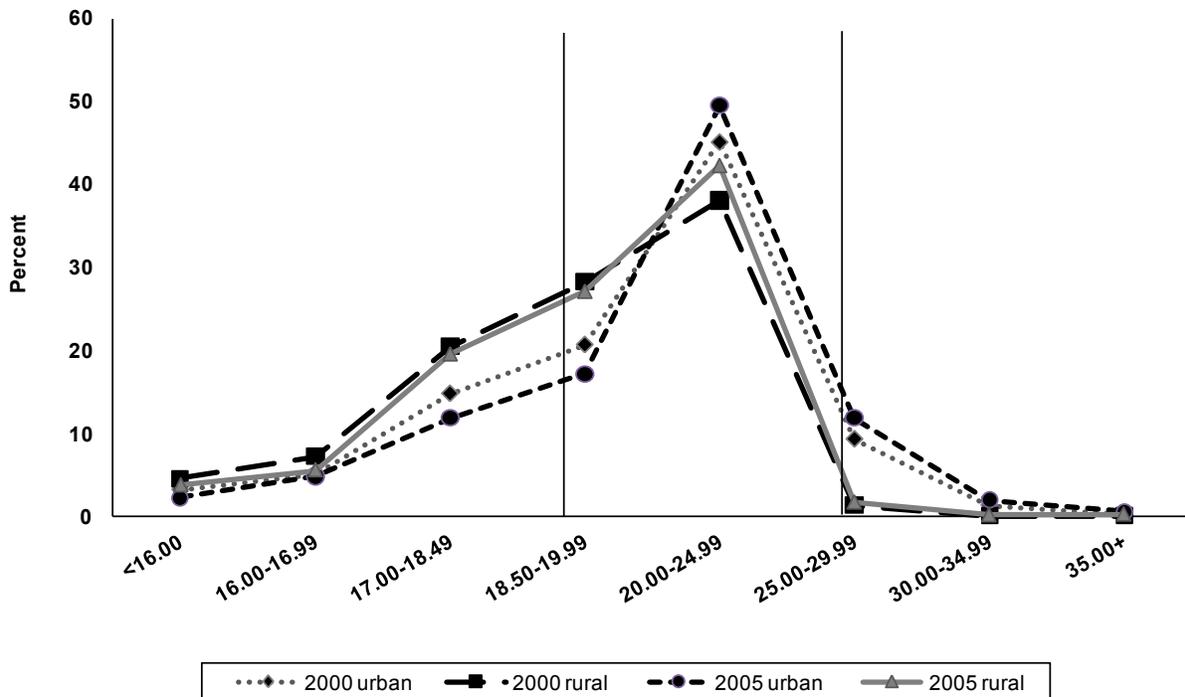
**Table 2: Mean BMI and levels of undernutrition using different cutoff points for women age 15-49 by background characteristics in Ethiopia, EDHS 2000 and 2005**

Background Characteristics	BMI (Kg/M <sup>2</sup> )							
	2000				2005			
	Mean BMI	Severely thin (% BMI <=15.9)	Moderately thin (% BMI 16.0-16.9)	Mildly thin (% BMI 17.0-18.4)	Mean BMI	Severely thin (% BMI <=15.9)	Moderately thin (% BMI 16.0-16.9)	Mildly thin (% BMI 17.0-18.4)
<b>Residence</b>								
Urban	20.95	3.21	5.15	14.81	21.65	2.29	4.84	11.79
Rural	19.56	4.55	7.23	20.48	19.92	3.73	5.54	19.50
<b>Region</b>								
Tigray	19.72	4.73	8.17	22.01	19.51	5.59	10.37	22.07
Afar	19.72	7.84	9.80	24.18	20.02	5.08	8.47	18.64
Amhara	19.57	4.77	7.22	19.91	19.93	4.26	5.61	17.74
Oromia	19.82	3.62	6.41	18.96	20.39	2.20	4.25	18.21
Somali	19.24	8.57	12.86	27.14	20.05	8.47	9.52	18.52
Ben-Gumuz	19.20	6.82	9.85	22.73	19.54	3.92	7.84	23.53
SNNPR	19.77	4.85	6.73	19.66	20.18	3.28	5.12	18.73
Gambella	19.23	5.88	11.76	20.59	19.65	5.26	10.53	21.05
Harari	20.91	2.94	5.88	14.71	20.97	0.00	6.25	12.50
Addis Ababa	21.78	1.56	3.73	12.44	22.18	2.47	3.09	9.88
Dire Dawa	20.98	2.86	8.57	15.71	21.32	3.33	6.67	13.33
<b>Parity</b>								
0	19.79	7.79	8.41	17.87	20.19	5.71	7.57	15.34
1-2	19.99	2.11	5.72	18.16	20.54	2.05	4.09	17.15
3-4	19.89	1.72	5.12	21.16	20.72	1.56	3.78	16.46
5+	19.76	2.85	6.49	21.03	19.92	2.62	4.56	22.38
<b>Marital Status</b>								
Never married	19.66	8.75	9.16	17.74	20.06	5.78	8.01	14.94
Married / Living together	19.86	2.32	5.68	20.29	20.32	2.46	4.17	19.08
Widowed/ Divorced/ Separated	20.05	3.62	6.97	18.84	20.42	2.63	5.12	20.32
<b>Total</b>	19.83	4.29	6.82	19.38	20.25	3.45	5.41	18.02

