

THE PREVALENCE OF, AND FACTORS ASSOCIATED WITH, OVERWEIGHT AND OBESITY IN BOTSWANA

GOBOPAMANG LETAMO

Department of Population Studies, University of Botswana, Gaborone, Botswana

Summary. The aim of this study was to estimate the prevalence of, and socio-demographic factors associated with, overweight and obesity in Botswana. A cross-sectional survey was conducted in 2007 using a multistage sampling method to select a representative sample of 4107 men and 4916 women aged 20–49 years. Logistic regression analysis was used to identify the socio-demographic factors associated with overweight and obesity. Mean BMI values for men and women were 21.7 kg/m² and 24.4 kg/m², respectively. Both overweight and obesity levels were higher among women than men. Overall, 23% of women were overweight compared with 13% of men. Obese women constituted about 15% compared with only 3% of men. However, 19% of men were underweight compared with 12% of women. The main socio-demographic factors associated with overweight and obesity were being older, living in a city/town, being married and having attained higher levels of education, and these relationships were statistically significant at the 5% level. Although over-nutrition is prevalent among adult female Batswana, underweight remains an important public health problem for males. Programmes and other interventions aimed at concurrently addressing both under-nutrition and overweight need to be developed.

Introduction

In developing countries undergoing health or epidemiological transition, a malnutrition pattern is predominantly emerging that is characterized by under-nutrition in children and ever-increasing obesity in adults (Popkin & Doak, 1998; Chopra *et al.*, 2002; Popkin, 2004; Prentice, 2006; Hossain *et al.*, 2007; Madanat *et al.*, 2008). The World Health Organization (WHO) in 1997 emphasized that obesity is becoming a major health problem in many developing countries, particularly in adult women (WHO, 1998). Recently, WHO estimates that globally there are more than 1 billion overweight adults and at least 300 million of them are obese (WHO, 2003). Overweight and obesity are now considered as serious health problems, and very important risk factors for many chronic diseases, including type 2 diabetes,

cardiovascular disease, hypertension and stroke, and certain forms of cancer and disability. In developing countries, obesity often co-exists with under-nutrition and presents serious social and psychological dimensions, affecting virtually all ages and socioeconomic groups (WHO, 2003).

In recent years, the prevalence of overweight and obesity in Botswana has increased with the rapid socioeconomic development. However, no nationally representative studies have been conducted to assess the prevalence and covariates of overweight and obesity. In order to establish effective prevention strategies, identifying potential determinants of overweight and obesity is imperative. The objectives of this study are: (i) to estimate the prevalence of overweight and obesity and (ii) to identify the socio-demographic determinants of overweight and obesity in Botswana using data from the 2007 Botswana Family Health Survey IV.

Data and Methods

Data

The Botswana Family Health Survey IV (BFHS IV) was conducted between September 2007 and January 2008 by the Central Statistics Office in close collaboration with UNICEF (Central Statistics Office, undated). The Multiple Indicator Cluster Survey (MICS) was combined with the BFHS IV because of the similarity of the indicator modules. Four questionnaires were administered, namely the Household Questionnaire, Female Questionnaire (administered to females aged 12–49), Male Questionnaire (administered to males aged 12–49) and the Under-5 Questionnaire (Central Statistics Office, 2009).

For this study, respondents aged 20–49 years were selected for the analysis. Other criteria include performing analysis for men and women separately. One other important feature of the BFHS IV is that for the first time, the survey collected information on adult weight and height for calculation of body mass index (BMI). The sample used in this study was weighted to ensure that it was nationally representative.

Measurement of variables

The dependent variables are (a) overweight and (b) obesity. The prevalence of overweight and obesity is commonly assessed by using BMI, defined as weight in kilograms divided by the square of height in metres (kg/m^2). In this study, BMI is categorized into four groups as per WHO recommendations: underweight ($\text{BMI} < 18.5 \text{ kg/m}^2$), normal ($18.5 \leq \text{BMI} < 25 \text{ kg/m}^2$), overweight ($25 \leq \text{BMI} < 30 \text{ kg/m}^2$) and obese ($\text{BMI} \geq 30 \text{ kg/m}^2$). Body mass index used in the logistic regression analysis was coded in such a manner that it had two categories: being overweight and obese ($\text{BMI} \geq 25$) or not ($\text{BMI} < 25$). Being overweight and obese assumed a value of 1 and 0 otherwise.

