

# Rural-urban differentials in the prevalence of overweight and obesity among women of child bearing age in Zambia

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## ABSTRACT

**Introduction:** Overweight and obesity have become leading causes of non-communicable diseases and millions of deaths worldwide every year are attributed to these conditions. Currently, diseases such as high blood pressure, strokes, type II diabetes, cancer among others, are attributable to overweight and obesity. This study sought to determine demographic and socioeconomic aspects associated with overweight and obesity among women residing in rural and urban areas of Zambia. It further examined the differences in factors that affect the prevalence of overweight and obesity among women residing in urban and those in rural areas of Zambia. reness and interest towards air pollution together with their positive behaviors, using different information sources.

**Methods:** The study analysed the BMI from a total of (6967) urban and (7855) rural women using data from the 2013-14 Zambia Demographic and Health Survey (ZDHS). Both univariate and bivariate analyses were performed to describe the study population. Binary logistic regression analysis was used to examine the effect of demographic and socioeconomic factors on overweight and obesity among women in rural and urban areas of Zambia.

**Results:** Overweight and obesity prevalence were (21.2 percent and 10.8 percent) among urban women versus (11.9 percent and 2.9 percent) among rural women. Age, region of residence, educational level and household wealth of women were significant predictors of both overweight and obesity among women regardless of place of residence. Women in urban areas who resided in male headed households, had (4-6 children) and drunk alcohol had higher odds of being overweight, whereas, women in male headed households only and reported having been drinking alcohol were associated with being obese. Literacy was found to be a major contributor of overweight among rural women.

**Conclusion:** Overweight and obesity are markedly higher among urban women than rural women, and that differences on how these occur between these two groups of women have a socioeconomic and demographic dimension. In order to deal with increasing overweight and obesity challenges among women in Zambia, the paper recommends continued sensitizations about dangers of overweight and obesity with emphasis on behaviour changes in feeding or eating practices focussing more on traditional low fat and low calorie foods which in actual sense are cheaper and produce healthier results. Added to this recommendation is the need to change life styles to include routine exercising and increased medical check-ups.

*Key words:* Rural-Urban, Overweight, Obesity, Socio-economic, Child Bearing Age

## INTRODUCTION

The rise in global overweight and obesity rates over the last three decades has been substantial and wide spread, presenting a major public health epidemic in both the developed and developing nations [1]. Overweight and obesity are defined as abnormal or excessive fat accumulation in the fat tissues (adipose tissue) of the body leading to impaired health or health hazards [2, 3, 4] which are measured by Body Mass Index (BMI) - a simple index to classify overweight and obesity in adults. It is defined as the weight in kilograms divided by the square of the height in meters ( $\text{KG}/\text{M}^2$ ). An adult female with BMI between 25 and 29.9 is classified as overweight and a BMI of 30 or over is classified as obese. Therefore, the fundamental cause of overweight and obesity is an energy imbalance between calories consumed and calories expended [5].

Globally, statistics show that, about 2.1 billion people - nearly 30% of the world's population are either obese or overweight [6]. Currently, there are very few countries in the world without overweight and obesity problems [5, 7, 8]. As of 2014, it was estimated that, more than 1.9 million of adults, aged 18 years and older, were overweight (Body Mass Index BMI 25 or higher) and of these, over 600 million were obese (BMI 30 or higher) [6, 9, 10].

Regionally, countries in the Middle East and North Africa, Central America, and Island nations in the Pacific and Caribbean have already reached exceptionally high rates of overweight and obesity (44%) or higher. In 2013 alone, the highest rates of overweight and obesity were seen in the Middle East and North Africa, where more than (65%) of women age 20 or older were found to be either overweight or obese [6].

In sub-Saharan Africa, under-nutrition has historically received more public health attention compared to over-nutrition. Yet, today, overweight and obesity and the chronic diseases that accompany them have also become silent killers [11, 12, 13]. This is despite the fact that, these countries are still struggling with the health and economic burdens of under nutrition.

Although overweight and obesity are two issues affecting people of all ages and incomes, everywhere [6], these two conditions tend to manifest themselves differently in developed and developing countries. This is in spite of us recognising that, most of these studies on overweight and obesity have tended to be more pronounced in affluent countries and societies. However, currently, overweight and obesity studies are also taking center stage in developing countries. This focus has been necessitated mostly by a number of factors; one of them being that overweight and obesity are fast becoming increasingly extensive in developing countries mainly due to the nutrition transition taking place [14].

Between developed and developing countries, overweight and obesity affects women and men disproportionately. In

developed countries for example, men tend to have higher rates of overweight and obesity, while women in developing countries exhibit higher rates of the two measures. In 2014, WHO found that about (40%) and (15%) of women in developing countries were either overweight or obese respectively. These differentials are not only pronounced in terms of developed or developing country scenarios; obesity and overweightness, especially among women are also explained through the rural-urban perspective. It has been argued already in literature and studies that women in urban areas suffer more from overweight and obesity compared to those in rural areas [4, 3, 15, 16].

Being overweight and obese has brought about fundamental health challenges the world has ever seen. While this paper's jurisdiction had no particular focus on health outcomes of these two conditions, it is important to highlight a few documented effects they seem to bring about. Overweight and obesity are two conditions associated with non-communicable diseases such as: cardiovascular diseases, type II diabetes, musculoskeletal disorders, some cancers (endometrial, breast, ovaries, cervical, and colon), hypertension, respiratory diseases, sleep apnea syndrome, osteoarthritis, psychological problems, infertility, decrease in perceived quality of life (depression) among other things [2, 14, 17, 18, 19, 20]. Moreover, they are also associated with five out of the ten leading causes of death and disability world over [7]. This is in spite of the fact that, both overweight and obese are largely preventable through lifestyle changes [2].