### Patterns of Undernutrition

Figure 3 shows the percent distribution of women age 15-49 according to levels of undernutrition, in rural and urban areas, based on BMI scores for 2000 and 2005. The shape of the graph looks skewed to the right, indicating that most women were concentrated in groups with lower BMI scores. The graphs show an increasing level in the BMI scores from <16 to 20-25, and then the direction is reversed to lower rates through BMI scores from 20-25 to 35+. For the lower BMI scores (<16 to 20-25), rural women show a relatively higher level than their urban counterparts, and for the higher BMI scores urban women show a relatively higher level of nutritional status than rural women.

**Figure 3: Percent distribution of women age 15-49 according to BMI scores, EDHS 2000 and 2005**



## **Bivariate Analysis of Differentials in Undernutrition**

Table 3 presents the percentage differentials of undernutrition (BMI<18.5) among women by selected socioeconomic and demographic characteristics, comparing rural and urban areas over the two surveys. The results of the bivariate analysis using Pearson's chi square test showed significant association between all explanatory variables and women's undernutrition in 2000; however marital status and religion were not significantly associated with undernutrition in 2005. In urban areas the background characteristics that had a significant effect on women's undernutrition were age in 2005, marital status in 2005, wealth in both 2000 and 2005, and partner's education in 2005. In rural areas all the underlying characteristics except women's education were significantly associated with women's undernutrition.

## **Demographic Differentials of Undernutrition**

### ***Women's age***

The magnitude of chronic energy deficiency among women at different ages reveals how nutritional status varies during the reproductive years. Among all women age 15-49, the prevalence of chronic energy deficiency by age shows that women age 15-19 and 40-49 were most affected, with prevalence of 38.4% in 2000 and 33.0% in 2005 among women age 15-19, and prevalence of 34.9% in 2000 and 30.9% in 2005 among women age 40-49 (Table 3).

**Table 3: Urban-rural differentials in undernutrition (percentage of women age 15-49 with BMI<18.5) by background characteristics in Ethiopia: urban, rural and total, EDHS 2000 and 2005**

Background Characteristics	2000						2005					
	Urban	N	Rural	N	Total	N	Urban	N	Rural	N	Total	N
<b>Age</b>												
15-19	24.5	770	42.4	2,640	38.4	3,410	22.2	324	36.0	1,156	33.0	1,480
20-29	20.4	906	25.1	3,356	24.2	4,263	18.4	407	21.9	1,482	21.1	1,889
30-39	21.3	511	28.0	2,403	26.8	2,915	18.7	214	26.5	1,083	25.2	1,298
40-49	30.2	338	35.7	2,132	34.9	2,470	13.5	148	33.8	863	30.9	1,011
<i>p-value</i>	0.099	*	0.000	***	0.000	***	0.298		0.000	***	0.000	***
<b>Parity</b>												
0	22.9	1,241	38.2	3,370	34.1	4,612	20.5	585	31.9	1,409	28.6	1,995
1-2	21.0	528	27.3	1,938	26.0	2,467	17.8	247	25.1	780	23.4	1,026
3-4	22.4	321	29.1	1,592	28.0	1,914	12.0	125	23.5	775	21.8	900
5+	27.1	435	30.8	3,630	30.4	4,065	20.6	136	30.3	1,620	29.6	1,756
<i>p-value</i>	0.458		0.000	***	0.000	***	0.272		0.002	***	0.001	***
<b>Marital Status</b>												
Never married	23.5	1,089	40.8	2,546	35.7	3,635	21.7	520	31.9	1,140	28.7	1,660
Married /Living together	20.6	967	29.4	6,661	28.3	7,629	13.3	384	27.3	2,950	25.7	3,333
Widowed/Divorced/Separated	27.7	469	30.0	1,324	29.4	1,793	22.5	191	30.3	495	28.1	685
<i>p-value</i>	0.102		0.000	***	0.000	***	0.016	**	0.057	*	0.171	
<b>Education</b>												
No education	26.0	858	31.9	8,767	31.3	9,625	20.9	253	28.4	3,338	27.9	1,660
Primary education	19.5	621	34.9	1,540	30.5	2,161	19.6	280	30.8	1,071	28.5	3,333
Secondary and above	23.1	1,048	28.7	223	24.1	1,271	17.6	562	24.1	174	19.0	685
<i>p-value</i>	0.132		0.127		0.002	***	0.619		0.244		0.001	***
<b>Religion</b>												
Orthodox	22.9	1,652	31.5	5,040	29.4	6,692	19.5	800	28.4	2,035	25.9	2,835
Muslim	25.5	537	34.6	3,168	33.3	3,706	16.0	162	31.0	1,451	29.5	1,613
Protestant	19.9	281	29.8	1,763	28.4	2,045	18.4	114	26.9	914	26.0	1,027
Others	23.6	55	33.4	560	32.6	615	22.2	18	25.0	184	24.8	202
<i>p-value</i>	0.505		0.173		0.045	**	0.846		0.333		0.228	