Height was measured in centimetres during the survey but was later converted to metres during the analysis. Male subjects with height < 1.0 and > 2.03 m and weight < 40 and > 185 kg were excluded from the analysis because they were considered

outliers. The percentage of male subjects with height <1.0 m constituted less than 0.5% and none had height above 2.03 m. For women subjects, the cut-off points were: <0.97 and >1.89 m for height and <35 and >170 kg for weight. None of the women had a weight above 170 kg. However, those with weight below 35 kg constituted 0.2%. Thus the percentage excluded from the analysis would not bias or influence the study results.

The independent variables used for analysis in this study are socio-demographic characteristics as collected in the 2007 BFHS IV. Age in years was categorized as follows: 20–24, 25–29, 30–34, 35–39, 40–44 and 45–49. Place of residence was aggregated as city/town, urban village and rural. Marital status was created as never married, currently married (married and living together) and formerly married (separated, divorced and widowed). Educational level achieved was measured as never having attended school and among those who attended school, whether they had primary, secondary, higher, non-formal or non-standard curriculum. For the purpose of this study, four categories of education were created as follows: those who never attended school classified as having no education. Non-formal and non-standard curriculum and primary were combined together to create primary education. Secondary and higher educational levels remained unchanged.

Statistical analysis

The prevalence estimates of overweight and obesity categories were calculated as percentages. Analysis of variance (ANOVA) was used to test whether differences between mean BMI are significant or not. To evaluate the association between obesity and associated factors, multivariate logistic regression analysis was applied to estimate the multivariable-adjusted odds ratio (OR) of overweight and obesity through the levels of various explanatory factors. For the multivariate analysis, underweight subjects were excluded and normal weight subjects were used as the referent for the factors associated with overweight and obesity. The adjusted ORs are presented together with a 95% confidence level. For all comparisons, p -values <0.05 are considered statistically significant.

Results

Out of 9023 subjects selected for analysis, 54% were women whilst 46% were men. Most of the respondents (49.1%) were in their twenties and roughly a fifth were aged over 40 years. The distribution of the sample was fairly even between cities/towns, urban villages and rural areas (approximately a third in each location). Almost half the selected sample comprised of never-married people, while formerly married constituted about 3%. Slightly more than 50% of respondents had attained secondary education.

Prevalence of overweight and obesity

Tables 1 and 2 present the percentage distribution of the population categorized as underweight, normal weight, overweight and obese for men and women separately

Table 1. Percentage of the female population underweight, normal weight, overweight and obese by socio-demographic characteristics and mean BMI, 2007 BFHS IV ($N=4916$)

Socio-demographic characteristic	Percentage of female population				Mean BMI (kg/m ²)	<i>n</i>
	Underweight (BMI<18.5 kg/m ²)	Normal weight (18.5≤ BMI<25.0 kg/m ²)	Overweight (25≤ BMI<30 kg/m ²)	Obese (BMI ≥ 30 kg/m ²)		
Age						
20–24	17.6	61.2	15.7	5.5	22.2	1244
25–29	13.2	53.2	23.2	10.4	23.5	1128
30–34	9.1	49.8	23.8	17.3	24.9	902
35–39	7.4	43.5	27.6	21.5	26.0	717
40–44	6.8	36.8	30.0	26.3	26.6	519
45–49	6.7	32.7	29.5	31.2	27.4	405
Place of residence						
City/town	9.6	47.3	25.5	17.6	24.9	1443
Urban village	11.8	48.4	24.4	15.4	24.5	1743
Rural	12.9	53.2	20.2	13.7	23.9	1730
Marital status						
Currently married/in union	9.6	44.9	25.5	19.9	25.4	2452
Formerly married/in union	4.2	41.4	33.5	20.9	26.6	193
Never married/in union	14.2	55.7	19.9	10.1	23.2	2271
Educational level						
No education	17.8	45.2	19.1	17.8	24.4	304
Primary	9.1	47.4	25.3	18.2	25.1	1080
Secondary	12.0	52.3	23.2	12.6	23.9	2716
Higher	11.0	46.1	22.5	20.3	25.2	816
Parity						
0	18.6	56.5	18.6	6.3	22.4	970
1	11.7	54.8	22.7	10.8	23.7	1215
2	9.5	48.1	24.7	17.8	24.8	1061
3	8.5	44.0	24.2	23.3	25.8	693
4+	8.6	42.8	23.3	22.1	25.9	977
<i>N</i>	565	2442	1142	757	24.4	4916
Total (%)	11.5	49.8	23.3	15.4	—	100.0

Table 2. Percentage of the male population underweight, normal weight, overweight and obese by socio-demographic characteristics, 2007 BFHS IV ($N=4107$)