Effects of overweight and obesity seem to have more profound effects on women of childbearing age too. Prevalence of overweight and obesity among women of child bearing age is especially important because of its association with multiple adverse health outcomes for the mother and foetus once [21]; and usually, women of reproductive age tend to accumulate fat much faster than those who are post menopause or those who are pre-menarche. There are several reasons for this condition including among others high energy intake [22], physical inactivity [23, 17], age, place of residence, educational level and social economic status [7, 18, 24, 25]. For example, lower levels of education among women, makes them less likely to find better paying jobs as such, fail to access food rich in minerals and nutrients. This same group may not also have access to better health facilities and worse still unable to make informed decisions about their own nutritional re

The global picture on overweightness and obesity is also reflected in Zambia. For the past two and half decades, the country has been experiencing relatively good affluence; improvements in the economy have changed the socio-cultural focus and a significant proportion of the population is currently classified as "middle class" [26]. This shift, which is similar to experiences in developed countries, has been associated with changed life styles where the consumption of fast energy-dense foods, high in fat, is eminent; physical inactivity coupled with changes

in modes of transportation (from public to private owned cars), and increased urbanisation are on the rise further compounding occurrence and experiences of overweight and obesity [7, 27]. While being overweight and obese are universally experienced by both men and women, evidence in Zambia seems to suggest that women are more prone to these effects than do men and women in urban areas seem to be more overweight and obese compared to those in rural areas.

The Zambia Demographic and Health Survey (ZDHS) of (2013-14) reports that 22.8 percent of women aged 15 - 49 years old were either overweight or obese (16.1 percent overweight and 6.7 percent obese) representing close to a four (3.6) percentage point increase from the 2007 ZDHS findings. The ZDHS (2013-14) further suggests that there is a substantial increase in the number of women becoming obese and overweight in both urban and rural areas of Zambia. For example, overweight and obesity had increased from 19.9 percent to 21.1 percent and 9.7 percent to 10.8 percent in urban and going up from 9.0 to 11.7 percent and 2.1 to 2.9 percent in rural areas for the period 2007 and 2014 respectively [28].

Overweight and obesity are serious problems that pose a huge and growing financial burden on already overburdened health systems. While Zambia may not have studies evidencing such detail, studies elsewhere show that, at individual level, the excess weight gained may lead in women developing non-communicable diseases such as diabetes, heart diseases, reduced life span [29]. These results in patients incurring direct health costs services including: surgery, laboratory and radiological tests, and drug therapy [30]. In addition, overweight and obesity may also lead to indirect costs, which have been defined as "resources forgone" due to compromised health conditions [30]. Resource forgone attributes fall into various categories which include value of lost work, such as number of days missed from work, costing employees (lost wages) and employers (in not completed) since work done is significantly at lower capacity [30, 31]. In some studies evidence suggest that overweight and obesity are associated with lower wages and lower household income [30, 32, 33]. Others even suggest that such health conditions force employers pay higher life insurance premiums and also pay out more to workers' compensation funds for employees who are obese compared to those who are not [30, 34].

Delving into Zambia, there is scanty to no evidence on studies conducted aimed at associating differentials in overweight and obesity provenances among women of reproductive age by rural-urban residence. In the same way, there seems to be little or no study in recent times which has endeavoured to associate these rural-urban differentials through the demographic and socio-economic lens. Due to this lacuna, this paper was developed to determine the prevalence of overweight and obesity among rural and urban women of reproductive age in Zambia;

and associate the prevalence to demographic and socio-economic factors. Specifically, the study attempted to provide answers to the following questions:

1. Is there a difference in the prevalence of overweight obesity among women residing in urban and rural areas of Zambia?
2. What demographic and socio-economic factors influence the prevalence of overweight and obesity among women of reproductive age in rural and urban Zambia?

## METHODS

This study utilised a representative cross-sectional of women aged 15 – 49 years, from the 2013-14 Zambia Demographic Health Survey (ZDHS). The sample was based on a stratified sampling method consisting of 18 052 households. In the first stage, 722 Enumeration Areas (EAs); that is 305 in urban and 417 in rural areas were selected with probability proportional to Standard Enumeration Area (SEA) size. In the second stage, a complete list of households served as the sampling frame in the selection of households for enumeration. On average, 25 households were selected in each cluster. Excluded from the listing were people living in institutional dwelling units (such as army barracks, hospitals, police camps, boarding schools etc). All women aged 15 – 49 years who were either permanent residents or visitors present of the households on the night of before the survey were eligible to be interviewed.

In the 722 selected clusters, 16, 258 households were occupied at the time of data collection of which 15 920 were successfully interviewed, yielding a household response rate of 98 percent. In the interviewed households, a total of 17 064 women age 15 – 49 were identified as eligible for individual interviews, and 96 percent of these were successfully interviewed. However, for the purpose of this study, the analysis concentrated on those women who had given a live birth in the two years preceding the survey [28]. Therefore, of the total 96% (16381) interviewed women in (10) provinces, only 14 822 (6 967 - urban and 7 855 - rural) women with complete data on variables of interest formed part of the study sample. In general, the DHS collects a number of indicators or variables which include among others background characteristics (age, education, place of residence), maternal health and weight and height of women.

## Variables

### Outcome Variable

Outcome variables, namely overweight and obesity, were derived from a computation of the Body Mass Index

(BMI) constructed by dividing the weight of the woman in kilograms by their height in metre squared ( $BMI = W/H^2$ ). For overweight, the BMI had two categories: "0" for those whose BMI was below 24.9 kg/m<sup>2</sup> and "1" for those whose BMI was between 25.0 to 29.9 kg/m<sup>2</sup> (overweight); Obesity was categorized as "0" for those whose BMI was below 29.9 kg/m<sup>2</sup> and "1" for those with a BMI of 30.0 kg/m<sup>2</sup> or more. Dummy variables with the code zero (0) were referenced categories.

### Explanatory Variables

A number of variables were considered to explain outcome variables. These variables were selected from literature reviews and their availability in the 2013-14 ZDHS dataset. Demographic explanatory variables included the following; place of residence (Urban and Rural), age of the respondent (15-49), sex of the household head, age of women at first birth ( $\leq 19$  years, 20-24 years and  $\geq 25$  years), total children ever born at time of the survey ( $\leq 3$  children, 4-6 children and  $\geq 7$  children), region of residence (Province), educational level, literacy (Can't or only read part of the sentence, visually impaired or No card with language, and Can read whole sentence), respondent currently working (No or Yes), wealth quintile and whether respondent drinks alcohol.