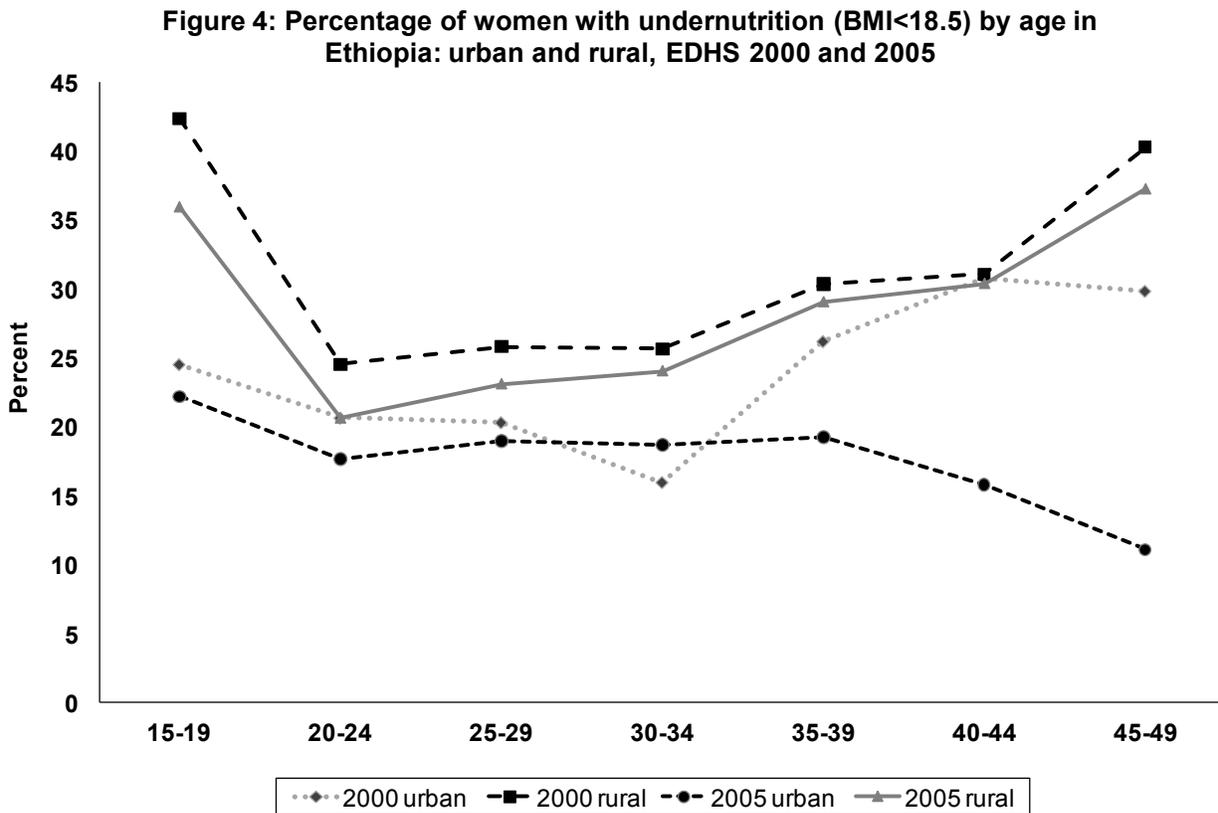
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Table 3: Cont'd