Socio-demographic characteristic	Percentage of male population				Mean BMI (kg/m ²)	<i>n</i>
	Underweight (BMI <18.5 kg/m ²)	Normal weight (18.5 ≤ BMI <25.0 kg/m ²)	Overweight (25 ≤ BMI <30 kg/m ²)	Obese (BMI ≥ 30 kg/m ²)		
Age						
20–24	23.7	70.3	4.4	1.6	20.4	1074
25–29	19.7	67.1	10.5	2.8	21.3	1005
30–34	18.5	62.8	15.1	3.6	22.1	770
35–39	17.1	58.8	18.4	5.7	22.4	566
40–44	16.7	54.9	22.7	5.7	22.7	403
45–49	15.6	53.5	22.6	8.3	23.3	289
Place of residence						
City/town	14.7	62.7	17.3	5.4	22.4	1326
Urban village	18.9	64.1	13.2	3.9	21.7	1270
Rural	24.5	64.6	8.8	2.1	20.9	1511
Marital status						
Currently married/in union	14.0	61.0	19.6	5.5	22.7	1833
Formerly married/in union	9.5	66.7	11.9	11.9	23.1	42
Never married/in union	24.4	66.1	7.4	2.1	20.8	2232
Educational level						
No education	24.1	66.0	7.4	2.5	20.9	445
Primary	24.5	62.4	11.2	1.9	21.1	824
Secondary	20.2	66.2	10.8	2.9	21.4	1925
Higher	11.4	58.9	21.8	7.9	23.2	887
No. children						
0	23.7	67.2	7.2	2.0	20.8	1877
1	17.5	62.3	15.9	4.2	21.9	857
2	14.5	60.9	19.7	4.8	22.6	602
3	14.9	57.9	20.8	6.4	22.7	343
4+	16.6	61.0	15.9	6.5	22.5	977
<i>N</i>	803	2616	528	152	21.7	4107
Total (%)	19.1	64.7	12.9	3.2	—	100.0

by selected socio-demographic variables, and mean BMI. Overall the proportion of subjects underweight was higher among men than women: 19.1% and 11.5% respectively. Underweight was more prevalent among the 20- to 24-year-olds (17.6% and 23.7% for women and men respectively), rural areas (12.9% and 24.5% for women and men respectively), never married (14.2% and 24.4% for women and men respectively), those with no education (17.8% and 24.1% for women and men respectively) and among those with no children (18.6% and 23.7% for women and men respectively).

With regard to overweight and obesity, more women than men were overweight and obese. Approximately 23.3% of women compared with 12.9% of men were found to be overweight, and 15.7% of women compared with 3.2% of men were obese.

Mean BMI values for women and men were 24.4 kg/m² and 21.7 kg/m² respectively, showing a mean difference of 3 kg/m². Body mass index increased with increasing age and education for both women and men. However, mean BMI increased for women of high parity and remained fairly stable for men with increasing number of children ever born. The BMI was slightly higher for cities/towns compared with rural areas (mean difference of 0.9 for women and 1.6 for men). Analysis of variance (ANOVA) indicated that differences in mean BMI across groups were statistically significant.

Factors associated with overweight and obesity

Overweight increased with age for both women and men. For instance, 16.3% of the 20- to 24-year-old women were overweight compared with 32.0% of the 45- to 49-year-old women. The prevalence of overweight and obesity was high for both women and men in cities/towns compared with rural areas. Overweight and obesity were also common among the currently married compared with the never-married women and men. Among men, overweight and obesity were more pronounced among those with post-secondary education compared with their counterparts with other educational achievement, if any.

Table 3 shows the results of multivariate regression analysis that identified socio-demographic factors associated with increased BMI (overweight and obesity) for women and men separately. For women, those aged 45–49 years were 5.8 times more likely to be overweight or obese than those aged 20–24 years. The likelihood of experiencing overweight and obesity increased steadily with increasing age for both women and men. Women who resided in cities/towns were 1.5 times more likely to be overweight or obese than those residing in rural areas. Currently married women were 1.5 times more likely to be overweight or obese compared with those who were never married. Women with post-secondary education were 1.8 times more likely to be overweight and obese than those who had no education. These relationships are statistically significant and the observed trends in women are similar to those observed for men.

In short, significant levels of overweight and obesity were observed in older adults, city/town dwellers, married couples and respondents with higher levels of education, and these relationships were statistically significant at the 5% level.