### Statistical Analysis

Statistical analysis first involved calculating overweight and obesity using anthropometric measurements (as outlined already). Secondly, producing descriptive frequencies comparing overweight and obesity among non-pregnant women aged (15-49 years) by selected demographic and socio-economic variables. In addition, independent samples t-tests were performed to compare BMIs for urban and rural women respectively.

The other statistical analysis conducted was the binary logistic regression. However, before this was done, a pairwise – correlation analysis was performed to test for multicollinearity amongst explanatory variables (no evidence of multicollinearity was found). All estimates were produced on a weighted analysis process so as to reflect sample selection and variations observable in samples and to ensure results were nationally representative. Binary logistic regression was used for both overweight and obesity split by place of residence. Adjusted odds ratios (AORs) and Confidence Intervals (CI, 95%) were calculated to measure the strength of association between identified independent and dependent variables. Odds ratios with 95%, 99%, and 99.9% confidence intervals were reported. The data was analyzed using STATA 13.0 software.

## RESULTS

### Description of study respondents

Results in table 1 below shows that, for both urban and rural women less than a quarter were aged between 15-19 years of age at the time of the survey. More than two thirds of households in both urban and rural areas were male headed. About six and seven in every ten women in urban and rural areas had given birth by age 19. More women in urban areas had fewer children compared to those in rural areas (73.5 percent and 53.0 percent).

By province, a larger share of overweight and obese women in urban settings resided in Lusaka, Copperbelt, Southern and Eastern provinces, (37.9 percent and 31.7 percent), while majority of obese and overweight women in rural settings resided in Eastern, Southern and Central provinces of Zambia (18.8 percent and 16.7 percent) respectively.

In terms of education, majority of the women in urban areas had been to secondary school 56.1 percent, while in rural areas, majority had only been to primary school. With regard to literacy, more women urban areas were able to read the "whole sentence" compared to rural women (75.0 percent versus 59.4 percent). More women in rural areas reported working at the time of the survey compared to those in urban areas (53.9 percent versus 43.6 percent). In addition, women in urban areas were twice as much likely to reside in rich households compared to their rural counterparts (85.4 percent versus 47.2 percent).

### Overweight and Obesity among Women in Zambia

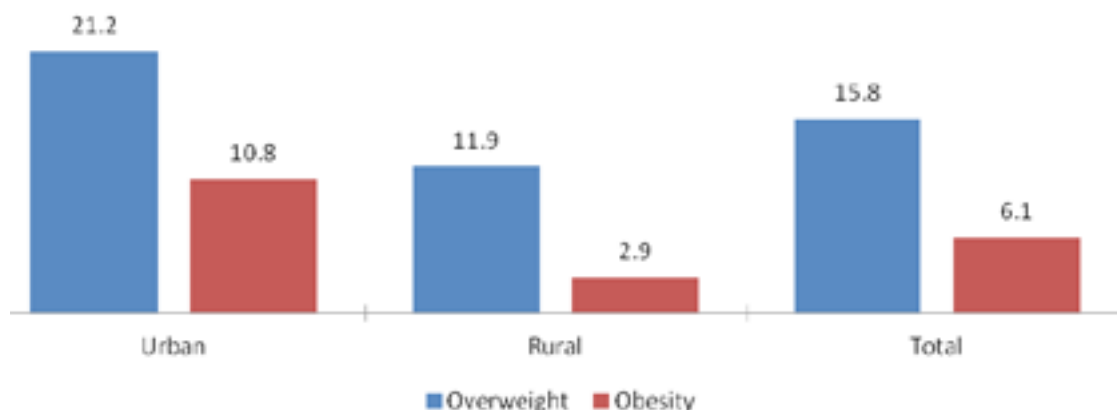
In figure, results show that overall, 15.8 percent and 6.1 percent of Zambian women were either overweight or obese. A higher proportion of overweight and obese women are found in urban areas (21.2 percent and 10.8 percent versus 11.9 percent and 2.9 percent). The overall mean ( $\pm$  SD) BMI was 22.69 $\pm$ 4.12. Specific differences were observed after disaggregating data by rural-urban settings. Independent-sample t-test reveals significant differences in the mean BMI scores for urban (23.55 $\pm$ 4.58) and rural women [21.87 $\pm$ 3.43;  $t(13396) = 25.13$ ,  $p < 0.001$ ] respectively. However, there is no significant difference in the mean height ( $< 1.45$  m) scores between urban (1.42 $\pm$ 0.03) and rural women [1.42 $\pm$ 0.04;  $t(310) = 0.30$ ,  $p < 0.82$ ].

### Bivariate results of overweight and obesity for non-pregnant women of child bearing age

Overall overweight and obesity increases with age

**TABLE 1. Percent distribution of the sample by demographic and socio-economic factors according to place of residence.**