Background Characteristics	2000						2005					
	Urban	N	Rural	N	Total	N	Urban	N	Rural	N	Total	N
<b>Occupation</b>												
Agricultural/Manual(skilled/unskilled)	26.2	512	30.6	5,638	30.2	6,150	23.5	120	26.9	1,187	26.6	1,307
Non-manual/Professional	19.2	914	28.0	1,251	24.3	2,165	16.5	352	23.8	418	20.5	770
Unemployed/Missing/Don't know	25.0	1,100	36.4	3,642	33.7	4,742	19.4	622	30.2	2,979	28.3	3,601
<i>p-value</i>	0.195		0.000	***	0.000	***	0.186		0.058	*	0.003	***
<b>Wealth Index</b>												
Non-rich	36.6	112	32.5	9,616	32.5	9,728	35.2	71	29.4	4,071	29.5	4,143
Rich	22.6	2,415	30.0	915	24.6	3,330	17.8	1,023	23.6	512	19.7	1,535
<i>p-value</i>	0.052	*	0.264	ns	0.000	***	0.000	***	0.054	*	0.000	***
<b>Partner's Education</b>												
No education	26.9	454	29.8	5,833	29.6	6,288	20.0	155	29.0	2,305	28.5	2,460
Primary	21.7	299	29.6	1,640	28.4	1,939	22.8	114	25.4	883	25.1	997
Secondary and above	20.8	663	26.0	435	22.9	1,097	11.1	297	21.2	226	15.5	522
Missing and don't know	23.6	1,111	40.4	2,622	35.4	3,733	22.2	527	32.3	1,170	29.2	1,698
<i>p-value</i>	0.388		0.000	***	0.000	***	0.011	**	0.009	***	0.000	***
<b>Partner's Occupation</b>												
Agricultural/Manual(skilled/unskilled)	24.2	665	29.7	7,458	29.3	8,122	18.0	231	27.9	3,242	27.3	3,473
Non-manual/Professional	21.9	734	25.7	474	23.4	1,208	15.5	313	24.1	156	18.4	469
Unemployed/Missing/Don't know	23.5	1,128	40.8	2,599	35.5	3,727	21.2	549	31.7	1,186	28.4	1,735
<i>p-value</i>	0.704		0.000	***	0.000	***	0.241		0.071	*	0.004	***
<b>Total</b>	23.2	2,526	32.3	10,531	30.5	13,057	18.9	1,094	28.8	4,584	26.9	5,677

Note: \*\*\* significant at  $p < 0.01$ ; \*\* significant at  $p < 0.05$ ; \* significant at  $p < 0.1$ ; unmarked = not significant

Figure 4 shows the level of women’s undernutrition by age groups, for rural and urban women over the years 2000 and 2005. A relatively similar pattern was observed among rural women as among the total group of women over the two survey years. Among rural women age 15-19, 42.4% in 2000 and 36.0% in 2005 were chronically undernourished. Among rural women age 40-49, 35.7% in 2000 and 33.8% in 2005 were chronically undernourished. Among urban women age 15-19, chronic undernutrition was lower; still, almost one-fourth (24.2% in 2000 and 22.0% in 2005) were undernourished. Examining the changes between 2000 and 2005 in levels of undernutrition by age group, chronic undernourishment remained relatively high except among older urban women. Unlike among other groups, the level of undernutrition among urban women age 35 and older showed a sharply decreasing trend (Figure 4).



### ***Parity***

The number of children ever born (parity) was another important factor found to significantly affect women's nutritional status. Results of Table 3 show that women who have never had a child (parity 0) and women with at least five children (parity 5+) were at a higher risk of chronic energy deficiency than other women. As expected, chronic energy deficiency by parity shows that for all parities undernutrition was much higher among rural than urban women.

### ***Marital status***

Never-married women were found to be the most affected by undernutrition, followed by divorced/separated/widowed women. Among never-married women, 35.7% in 2000 and 28.7% in 2005 were chronically undernourished. Among both rural and urban women for both surveys, those married or living together were the least affected by chronic energy deficiency (Table 3).

