Patterns and determinants of overweight and obesity among adults in Botswana

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Abstract

Recent epidemiological evidence indicates marked increase in the prevalence of overweight and obesity. This study examines patterns and determinants of overweight and obesity in Botswana. In 2007, the Ministry of Health and World Health Organization conducted a cross-sectional survey of chronic non communicable diseases and risk factors using the STEPS approach. This allowed for the collection of demographic data (STEP 1), physical measurement of height, weight, waist, hips and blood pressure (STEP 2) and finally biochemical measurements, which included collection of blood samples (STEP 3). The survey yielded a nationally representative sample of 4003 respondents who are used for this analysis. From a total sample of 4003, national overweight/obesity prevalence was estimated at 18.2% (6% for males and 23.9% for females). Logistic regression analysis has shown significant association between gender and overweight/obesity prevalence, with females (OR 3.7) more likely to be obese than men. Overweight/obesity increases significantly with age, socio-economic status (high education and employment status) for both men and women. Furthermore, overweight/obesity is associated with behavioural risk factors such as hazardous drinking (OR 1.29) and vegetable consumption (OR 1.41) and not with physical inactivity and daily smoking. It is evident that overweight/obesity is becoming a major concern in Botswana hence there is need for efforts to reduce overweight/obesity in the population through a balanced diet and increased physical activity.

Introduction

Overweight and obesity continues to rise at an alarming rate and has even replaced under-nutrition as the most common public health concern in many countries. The increased prevalence of obesity and overweight, which was initially more marked in developed countries (Reilly 1999; World Health Organization. 1998 ; Tremblay & William 2000), has now become a major concern for developing countries (Young et al. 2009, World Health Organization 2011). Obesity is associated with significant health risks and comorbidities such as cardiovascular disease, diabetes (type 2) and various cancers (Hill et al. 2008; Dalal et al. 2011). Some studies have shown that obesity, overweight and under nutrition can co-exist. Although the aetiology of obesity is rather complex, increased intake of fast foods, replacement of the traditional high fibre diet with Western diets with high sugar and fats and the tendency for a more sedentary lifestyle are believed to contribute to increased prevalence of obesity (Vernooij et al. 2012).

Some studies have recently shown that Low income and middle-income countries (LMICs) carry the majority of the obesity and overweight and other chronic non communicable diseases burden, and are predicted to continue to do so in the future (Kelly et al. 2008). Most of the LMCs are countries such as those in Sub-Saharan Africa (SSA), lower-middle-income countries such as India and parts of South-East Asia, and upper-middle-income countries such as China and most of South America (World Bank 2015). Until recently, SSA was minimally affected by the obesity and overweight epidemic due to under-nutrition and a major burden of HIV and tuberculosis (Micklesfield et al. 2013). Research on obesity and overweight has started to gain significance in sub Saharan Africa (Abubakari et al. 2008; Ziraba et al. 2009; Mayosi et al. 2009). For instance a recent review by Bhurosy and Jeewon (2014) has shown of evidence of increasing Body Mass Index (BMI) in middle income SSA countries.

There is significant evidence of an inverse relation between the prevalence of obesity and physical activity (Tjepkema 2005; Katzmarzyk et al. 2002; Kaplan et al 2003). It has been suggested that the relation between physical activity and health outcomes such as obesity may be moderated by a number of lifestyle factors, especially sedentary lifestyle (Levine, Hill, & Klesges 2006). In many developing countries, there has been a substantial shift from jobs with high-energy expenditure such as farming, mining, and forestry, and employment is inclined towards the more-sedentary sectors of manufacturing, services and office based-

work (Popkin & Gordon-Larsen 2004). This trend has typically been observed in countries experiencing economic transition and urbanization.

HIV/AIDS has been the leading cause of morbidity and mortality in Botswana and this has led the government to neglect chronic non-communicable diseases. Recent evidence from Botswana indicates that risk factors for non-communicable diseases such as obesity and overweight are on the increase. Morbidity trends in Botswana have shown that there is a decline in childhood infectious diseases and an increase in chronic non communicable diseases and their associated risk factors (National Health Policy 2011). A study by Ministry of Health and WHO (2008) showed a marked increase in non-communicable diseases and risk factors, more especially hypertension, cancer, diabetes and overweight and obesity over the past two decades. Overweight and obesity were associated with significant prevalence of hypertension and that hypertension has increased five-fold over the period 1980 – 1998 (CSO 1980-1998) and has continued to increase over the years (WHO and Ministry of Health, 2008).

Despite evidence indicating increasing burden of overweight and obesity in Botswana, there is little evidence on patterns and determinants of obesity. A study by Letamo (2011) on overweight and obesity was mainly on socio-demographic factors associated with obesity and overweight prevalence. The study did not consider behavioural and lifestyle factors which have been shown to have significant effect on prevalence of overweight and obesity. There is therefore need to profile behavioural and lifestyle factors associated with obesity and overweight in Botswana. Understanding patterns and determinants of obesity and overweight is quite essential for informing policy and developing effective prevention programmes based on a detailed scientific understanding of the multiple interlinked risk factors for obesity and obesity.