VARIABLE	URBAN		RURAL		TOTAL	
	PERCENT	WEIGHTED COUNT	PERCENT	WEIGHTED COUNT	PERCENT	WEIGHTED COUNT
<b>Age Group</b>						
15-19	23.7	1,649	21.7	1,704	22.6	3,353
20-24	19.2	1,339	16.5	1,296	17.8	2,635
25-29	17.1	1,193	16.1	1,263	16.6	2,456
30-34	14.4	1,002	14.8	1,163	14.6	2,166
35-39	12.0	837	12.8	1,004	12.4	1,842
40-44	7.9	553	10.6	831	9.3	1,384
45-49	5.6	392	7.6	595	6.7	987
<b>Sex of household head</b>						
male	71.3	4,968	75.5	5,930	73.5	10,898
female	28.7	1,999	24.5	1,926	26.5	3,924
<b>Age at first birth</b>						
<= 19	62.7	3,032	74.9	4,781	69.6	7,813
20 - 24	29.0	1,404	21.8	1,394	24.9	2,797
>=25	8.3	403	3.2	207	5.4	610
<b>Total Children Ever Born Recorded</b>						
<= 3	73.5	5,122	53.0	4,160	62.6	9,282
4-6	20.3	1,415	27.1	2,125	23.9	3,540
>=7	6.2	430	20.0	1,571	13.5	2,000
<b>Region</b>						
Central	5.6	391	11.9	935	8.9	1,326
Copperbelt	31.2	2,172	5.1	400	17.3	2,571
Eastern	3.8	263	18.8	1,479	11.8	1,742
Luapula	3.3	227	9.9	775	6.8	1,002
Lusaka	37.9	2,642	4.5	355	20.2	2,997
Muchinga	2.5	171	7.6	600	5.2	772
Northern	3.3	227	10.7	841	7.2	1,068
North Western	2.6	183	5.9	460	4.3	643
Southern	7.1	498	16.7	1,311	12.2	1,809
Western	2.8	193	8.9	700	6.0	893
<b>Educational level</b>						
No education	3.4	238	12.2	958	8.1	1,196
Primary	31.1	2,167	60.1	4,723	46.5	6,890
Secondary	56.1	3,908	26.3	2,069	40.3	5,977
Higher	9.4	653	1.3	106	5.1	759
<b>Literacy Levels</b>						
Can't or only read part of the sentence	24.2	1,685	54.4	4,273	40.2	5,958
Visually Impaired or No card with language	0.4	30	0.3	25	0.4	55
Can read whole sentence	75.4	5,252	45.3	3,557	59.4	8,809
<b>Respondent currently working</b>						
No	56.4	3,919	46.1	3,596	50.9	7,515
Yes	43.6	3,032	53.9	4,204	49.1	7,236
<b>Wealth quintile</b>						
Poor	2.7	190	61.7	4,846	34.0	5,036
Middle	11.8	824	25.0	1,964	18.8	2,788
Rich	85.4	5,952	13.3	1,046	47.2	6,998
<b>Respondent drinks alcohol</b>						
No	85.8	5,979	92.4	7,257	89.3	13,235
Yes	14.2	988	7.6	598	10.7	1,587
Total	100	6,967	100	7,855	100	14,822

**FIGURE 1. Percentage of overweight and obese women by place of residence.**

of respondents (table 2). In urban areas, women aged 45-49 exhibited higher overweight and obesity outcomes compared to those much younger (36.8 percent and 21.5 percent among women aged 45 – 49 versus 10.7 percent and 1.8 percent among those aged 15 – 19). This pattern was the same in rural areas as well (17.3 percent and 6.6 percent among women aged 45 – 49 versus 5.0 percent and 0.4 percent among those aged 15 – 19);  $p < 0.001$ ). In the same way, women in male headed households and residing in urban areas had higher proportions of being both overweight and obese (21.3 percent and 11 percent) compared to women in female headed households (20.9 percent and 10.3 percent  $p > 0.05$ ) and residing in rural areas (12.1 percent and 2.9 percent versus 11.2 and 2.8 percent  $p = 0.01$ ). Among rural women, overweight and obesity increased with increasing age at first birth. For example, women whose age at first birth was 25 years or more had twice as high the proportion of being obese ( $p < 0.05$ ). By the same token, a statistically significant relationship was observed between the number of children ever born to a woman and being overweight or obese in both urban and rural areas ( $p < 0.001$ ). Urban or rural women with 7 or more children had higher proportions of being overweight or obese (30.1 percent and 15.8 percent; versus 17.7 percent and 4.2 percent) compared to those with 3 or less children (18.5 percent and 8.2 percent; versus 9.1 percent and 1.8 percent).

In urban settings, the highest proportion of overweight women by province were found in Southern, Eastern, and Lusaka provinces (23.4 percent; 22.7 percent and; 22.4 percent) while for obesity, the highest proportion were in Lusaka, Copperbelt and Southern provinces (13.3 percent, 10.7 percent and 9.4 percent;  $p < 0.001$ ) respectively. On the other hand, for rural women, Lusaka, Eastern Copperbelt and Southern provinces had the highest proportion of women who were both overweight and obese (21.5 percent and 9.0 percent; 14.9 percent and 3.4 percent; 14.1 percent and 5.3 percent and; 14.0 percent and 4.2 percent;  $p < 0.001$ ).

Results further show that overweight and obesity increased with increases in educational attainment among women of child bearing age. About two to three in every ten women with higher educational level in both urban and rural areas were either overweight or obese ( $p < 0.001$ ). In addition, among those with no education about two in every ten urban women compared to one in every ten rural women were overweight ( $p < 0.001$ ). In addition, table 2 also shows that women in urban areas reporting “currently working” at the time of the survey had higher proportions of being both overweight and obese (25.7 percent and 14.8 percent versus 17.7 percent and 7.7 percent,  $p < 0.001$ ) respectively. In the same way, results suggest that, overweight and obesity were positively correlated with wealth quintile. The proportion of overweight and obesity increases with higher notches of wealth among women in urban areas, that is from (8.7 percent to 22.3 percent; and from 1.6 percent to 12.0 percent,  $p < 0.001$ ). As for women in rural areas, the increment was from (9.3 percent to 20.9 percent) for overweight and (1.3 percent to 9.2 percent,  $p < 0.001$ ) for those classified as obese.

Table 2 also shows the relationship between overweight and obesity and alcohol consumption. Results show that women in urban areas who reported that they drink alcohol at the time of the survey, had also a higher proportion of being overweight and obese (26.1 percent and 17.2 percent,  $p < 0.001$ ) compared to women in rural areas (13.3 percent and 4.2 percent;  $p > 0.05$ ) respectively.

### Multivariate results of overweight and obesity

#### *Rural-urban differentials in overweight among non-pregnant women of child bearing age*

Table 3 shows adjusted odds ratios which are associations between overweight by place of residence and by demographic and socio-economic characteristics.