## **Socioeconomic Differentials of Undernutrition**

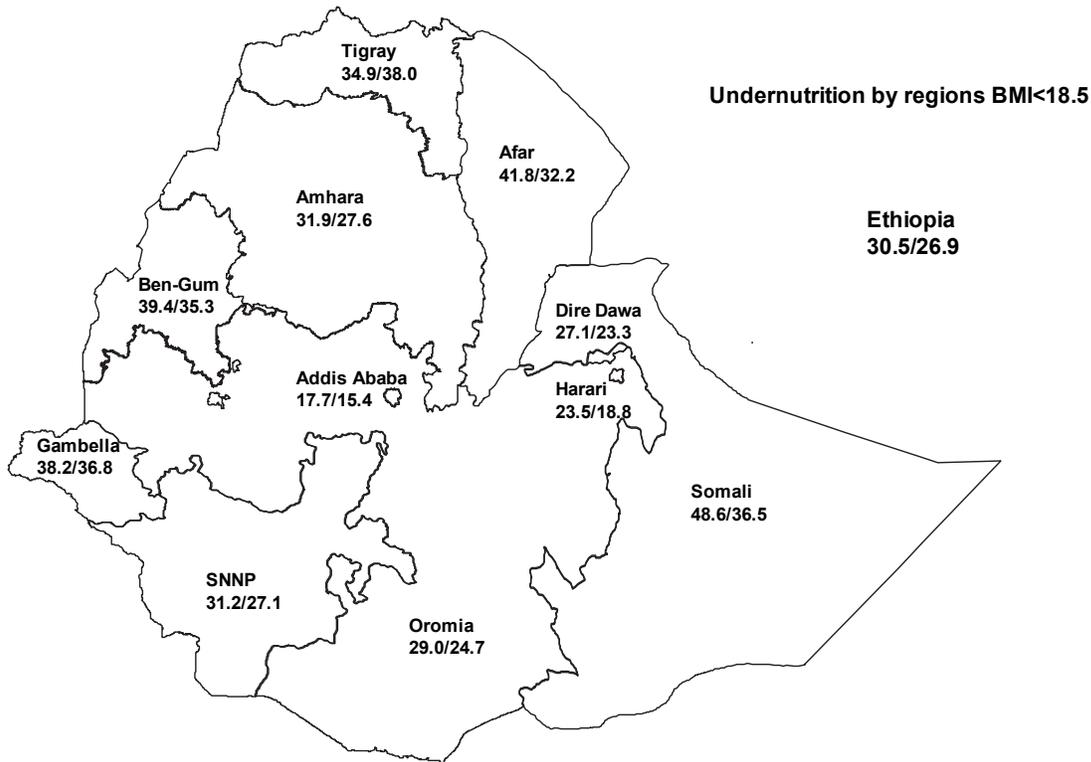
### ***Urban- rural residence***

All findings show higher levels of undernutrition among rural women than urban women, although there were declines among both groups between 2000 and 2005. The undernutrition level declined from 32.3% to 28.8% among rural women and from 23.2% to 18.9% among urban women over the two survey years (Table 3). The decline was more pronounced among women in urban areas.

### ***Region of residence***

As evident from Figure 5 and Table 4, region of residence was an important factor that significantly affects the level of undernutrition in Ethiopia. In all of the regions except Tigray the level of undernutrition showed a decrease from 2000 to 2005. In Tigray, Afar, Somali, Gambella and Ben-Gumuz the undernutrition level was more than 35%. In 2000 the level of undernutrition was highest (48.6%) in Somali, though it declined to 36.5% in 2005. In 2005 the level of undernutrition was highest in Tigray, at 38.0%, up from 34.9% in 2000.

**Figure 5: Percentage of women age 15-49 with CED by region of residence in Ethiopia: EDHS 2000 and 2005**



### **Multivariate Analysis: Relative Risks of Undernutrition**

Table 4 depicts the adjusted odds ratios of undernutrition (BMI <18.5) by background characteristics for rural and urban areas and the total sample, to identify factors affecting the level of undernutrition and examine changes over the two survey years. The results show that the factors significantly affecting women’s undernutrition changed from 2000 to 2005. In the 2000 EDHS, age, marital status, religion, occupation, wealth index and region of residence were found to significantly affect chronic energy deficiency for the total sample of women. In 2005, however, religion and region of residence were no longer determinant factors for women’s undernutrition.

Women age 15-19 and 40-49 were more than 1.5 times more likely (OR= 1.7, 1.7 in 2000 and OR=1.8, 1.4 in 2005) to suffer from undernutrition compared with women age 20-29. As expected, women in the rich category were less likely (OR= 0.74, 0.68) to be affected by undernutrition than their non-rich counterparts. Women in Tigray, Afar, Somali, Ben–Gumuz and Gambella were more likely to be affected by chronic undernutrition than women in Oromia region.