Table 3. Socio-demographic variables associated with increased BMI (overweight and obesity) in adult Botswana women ($N=4303$) and men ($N=3282$) identified by logistic regression model (adjusted odds ratios)

Socio-demographic variables	Women			Men		
	Adjusted OR	SE	<i>p</i> -value	Adjusted OR	SE	<i>p</i> -value
Age						
20–24 (Ref.)	—	—	—	—	—	—
25–29	1.678	0.102	<0.001	1.805	0.171	0.001
30–34	2.091	0.111	<0.001	2.473	0.182	<0.001
35–39	3.044	0.124	<0.001	3.575	0.199	<0.001
40–44	4.506	0.142	<0.001	5.340	0.217	<0.001
45–49	5.813	0.158	<0.001	7.135	0.240	<0.001
Place of residence						
City/town	1.519	0.085	<0.001	1.565	0.116	<0.001
Urban village	1.366	0.080	<0.001	1.317	0.119	0.024
Rural (Ref.)	—	—	—	—	—	—
Marital status						
Currently married/in union	1.530	0.070	<0.001	1.513	0.113	<0.001
Formerly married/in union	1.247	0.167	0.187	0.809	0.403	0.598
Never married/in union (Ref.)	—	—	—	—	—	—
Educational level						
No education (Ref.)	—	—	—	—	—	—
Primary	1.192	0.151	0.244	1.468	0.203	0.058
Secondary	1.558	0.155	0.004	2.542	0.196	<0.001
Higher	1.716	0.169	0.001	4.326	0.200	<0.001
Parity						
0 (Ref.)	—	—	—	—	—	—
1	1.097	0.107	0.384	1.325	0.140	0.044
2	1.262	0.115	0.044	1.234	0.159	0.186
3	1.270	0.132	0.071	1.308	0.189	0.157
4+	1.160	0.137	0.278	1.045	0.196	0.820

SE represents standard error; Ref. is the reference category. Note that the odds ratios presented are results of a multivariate logistic model including all variables shown in the table.

Discussion

Overweight and obesity are important factors in the increasing prevalence of non-communicable diseases such as hypertension, and thus contribute to premature mortality (WHO, undated). The 2007 BFHS IV had an adult health section designed to provide nationally representative anthropometric data for Botswana. These data show an adult Botswana population that is predominantly overnourished among the females and undernourished among the males. The prevalence of overweight and obesity tends to be concentrated among urban settings, older population, married people and people with higher levels of education. Urbanization, ageing and

education achievement have been on the rise in Botswana, which could impact negatively on overweight and obesity and consequently on the prevalence of non-communicable diseases such as hypertension and stroke, cardiovascular disease and type 2 diabetes (Must *et al.*, 1999; WHO, 2000; Visscher & Seidell, 2001; Manson *et al.*, 2004; Terres *et al.*, 2006; Suleiman *et al.*, 2009).

Because being overweight and obese have traditional and cultural undertones, these connotations present complexities in the prevention and management of overweight and obesity. It has been observed that in South Africa, being obese is perceived to reflect affluence and happiness in many sectors of the African population (Puoane *et al.*, 2002). These authors observed that overweight or obesity in women is thought to reflect on a husband's ability to care for his wife and family. Overweight and obesity are also thought to reflect persons who are healthy and without HIV/AIDS (Clark *et al.*, 1999). These perceptions are also prevalent in Botswana.

Although BMI provides a simple index of weight-for-height that is commonly used in calculating overweight and obesity in adult populations, it has various limitations that need to be discussed. One such limitation is the fact that not all individuals with increased BMI have excessive fat accumulation. Some individuals with high BMI may have massive muscles and low fat.

Conclusions and Recommendations

This study set out to investigate the prevalence of overweight and obesity and their determinants. The study found that the adult Botswana population has higher levels of overweight and obesity among women and higher levels of under-nutrition among men. About 39% of women were either overweight or obese compared with only 16% of men. High levels of overweight and obesity were observed in older adults, city/town dwellers, married couples and respondents with higher levels of education. These patterns of overweight and obesity in the adult female population and underweight among the adult male population of Botswana have policy and programme implications. The paper found a double burden of under- and over-nutrition in adults in Botswana.

In Botswana, overweight and obesity appear to start at a young age: the data show 21% of women were either overweight or obese at the ages of 20–24 years while 23.7% of men were underweight. Therefore, primary prevention of both overweight and under-nutrition must start at a young age. Thus although overweight is a problem particularly among women, underweight remains an important public health problem among men.

The relationship between education and BMI shows that women with no education had lower BMI than those with schooling. Uneducated women tend to work in sectors of the economy that require manual work, unlike their better-educated counterparts. Ideally, women with high levels of education should be better informed about the relationship between body weight and health and therefore less likely to be overweight or obese. Through reading and accessing other forms of media, educated women should be aware and take cognizance of the preferred body image of thinness. As a result they would try to control their body weight in an attempt to conform to the media images that they internalize. However, they should

also be made aware that the desire for extreme thinness can be problematic as it can result in anorexia. The data, however, are showing exactly the opposite of this expectation. Women with higher educational attainment tend to have high BMI. Better educated women tend to live mainly in urban areas where the majority of fast food restaurants are located and these areas are also characterized by overweight and obesity, which increases the likelihood of women experiencing overweight and obesity. More aggressive campaigns about weight control and its health benefits targeting both men and women need to be undertaken.