**TABLE 2. Percentage distribution of women's overweight and obesity by according to demographic and socio-economic features by place of residence**

VARIABLE	URBAN				p-value	RURAL				p-value
	OVERWEIGHT		OBESITY			OVERWEIGHT		OBESITY		
	%	CI	%	CI		%	CI	%	CI	
<b>Age at first birth</b>										
15-19	10.7	[8.8,12.9]	1.8	[1.1,2.9]	0.00	5.0	[4.0,6.3]	0.4	[0.2,0.7]	0.00
20-24	16.7	[14.1,19.7]	5.1	[3.6,7.0]		9.8	[8.2,11.8]	1.5	[0.8,2.8]	
25-29	23.3	[20.6,26.2]	10.8	[8.8,13.2]		11.1	[9.5,13.0]	2.2	[1.4,3.5]	
30-34	27.3	[24.0,30.9]	15.8	[13.1,18.9]		13.8	[11.5,16.6]	3.7	[2.7,5.1]	
35-39	24.8	[21.1,28.9]	19.0	[15.6,23.0]		16.2	[13.5,19.4]	4.7	[3.4,6.4]	
40-44	31.1	[26.1,36.6]	22.6	[18.3,27.5]		18.2	[15.6,21.1]	5.1	[3.8,7.0]	
45-49	36.8	[30.2,44.1]	21.5	[16.5,27.6]		17.3	[14.2,21.0]	6.6	[4.4,9.7]	
<b>Sex of household head</b>										
male	21.3	[19.9,22.7]	11.0	[9.9,12.2]	0.88	12.1	[11.1,13.2]	2.9	[2.5,3.5]	0.01
female	20.9	[18.5,23.4]	10.3	[8.5,12.4]		11.2	[9.6,12.9]	2.8	[1.9,4.0]	
<b>Age at first birth</b>										
<= 19	24.2	[22.2,26.3]	12.8	[11.2,14.6]	0.22	13.0	[11.9,14.1]	3.3	[2.7,4.1]	0.04
20 - 24	25.9	[22.9,29.2]	14.6	[12.0,17.6]		13.1	[10.7,15.9]	3.0	[2.2,4.2]	
>=25	28.9	[24.3,33.9]	16.9	[12.8,21.9]		14.0	[9.6,19.9]	6.6	[3.7,11.7]	
<b>Total Children Ever Born Recorded</b>										
<= 3	18.5	[17.0,20.0]	8.2	[7.2,9.4]	0.00	9.1	[8.1,10.1]	1.8	[1.4,2.4]	0.00
04-Jun	28.3	[25.4,31.3]	18.6	[16.1,21.4]		13.0	[11.4,14.9]	4.0	[3.2,5.2]	
>=7	30.1	[24.2,36.8]	15.8	[12.1,20.3]		17.7	[15.6,20.0]	4.2	[3.1,5.5]	
<b>Region</b>										
Central	19.5	[16.7,22.5]	8.6	[6.3,11.8]	0.00	11.8	[9.6,14.3]	3.5	[2.2,5.3]	0.00
Copperbelt	21.4	[19.5,23.4]	10.7	[8.9,12.8]		14.1	[10.7,18.3]	5.3	[3.3,8.3]	
Eastern	22.7	[18.5,27.5]	7.5	[5.6,9.9]		14.9	[12.8,17.2]	3.4	[2.4,4.7]	
Luapula	13.9	[10.8,17.8]	5.9	[3.9,8.9]		9.6	[7.3,12.6]	0.8	[0.4,1.7]	
Lusaka	22.4	[20.1,25.0]	13.3	[11.4,15.4]		21.5	[18.4,25.0]	9.0	[6.5,12.3]	
Muchinga	18.8	[15.5,22.8]	7.8	[5.4,11.0]		8.2	[6.1,10.8]	1.5	[0.8,2.8]	
Northern	15.1	[12.6,18.0]	6.9	[4.6,10.4]		9.0	[6.8,11.8]	0.6	[0.3,1.3]	
North Western	19.1	[15.0,24.0]	8.1	[5.3,12.3]		8.4	[6.0,11.6]	3.0	[1.7,5.1]	
Southern	23.4	[19.5,27.8]	9.4	[6.9,12.7]		14.0	[11.2,17.5]	4.2	[2.8,6.2]	
Western	16.9	[13.7,20.7]	5.5	[3.5,8.5]		6.8	[4.7,9.7]	0.3	[0.1,0.9]	
<b>Educational level</b>										
No education	25.8	[19.6,33.1]	6.3	[3.1,12.5]	0.00	12.6	[10.4,15.3]	2.4	[1.5,3.8]	0.00
Primary	21.6	[19.5,24.0]	10.8	[9.1,12.8]		11.0	[9.9,12.1]	2.6	[2.0,3.2]	
Secondary	19.5	[17.9,21.2]	9.7	[8.5,11.0]		12.5	[11.1,14.1]	3.1	[2.3,4.1]	
Higher	28.0	[23.7,32.7]	19.1	[15.1,23.9]		30.3	[22.0,40.0]	17.4	[11.1,26.2]	
<b>Literacy Recorded</b>										
Can't or only read part of the sentence	20.4	[18.1,23.0]	9.2	[7.2,11.5]	0.17	11.1	[9.8,12.5]	2.3	[1.8,2.9]	0.00
Visually Impaired or No card with language	37.4	[19.5,59.5]	7.2	[1.0,38.2]		23.3	[9.4,47.1]	10.2	[3.4,27.0]	
Can read whole sentence	21.3	[19.9,22.8]	11.4	[10.2,12.7]		12.7	[11.6,14.0]	3.6	[2.9,4.4]	
<b>Respondent currently working</b>										
No	17.7	[16.0,19.6]	7.7	[6.7,8.9]	0.00	10.7	[9.4,12.0]	3.0	[2.3,3.8]	0.05
Yes	25.7	[23.8,27.7]	14.8	[13.2,16.6]		13.0	[11.8,14.3]	2.8	[2.3,3.5]	
<b>Wealth Quintile Recorded</b>										
Poor	8.7	[6.5,11.6]	1.6	[0.6,3.8]	0.00	9.3	[8.3,10.3]	1.3	[1.0,1.7]	0.00
Middle	16.2	[13.7,19.1]	4.1	[2.7,6.0]		13.4	[11.9,15.1]	3.4	[2.5,4.5]	
Rich	22.3	[20.9,23.7]	12.0	[11.0,13.2]		20.9	[18.2,23.9]	9.2	[7.4,11.4]	
<b>Drinks Alcohol</b>										
No	20.4	[19.1,21.7]	9.8	[8.8,10.9]	0.00	11.7	[10.8,12.7]	2.8	[2.3,3.3]	0.16
Yes	26.1	[22.9,29.6]	17.2	[14.2,20.6]		13.3	[10.5,16.8]	4.2	[2.8,6.2]	
Total	21.2	[20.0,22.4]	10.8	[9.8,11.9]		11.9	[10.9,12.8]	2.9	[2.4,3.4]	