**Table 4: Adjusted odds ratios of undernutrition (BMI<18.5) among women 15-49 by background characteristics in Ethiopia: urban, rural and total, EDHS 2000 and 2005**

Background Characteristics	2000			2005		
	Urban	Rural	Total	Urban	Rural	Total
<b>Age</b>						
15-19	1.10	1.92***	1.70***	0.96	2.00***	1.72***
20-29 <sup>R</sup>	1.00	1.00	1.00	1.00	1.00	1.00
30-39	1.07	1.25**	1.21*	0.94	1.18	1.14
40-49	1.42	1.88***	1.80***	0.48	1.64***	1.42**
<b>Parity</b>						
0	0.87	0.85	0.87	0.69	1.02	0.97
1-2 <sup>R</sup>	1.00	1.00	1.00	1.00	1.00	1.00
3-4	1.03	1.12	1.09	0.68	1.00	0.92
5+	1.14	0.94	0.94	1.78	1.18	1.18
<b>Marital Status</b>						
Never married	1.56*	1.63***	1.58***	2.7**	1.02	1.17
Married/Living together <sup>R</sup>	1.00	1.00	1.00	1.00	1.00	1.00
Widowed/Divorced/Separated	1.44*	0.98	1.08	2.22**	1.08	1.18
<b>Education</b>						
No education	1.26	0.94	1.01	1.16	0.90	0.94
Primary education <sup>R</sup>	1.00	1.00	1.00	1.00	1.00	1.00
Secondary and above	1.45**	0.93	0.96	0.98	0.71	0.82
<b>Religion</b>						
Orthodox <sup>R</sup>	1.00	1.00	1.00	1.00	1.00	1.00
Muslim	1.09	1.16	1.17*	0.67	1.24	1.16
Protestant	1.01	0.91	0.95	0.98	1.04	1.01
Others	1.26	1.13	1.14	0.99	1.01	0.98
<b>Occupation</b>						
Agricultural/Manual(skilled/unskilled) <sup>R</sup>	1.00	1.00	1.00	1.00	1.00	1.00
Non-manual/Professional	0.65	0.82*	0.81**	0.84	0.91	0.92
Unemployed/Missing/Don't know	0.93	1.26***	1.21**	0.92	1.19*	1.15
<b>Wealth Index</b>						
Non-rich <sup>R</sup>	1.00	1.00	1.00	1.00	1.00	1.00
rich	0.61*	0.90	0.74***	0.37***	0.80	0.68***
<b>Region</b>						
Tigray	2.06**	1.48***	1.54***	1.92*	2.08***	2.02***
Afar	0.91	2.14***	1.84***	0.64	1.62**	1.44*
Amhara	1.71**	1.27**	1.29**	0.78	1.27	1.21
Oromia <sup>R</sup>	1.00	1.00	1.00	1.00	1.00	1.00
Somali	4.03***	1.80***	2.19***	1.31	1.70**	1.61**
Ben-Gumuz	3.08***	1.60***	1.72***	2.26	1.52**	1.59**
SNNPR	0.88	1.23*	1.21*	0.68	1.15	1.12
Gambella	1.89	2.09***	1.98***	1.18	2.18***	2.053***
Harari	1.00	1.17	0.99	0.97	1.39	1.08
Addis Ababa	0.88	NA	0.70***	0.78	1.11	0.87
Dire Dawa	1.35	1.55**	1.18	1.25	1.36	1.21

<sup>R</sup>: Reference Category

Note: NA = Not applicable; \*\*\* significant at  $p<0.01$ ; \*\* significant at  $p<0.05$ ; \* significant at  $p<0.1$ ; unmarked = not significant

### **Factors Affecting Women's Undernutrition in Rural Areas**

The level of undernutrition in rural areas was significantly affected by age, marital status, occupation and region of residence, but in 2005 marital status was no longer a determinant factor. Rural women age 15-19 and 40-49 were more than 1.5 times more likely to be affected by chronic energy deficiency than women age 20-29. Never-married women were 1.6 times more likely to be affected by chronic energy deficiency than married women. However, in 2005 marital status was no longer a predicting factor for undernutrition. Unemployed women were more likely (OR=1.3, 1.2) to be affected than those working in agriculture, but women in non-manual/professional jobs were less likely to be affected by chronic undernutrition. Women living in five of the regions (Tigray, Afar, Somali, Ben-Gumuz and Gambella) were more than 1.5 times more likely to be affected by chronic undernutrition than women in Oromia region.