Further studies need to be undertaken to understand in-depth the cultural attitudes of Botswana toward weight, diet and physical activity. These studies will help shed light on the best strategies that could be employed to tackle the overweight and obesity epidemic ravaging the country. Prevention strategies may not succeed if they do not tackle cultural meanings of being overweight and obese.

Acknowledgments

The author wishes to acknowledge and thank the Central Statistics Office in the Ministry of Finance & Development Planning for allowing the author to use the 2007 BFHS IV data set.

References

- Central Statistics Office** (Undated) *1971, 1981, 1991 and 2001 Census Demographic Indicators, Botswana*. URL: http://www.cso.gov.bw/index.php?option=com_content&task=view&id=13&Itemid (accessed 18th February 2010).
- Central Statistics Office** (2009) *2007 Botswana Family Health Survey IV*. Draft Statistical Report, in collaboration with UNICEF. Gaborone, Botswana.
- Chopra, M., Galbraith, S. & Darnton-Hill, I.** (2002) A global response to a global problem: the epidemic of over-nutrition. *Bulletin of the World Health Organization* **80**, 952–958.
- Clarks, R. A., Niccolai, L., Kissinger, P. J., Peterson, Y. & Bouvier, V.** (1999) Ethnic differences in female overweight: data from the 1985 National Health Interview Survey. *American Journal of Public Health* **78**, 1326–1329.
- Hossain, P., Kavar, B. & El Nahas, M.** (2007) Obesity and diabetes in the developing world – a growing challenge. *New England Journal of Medicine* **356**, 213–215.
- Madanat, H. N., Troutman, K. P. & Al-Madi, B.** (2008) The nutrition transition in Jordan: the political, economic and food consumption contexts. *Promotion and Education* **15**(1), 6–10.
- Manson, J. E., Skerrett, P. J., Greenland, P. & Vanltallie, T. B.** (2004) The escalating pandemics of obesity and sedentary lifestyle: a call to action for clinicians. *Archives of Internal Medicine* **164**, 249–258.
- Must, A., Spadano, J., Coakley, E. H., Field, A. E., Colditz, G. & Dietz, W. H.** (1999) The disease burden associated with overweight and obesity. *Journal of the American Medical Association* **282**, 1523–1529.
- Popkin, B. M. & Doak, C. M.** (1998) The obesity epidemic is a worldwide phenomenon. *Nutrition Review* **56**, 106–114.
- Popkin, B. M.** (2004) The nutrition transition: an overview of world patterns of change. *Nutrition Review* **62**, S140–143.
- Prentice, A. M.** (2006) The emerging epidemic of obesity in developing countries. *International Journal of Epidemiology* **35**, 93–99.

- Puoane, T., Steyn, K., Bradshaw, D., Laubscher, R., Fourie, J., Lambert, V. & Mbananga, N.** (2002) Obesity in South Africa: the South African Demographic and Health Survey. *Obesity Research* **10**(10), 1038–1046.
- Suleiman, A. A., Alboqai, O. K., Yasein, N., El-Qudah, J. M., Bataineh, M. F. & Obeidat, B. A.** (2009) Prevalence of and factors associated with overweight and obesity among Jordan University Students. *Journal of Biosocial Science* **9**, 738–745.
- Terres, N. G., Pinheiro, R. T., Horta, B. L., Pinheiro, K. A. T. & Horta, L. L.** (2006) Prevalence and factors associated to overweight and obesity in adolescents. *Revista de Saúde Pública* **40**(4), 627–633.
- Visscher, T. L. S. & Seidell, J. C.** (2001) The public health impact of obesity. *Annual Review of Public Health* **22**, 355–375.
- WHO** (1998) *Obesity: Preventing and Managing the Global Epidemic*. Report of WHO Consultation, Geneva, June 3–5th 1997. WHO, Geneva.
- WHO** (2000) *Obesity: Preventing and Managing the Global Epidemic*. WHO Technical Report Series No. 894. WHO, Geneva.
- WHO** (2003) *Global Strategy on Diet, Physical Activity and Health*. WHO, Geneva.
- WHO** (undated) *Obesity and overweight*. URL: <http://www.who.int/dietphysicalactivity/publications/facts/obesity/en/> (accessed 18th February 2010).