**TABLE 3. Demographic and socio-economic factors associated with overweight and obesity among non-pregnant women of child bearing age (15 – 19 years) in Zambia by place of residence.**

VARIABLE	URBAN				RURAL			
	OVERWEIGHT		OBESE		OVERWEIGHT		OBESE	
	AOR	C.I (LL - UL)	AOR	C.I (LL - UL)	AOR	C.I (LL - UL)	AOR	C.I (LL - UL)
<b>Age group</b>								
15 – 19	1		1		1		1	
20 - 24	1.9*	1.1 - 3.4	3.5	0.9 - 13.8	2.2***	1.4 - 3.4	5.2*	1.3 - 20.1
25 - 29	2.9***	1.7 - 5.0	7.2**	1.8 - 28.6	2.6***	1.6 - 4.2	6.6**	1.8 - 23.8
30 - 34	4.0***	2.4 - 6.8	11.1***	2.9 - 42.4	3.5***	2.2 - 5.7	11.7***	3.3 - 41.1
35 - 39	4.2***	2.5 - 7.1	14.0***	3.6 - 54.7	4.3***	2.5 - 7.4	15.5***	4.2 - 57.2
40 - 44	6.5***	3.6 - 11.6	18.5***	4.6 - 74.0	5.0***	3.0 - 8.4	18.9***	5.0 - 70.9
45 - 49	8.2***	4.4 - 15.3	19.5***	4.6 - 82.9	5.3***	3.1 - 9.3	26.3***	7.1 - 97.5
<b>Sex of household head</b>								
Male	1		1		1		1	
Female	0.8*	0.6 - 1.0	0.7*	0.6 - 1.0	1.0	0.8 - 1.2	1.0	0.6 - 1.7
<b>Age at first birth</b>								
≤ 19 years	1		1		1		1	
20 - 24 years	0.9	0.7 - 1.1	0.9	0.6 - 1.2	0.8	0.7 - 1.0	0.6	0.4 - 1.0
≥ 25 years	0.8	0.6 - 1.0	0.7	0.4 - 1.0	0.8	0.5 - 1.4	0.9	0.4 - 2.2
<b>Total number of children ever born</b>								
≤ 3 children	1		1		1		1	
4 - 6 children	1.3**	1.1 - 1.6	1.2	0.9 - 1.7	1.1	0.9 - 1.5	1.3	0.8 - 2.1
≥ 7 children	1.0	0.7 - 1.5	0.9	0.6 - 1.4	1.2	0.9 - 1.6	0.9	0.5 - 1.6
<b>Region</b>								
Central	1.2	0.9 - 1.7	1.2	0.7 - 2.2	2.3***	1.5 - 3.7	13.6***	3.1 - 58.9
Copperbelt	1.3*	1.0 - 1.8	1.4	0.8 - 2.5	2.9***	1.7 - 4.7	19.8***	4.4 - 89.2
Eastern	1.5*	1.1 - 2.1	1.3	0.7 - 2.4	3.1***	2.0 - 4.8	15.3***	3.5 - 66.0
Luapula	0.9	0.7 - 1.4	1.1	0.6 - 2.1	1.6	1.0 - 2.5	3.7	0.7 - 18.8
Lusaka	1.6**	1.2 - 2.1	1.8*	1.1 - 3.1	4.1***	2.5 - 6.7	21.1***	4.7 - 95.2
Muchinga	1.2	0.9 - 1.7	1.5	0.8 - 2.7	1.3	0.8 - 2.2	6.7*	1.4 - 31.4
Northern	0.9	0.6 - 1.2	1.1	0.6 - 2.1	1.5	0.9 - 2.4	1.8	0.3 - 10.1
North-Western	1.3	0.9 - 2.0	1.5	0.8 - 2.9	1.7	1.0 - 2.8	11.9**	2.6 - 54.5
Southern	1.4*	1.1 - 1.9	1.3	0.7 - 2.3	2.7***	1.6 - 4.5	14.8***	3.4 - 63.9
Western	1		1		1		1	
<b>Educational Level</b>								
No education								
Primary	1.2	0.8 - 1.7	2.5*	1.1 - 5.6	1.1	0.8 - 1.4	1.2	0.7 - 2.1
Secondary	1.3	0.8 - 2.1	3.1*	1.3 - 7.6	1.4	0.9 - 2.0	1.6	0.6 - 3.9
Higher	2.3**	1.3 - 3.9	4.8**	1.8 - 12.6	3.5***	1.8 - 6.9	3.7*	1.2 - 11.3
<b>Literacy</b>								
Can't read or only read part of sentence	1		1		1		1	
Visually Impaired or no card with language	1.7	0.5 - 5.7	0.6	0.1 - 5.1	2.7*	1.0 - 7.0	2.6	0.6 - 11.9
Can read whole sentence	1.2	0.9 - 1.6	1.1	0.7 - 1.7	1.0	0.8 - 1.3	1.1	0.7 - 1.8
<b>Respondent Currently working</b>								
No	1		1		1		1	
Yes	1.1	0.9 - 1.3	1.1	0.8 - 1.4	1.1	0.9 - 1.3	0.8	0.5 - 1.1
<b>Wealth Quintile</b>								
Poor	1		1		1		1	
Middle	2.0***	1.3 - 2.9	2.2	0.8 - 6.0	1.5***	1.2 - 1.8	1.9**	1.2 - 2.9
Rich	3.9***	2.7 - 5.6	5.5***	2.1 - 14.2	2.8***	2.2 - 3.7	4.6***	2.9 - 7.4
<b>Drinks Alcohol</b>								
No	1		1		1		1	
Yes	1.4**	1.1 - 1.7	1.6**	1.2 - 2.1	1.0	0.8 - 1.3	1.1	0.7 - 1.9