### **Factors Affecting Women's Undernutrition in Urban Areas**

The results of table 4 also depict that in urban areas marital status, education (in 2000 only), wealth and region of residence significantly affected women's level of undernutrition. Never-married women and widowed/divorced/separated women were more likely (OR=1.6, 2.7) and (OR= 1.4, 2.2) to be affected by the chronic energy deficiency than women who were married or living together. In the year 2000, urban women with secondary/higher education were 1.5 times more likely to be affected by chronic undernutrition than women with only a primary education. Unlike rural women, for urban women wealth - was significantly associated with chronic undernutrition: rich women were less likely (OR=0.6, 0.4) to be affected by chronic undernutrition than their non-rich counterparts. Residence in Tigray, Amhara, Somali and Ben-Gumuz regions significantly affected women's level of undernutrition in 2000 but in 2005 only in Tigray did region of residence significantly affect women's nutritional status. Women living in Tigray region were almost twice as likely to be affected by chronic energy deficiency than women in Oromia region, over both survey years.

## DISCUSSION

Undernutrition is assumed to be affected by both health and food security status of the individual. Thus the evaluation of undernutrition needs to be seen in light of these two pillars. To demonstrate the rural-urban disparity in women's nutritional status for all characteristics, the study examined data for rural, urban and total samples over the two survey years, 2000 and 2005. This was to better explain the discrepancy between rural and urban women in terms of their ways of living. In the rural parts of Ethiopia, less expanded educational institutions, traditional ways of farming as only means of surviving, early marriage, less developed infrastructures, and cultural and religious influences are assumed to have substantial influence on women's nutritional status.

Results of both bivariate and multivariate analysis confirmed that there is a 30% disparity in the levels of undernutrition between urban and rural women. Women living in rural areas of the country are much more undernourished than their urban counterparts, for both 2000 and 2005. Similar results have been reported from earlier studies in Ethiopia and elsewhere in sub-Saharan Africa and in India (Uthman and Aremo, 2008; Ramesh, 2004; Teller and Yimer, 2000). The disparity may be due to better infrastructural facilities and higher expenditures on health in urban areas. Greater access to health care, safe water and sanitation facilities may be the causal factors for better nutritional status among urban women. Moreover, better infrastructure, which has a direct influence on food security, is relatively poor in the rural parts of Ethiopia. Another important reason associated with low nutritional status of rural women may be the higher levels of labor or workload among rural women compared with their urban counterparts. The above basic problems in collaboration with slow expansion of education and social services and roads in rural parts of Ethiopia may contribute to lower nutritional status among women in rural areas.

Regarding the regional variations in undernourishment, both bivariate and multivariate results for the total sample of women (both rural and urban) confirmed that women who live in Tigray, Afar, Somali, Ben-Gumuz and Gambella are at a higher risk of undernutrition than those in Oromia region. The multivariate results also showed similar findings: women living in Tigray, Somali, Ben-Gumuz and Gambella are at a higher risk of undernutrition than those living in Oromia region.

All of the regions having a relatively higher prevalence of undernutrition are found in the lowlands of the country, with the exception of the highlands of Tigray, where undernutrition is also prevalent. Overall, women living in the lowlands are more undernourished than women living in the highlands (Jemal et al., 2003; Woldemariam and Timotiws, 2002). The probable reason for this could be associated with livestock holding (more in the lowlands), land ownership (greater in the lowlands), education (less literacy in the lowlands) and types of illness (more malaria in the lowlands). A cultural problem associated with pastoral communities that limits their required dietary intake from crop products could also be a reason for high prevalence of undernutrition in the lowlands of the country. Moreover, the educational level of women in the lowlands was significantly below that of women in the highlands. It can also be assumed that the low level of educational background could be associated with women's lack of decision-making power, which in turn has played a role in increasing the undernutrition rate in the lowlands of Ethiopia (Jemal et al., 2003). In addition, tropical diseases like malaria and sleeping sickness are relatively more common in the lowlands of Ethiopia, which are immediate factors that reduce the nutritional status of women.

The low BMI value in women living in the highlands of Tigray may be related to low agricultural productivity because of shortage of arable land and livestock products. The low nutritional status of women found in Tigray and Amhara regions might be associated with land degradation, land fragmentation and protracted war frequently occurring in the region (in Tigray). It is also known that Tigray and Amhara regions (the northern parts of the country) have been the center of agriculture since the dawn of civilization. Thus fertility of the soil has been overused (degraded) over many years to the degree that it cannot support the current high population in the area. As a result, many people and especially farmers in rural areas are living from subsistence agriculture, which may be a coping strategy.

The protracted war in Tigray has also had an impact on food security by hampering people's access to food supplies. In addition, the recent land redistribution in Amhara and Tigray has created fragmentation of the land, which in turn affects the production per head, and at the time of the study people may not have been encouraged to use key technological inputs in agriculture (fertilizers, pesticides).