AOR = Adjusted Odds Ratio; C.I. = Confidence Interval; LL = Lower Limit; and UL = Upper Limit



Age plays a pivotal role in determining overweight prevalence in both urban and rural areas of Zambia. In table 3 differences were observed between overweight and age of the respondent. For example, women aged 44-49 in urban settings had five times higher odds of being overweight (AOR 5.10; CI 2.9-5.87;  $p < 0.001$ ) compared to those in the reference category (15-19 years). This is comparable to women in rural areas too, where those aged 44-49 had over three times higher odds of being overweight (AOR 3.43 CI 2.03 – 5.80 ;  $p < 0.001$ ) compared to those in the reference group (15-19 years). In rural areas, women in the age category of 20– 24, had about two times higher odds of being overweight (AOR 2.20; CI 1.4 - 3.4;  $p < 0.001$ ) compared to the reference category (15 – 19 years) while women aged 44-49 had about five times higher odds of being overweight (AOR 5.30; CI 3.1 - 9.3;  $p < 0.001$ ) compared to those in the reference category (15-19 years). The results show that rural based women accelerate faster towards becoming overweight compared to their urban based counterparts.

While descriptive outputs indicate a significant correlation between overweight and residence, data in table 3 suggests no such relationship. However, age at first birth and total number of children ever born to a woman has observable differences by rural or urban residence. Results in table 3 show that women whose ages at first birth were between 20-24 and residing in rural areas had lower odds of being overweight (AOR 0.80; CI 0.66-0.98;  $p < 0.05$ ) compared to those aged 19 years or less. While the odds of being overweight is higher for both urban and rural women subject to the total number of children a woman has ever born, only results for women in urban areas with children between 4 and 6 indicate a significant relationship compared to the reference category (AOR 1.3; CI 1.0-1.35;  $p < 0.01$ ). In the same way, women who had given birth to between four and six children, and resided in urban areas, had higher odds of being overweight (AOR 1.30; CI 1.1 - 1.6,  $p < 0.01$ ), compared to women with no children.

In terms of other social, residential and demographic characteristics, results in table 3 show substantial variations. By province, women in rural parts of Central, Copperbelt, Eastern, Lusaka and Southern provinces had higher odds of being overweight compared to those in Western province. In the same way, women with primary and secondary level education in both rural and urban areas had lower odds of being overweight compared to those with higher level of education. Women residing in urban areas who had higher education had about two times higher odds of being overweight (AOR 2.30; CI 1.3 - 3.9,  $p < 0.01$ ) compared to those without education. Similarly, women residing in rural areas who had higher education had more than three time higher odds of being overweight (AOR 3.50; CI 1.8 - 6.9,  $p < 0.001$ ) compared to those without education. Similarly, women in both urban and rural areas whose household wealth

quintiles were classified as “poor” or “middle” had lower odds of being overweight compared those in rich wealth quintiles. In both urban and rural areas, women with middle and richer wealth quintiles were more likely to be overweight compared to those whose wealth quintile was reported as poor.

As mentioned already, alcohol consumption has a bearing on overweight among women of reproductive health. Table 3 shows that women who resided in urban areas and consumed alcoholic beverages had higher odds of being overweight (AOR 1.40; CI 1.1 - 1.7,  $p < 0.01$ ) compared to those who did not drink alcohol. However, alcohol consumption had no bearing on overweight among women in rural areas.

### **Rural-urban differentials in obesity among non-pregnant women of child bearing age**

Table 3 also shows results of obesity by rural-urban differences and by socio-economic and demographic characteristics among non-pregnant women of child bearing age in Zambia. Obesity, like overweight is affected by age, with the odds of being obese increasing with age for both rural and urban women. Results in table 3 show that by age 45, women in rural areas had higher odds of being obese (AOR 26.3  $p < 0.001$ ) compared to women urban areas (AOR 19.5,  $p < 0.001$ ).

Table 3 also shows that women in rural parts of Central, Copperbelt, Eastern, Lusaka North Western and Southern provinces had higher odds of being obese compared to those residing in Western province. On the contrary, education level attainment and household wealth quintile does affect women’s progression towards obesity irrespective of whether they reside in urban or rural areas. Higher education attainment lowers the odds of obesity. And finally, women who do not drink alcohol and residing in urban areas have lower odds of being obese (AOR 0.66; CI 0.47-0.77,  $p < 0.001$ ) compared to those who drink.

## **DISCUSSION**

This paper has provided oversight evidence to the effect that differences between overweight and obesity amongst non- pregnant women of child bearing age resident in either urban or rural areas exist. Women in urban areas seem to gravitate towards either being overweight or obese faster compared to women in rural areas. This may be due to a myriad of reasons but pertinent amongst them could be that women in urban areas are more self-reliant, independent and may be living better and affluent lives compared to those in rural areas. However, results herein also seem to suggest that women are affected by almost similar socio-economic and demographic characteristics irrespective of their residence.

This paper endeavoured to answer specific questions: are there differences in the prevalence of overweight obesity among women residing in urban or rural areas of Zambia? And if that is the case, what is the influence of demographic and socio-economic factors on overweight and obesity among women of reproductive age in the urban and rural areas of Zambia? Overall, the study found that the prevalence of overweight (15.8%) was higher than the prevalence for obesity (6.1 percent) in Zambia. Among women in rural areas, 11.9% and 2.9% were overweight and obese respectively. Similarly, in urban areas, 21.2% and 10.8% of women were overweight and obese respectively. In this case, overweight and obesity are more prevalent in urban areas. These observations are similar to what [35] found where obesity was more prevalent in urban Tunisia compared to rural areas. The possible explanation for this situation can be adduced from a study by [36] highlighting that the nature of occupation prevailing in rural and urban setting in Africa contributes to the differences in obesity and overweight between the two settings.

This study also reveals that, women regardless of the place of residence tend to gravitate towards overweight and obesity with increasing age. This is supported by other similar studies [7, 37, 38, 39, 40, 41, 42, 43, 55, 56]. The major reason as to why this phenomenon may exist is because of the decreased physical activity that each year brings on these women and increased weight gain during this period [7, 14]. In addition, changes in life styles [37] such as consumption of fast foods (high in sugar content, saturated fatty acids) brought about due to urbanisation and globalisation may have contributed to high overweight and obesity among Zambian women.

In addition, exposure characteristics to being overweight or obese for women of child bearing age are similar, with very little variations. For example, education affects women's gravitation towards being overweight or obese in similar strides for both urban and rural women with higher educational attainment positively associated with women being overweight or obese. This finding is similar to what studies conducted in developing countries found [56]. This is in spite the fact that, education is well known to be beneficial to well being of individuals through cognitive advantages that result in healthier lifestyles and better behaviours related to both determinants of overweight and obesity [37]. This finding is however contrary to studies carried out in developed countries where those who are highly educated have lower odds of being overweight and obese [40] compared to those less educated.

Findings from other studies further show that, women who belong to higher income groups or higher household wealth quintiles tend to exhibit higher odds of being overweight and obesity [42, 56] compared to those in lower wealth statuses. This position is also resonated with the positive effects that alcohol tends to have on both overweight and obesity.

Major unexplainable attributes in these differentials are results on provincial experiences of overweight and obesity on one side and rural-urban aspects on the other side. Women in rural settings of provinces (except for Muchinga and Northern) were more likely to be overweight and obese compared to women in urban settings. There is no clear or speculative explanation for this result, except to explore this outcome further. However, one fundamental observation on results by province is that Muchinga and Northern provinces were one until 2012. Whether this has affected how overweight and obesity affects women in these two provinces is a matter beyond this paper.

Results also show that women in urban areas of the Copperbelt, Eastern, Lusaka and Southern provinces had higher odds of being overweight compared to those in Western province. Lusaka province further showed women having higher odds of being overweight compared to those in Western province. These provinces are relatively not poor compared to Western province. Western province is the poorest province in Zambia [28,]. Most urban areas are characterised by fast-food outlets and people in these regions have a tendency to eat junk foods from these outlets. A study by [36] and [39] supports the notion that people in the urbanized regions have a tendency to eat from western food outlets and urban residents perceive eating at such joints as a sign of affluence. The study further argues that the diet in the rural areas tends to be healthier compared to urban.

In terms of education, women with higher education in both urban and rural areas had higher odds of being overweight and obese compared to those without education. Moreover the odds of being overweight increased with the level of education in urban areas. Earlier studies in Kasama, Kaoma [45], Kitwe [46] and Lusaka [39] districts of Zambia as well as other developing countries [42, 47, 48,] found similar results. [46] for example notes that this positive relationship could be explained by changes in lifestyle, increased access to motorized transportation, increased rates of sedentary employment and sedentary lifestyles in general, and increased ability to eat fast food. These results are however not consistently similar with of a similar nature conducted in different fronts (especially in developing countries). For [40, 49] observed a general inverse association between educational level and the prevalence of overweight/obesity.

This study has also shown that women in both urban and rural areas whose household wealth quintiles are middle and rich had higher odds of being overweight and obese compared with those in poor wealth households. The odds of being overweight and obese, increases with an increase in wealth. Richer women, it is argued, are likely to be overweight or obese because most of the people who belong to this category rarely indulge in physical activity compared to the poor who often engage in labour intensive physical activities to make ends meet [50, 51, 52]. Moreover, people in the poor quintile are less likely

to be overweight or obese because they eat a limited range of food and mostly high in fibre content. A number of studies in Africa have attributed the positive association between overweight/obesity and wealth quintile to cultural norms that "being fat (overweight and obese) is a sign of wealth and a sign of being healthy" [35, 36, 38, 47].

Alcohol is a recipe for gaining weight. In this paper, results indicate that alcohol consumption increases the odds of being overweight and obesity among women residing in urban areas. This concurs with studies [47, 53, 54, 56] that observed that alcohol intake has significant effects on obesity. The main reason for this is that alcohol has high caloric content and this may cause overweight and obesity in physically inactive individuals. And these results also show in clear terms that women who had given birth to between 4 to 6 children and reside in urban areas had higher odds of being overweight, compared to women with no children. These results also resonate with studies done by [37, 47].

## CONCLUSION

Generally, the prevalence of overweight and obesity in Zambia are 15.8% and 6.1%, respectively. In rural areas the study finds that age, region, education level, age at first birth, wealth quintile are associated with being overweight, while age, region and wealth quintile were observed to be related with obesity. In urban areas the study found that age, sex of household head, region, education level, wealth quintile and alcohol consumption are associated with overweight, while age, region or province, education, wealth quintile and alcohol consumption were observed to be associated with obesity. In view of the above, the study concludes that differences exist in the factors that affect obesity and overweight in rural and urban areas.

## Policy Implications

1. Considering the fact that consequences of overweight and obesity have serious implication both at the individual and economy levels, there is need for policy makers and stakeholders involved in maternal health to put in place policies and interventions to curtail the seemingly increasing levels of overweight and obesity. The results of this paper provide pointers to the areas that need policy intervention and these include; Programmes to sensitise the public about the dangers of overweight and obesity. This should start at an early age when its within controllable limits. Investing in health care and rehabilitation for older persons extends their healthy and active years

2. There is need to change the perception that being fat is a sign of wealthy. This can be achieved through encouraging healthy and balanced diets. The target groups should be all women in rural and urban areas.
3. Encouraging people to invest in health through low fat diet, exercising, lifestyle change, etc.

## Study Limitations

Measuring overweightness and obesity may not be sufficient using a cross-sectional study like the DHS. In countries where such studies have taken place, longitudinal epidemiological studies have been conducted to measure changes over time and such studies have produced better estimates of overweight and obesity data with better outlooks in terms of causality and attribution. This study had no such strengths and for the future, this aspect may have to be considered diligently.

## Competing Interests

The authors declares that they have no competing interests

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