Our study found that young women (age 15-19) and older women (age 40-49) are more likely to be undernourished than women age 20-29. The result of the multivariate analysis also confirms that never-married women age 15-19 and 40-49 are significantly more affected by undernutrition than women age 20-29, but age is not a factor that significantly affects urban women at all levels. Other studies have found similar results (Teller et al., 2000; Woldemariam et al., 2002). The fact that unmarried adolescent women are often at the bottom of the food chain, with little or no decision-making power in the household about food distribution, could lead to food security issues and may contribute to their poor nutritional status. Moreover, women age 15-19 need adequate nutrients to support fast physical, mental and emotional growth. Unawareness of adolescent women about their own health and nutritional status could be another reason associated with their poor nutritional status. In addition, lower nutritional status among rural women could be explained partly by the fact that rural women age 15-19 are more vulnerable to early marriage and childbearing than women in urban parts of the country (Central Statistical Authority [Ethiopia] and ORC Macro, 2006). Hence, in addition to their own health needs, rural woman need adequate dietary intake for child growth and pregnancy.

Rural women age 40-49 are relatively less educated than younger women and therefore may have low decision-making power, which inhibits their control over income and household assets. Moreover, older women have a relatively higher-level parity (more children ever born), which could obligate them to take care of their children rather than protecting their own health and nutritional status, given limited household resources.

In urban areas never-married women are more likely to be undernourished than women who are married or living together. However, marriage has no effect on undernourishment status in rural areas. Due to cultural values and poor decision-making autonomy, women have little access to higher education and high- and middle-income jobs. Hence, many women are dependent on their partners and thus may not be able to get adequate nutrition if they have no partner. In addition, in most cases never-married women belong to households with relatively poor economic status, which may also make it more difficult to obtain sufficient food.

In rural areas, occupation was found to be one of the determinant predictors of risk of undernutrition. Unemployed women are more likely, and non-manual and professional women are less likely, to be undernourished than agricultural/skilled/unskilled women. The same result

has been observed among other sub-Saharan countries (Hindin, 2000 and 2005). The probable reason for this could be that women who work in agriculture have lower educational status than women working in non-agricultural jobs (EDHS, 2005), and they have relatively less decision-making autonomy and less control over income than women with non-agricultural jobs.

Another important determinant of the nutritional status of women in Ethiopia is household wealth. As expected, both bivariate and multivariate results, particularly for urban women, confirmed that those with non-rich wealth status are at a higher risk of undernutrition than their rich counterparts. This finding is also consistent with other studies (Edilberto, 1997; Teller et al., 2000; Woldemaraim et al., 2002). This may indicate that household economic status has a direct association with household food security. Household food security in turn is a precondition for daily dietary intake for all household members.

Another important finding that influences women's nutritional status is partner's characteristics (education and occupation). The results of the bivariate analysis illustrate that, with increasing partner's educational levels from no education to secondary and above, the level of undernutrition among women shows a linear decline in both rural and urban areas and for both survey years. Similarly, the level of undernutrition across occupational status declines as partner's occupational status rises. The same finding has been observed in other sub-Saharan countries (Hindin, 2005). The probable explanation for this could be that women with agricultural/skilled/unskilled or unemployed partners often have lower educational levels and less autonomy than those whose partners have higher occupational status. In developing countries like Ethiopia, where women are highly dependent on their partners, women with low-status partners (in terms of educational and occupational status) have less access to household food security, which increases the rate of undernutrition.

## **CONCLUSION AND POLICY RECOMMENDATIONS**

Our study found that in Ethiopia rural women were more likely to be affected by undernutrition than their urban counterparts. Women age 15-19 and 40-49 were more likely to be undernourished. Never-married women were more likely than other women to be affected by undernutrition, particularly in urban areas. In urban areas rich women were less likely to be undernourished, but wealth had no effect on undernourishment in rural areas. Among regions, women living in Tigray (both rural and urban), Afar (rural), Somali (rural) and Gambella (rural) were highly likely to be undernourished. Unemployed women were more likely to be undernourished, particularly in rural parts of the country. Regarding partner's status (education and occupation), women whose partners had lower educational and occupational status were more affected by undernutrition than those whose partners had higher status.

Considering these important findings, the following policy recommendations are suggested: 1) disseminate the findings of the study in Ethiopia; 2) increase agricultural productivity particularly in Tigray, Afar, Gambella, Ben-Gumuz and Somali regions; 3) promote health service provision systems in these regions; 4) expand women's education, particularly in rural areas; 5) create employment opportunities, particularly in urban areas.

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