Methods

Data Source and Sampling Design[1]

The sampling design used in this article was adapted from the WHO STEPS survey report of 2010. Secondary data derived from the 2007 STEPS survey[2], which was a population based

[1] For further details on the sampling design and data collection, refer to Ministry of Health (2010).
[2] WHO STEPS survey: This is one of a series of World Health Organization surveys that prescribe three steps questionnaire collecting demographic and behavioural, physical measurement and biochemical measurements of

survey of adults aged 25-64 years is used to assess patterns and determinants of obesity and overweight. The 2001 population and housing census sampling frame was adopted and multistage sampling procedure was used for the 2007 STEPS survey. The survey included 4003 individuals in ages 25-64 years covering both rural and urban areas. The survey was carried out in 3 steps, where STEP 1 was on the collection of demographic and behavioural aspect; STEP 2 was on physical measurement of height, weight, waist and hip; blood pressure, and pulse rate and STEP 3 was on biochemical measurements which included collection of blood samples. The main aim of the STEPS surveys is to carry out surveillance of non-communicable diseases using validated instruments, especially in middle and low income settings.

Measurement of Variables

Dependent variable

This study used *overweight/obesity prevalence* as the outcome variable, and it was measured using Body Mass Index. Obesity and overweight was assessed by using body mass index (BMI), defined as the weight in kilograms divided by the square of the height in metres (kg/m2). Obesity is usually defined when the BMI values is greater than. In this study, BMI is categorized into four groups as per WHO recommendations: underweight (BMI < 18.5 kg/m2), normal weight (18.5 ≤ BMI <25 kg/m2), overweight (25%BMI<30 kg/m2) and obese (BMI ≤30 kg/m2). Body mass index used in the logistic regression analysis was coded in such a manner that it had two categories: being obese and overweight (BMI≥25) or not (BMI<25). Being obese and overweight[3] assumed a value of 1 and 0 otherwise to have a binary outcome. Height was measured in centimetres during the survey but was later converted to metres during the analysis.

Explanatory variables

The major factors that were considered to be associated with overweight and obesity such as daily smoking, alcohol consumption, poor fruit and vegetable consumption, and lack of physical activity were used as key risk factors for obesity and overweight. Variables such as sex, age, education, and employment status were used as control variables because as evidenced in some other studies (see 17, 18 & 19) these variables have been observed to be

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individuals. The steps consist of these three core items, which provide data on socioeconomic risk factors, metabolic and lifestyle risk factors.

associated with obesity and overweight prevalence. In order to hold constant their effect on the dependent variable, these variables were included in the regression models (model I, II & III), so that the association between the independent variables becomes isolated and discernible. The measurement of socioeconomic and behavioural factors is given in table 1.

Data analysis

Univariate and bivariate analyses were used to show patterns of overweight/obesity among respondents. Results of univariate and bivariate analyses were presented as percentages. Logistic regression analysis was used to explore the key determinants of overweight/obesity. Logistic regression results are presented in the form of adjusted odds ratios, which explain the probability of being overweight/obesity in a particular category while controlling factors. Data for this were analysed using Statistical Package for Social Sciences version program. Three models were used for analyses. Model I presents the probability of being overweight/obese by risk factor variables for the whole population (sample), while controlling for socio-economic factors. Model 2 is on the probability of being overweight/obese by risk factor variables for men, controlling for their socio-economic status, while model 3 is for the probability of overweight/obesity by risk factors for women, controlling for their socio-economic status. Logistic regression results are presented as odds ratios together with their 95% confidence intervals.

Results

Sample description

Table 2 presents sample characteristics of the study population gender. Results indicate that male respondents constituted about one third (32%) while females accounted for the remaining two thirds (68%) of the sample. For both males (49%) and females (43%) the predominant age group is those in ages 25-34 years, followed by those in ages 35-44 years accounting for quarter for both males (25.3%) and females (25.4%). About 40% of males and 52% of females have primary school education or less, while a small proportion of females (13.4%) compared to males (23.3%) had tertiary education. Men who were involved in unpaid work (36.4%) constituted a large share when considering type of employment, followed by government employees (28.4%), non-government employees (22%) and self-employed (13.2%). This also true for females where women doing unpaid work (55.2%)

constituted a large proportion, followed by non-government employees (22%), government employees (12.4%) and self-employed (10.3%), respectively.

The proportion of respondents who were current daily smokers was high among males (33.1%) than females (8.8%). Furthermore, results indicate that a higher proportion of males (48.4%) than females (9.9%) were hazardous drinkers. When considering physical activity, slightly more than one quarter of males (26.8%) reported that they do moderate-intensity sports, physical fitness or recreational activities that cause small increases in breathing. Meanwhile, about 5% for women reported that they do moderate-intensity sports, physical fitness or recreational activities that cause small increases in breathing. About 9% among males and females reported that they do not eat vegetables in any one day of the week. Overall 6% of men and about 24% of women in the sample were obese.

Patterns of overweight\obesity prevalence

Table 3 is on the prevalence of obesity and overweight for each category of independent variables stratified by gender. Obesity and overweight were observed to be more prevalent among females (24%) than males (6%). Results also indicate that for both men and women obesity and overweight prevalence increases with age until age 54 years for both men and women. For instance prevalence among males in ages 25-34, 35-44, 45-54 and 55-64 years was 4.1, 6.9, 9.5 and 6.3% respectively, while for females in ages 25-34, 35-44, 45-54 and 55-64 years it was estimated at 15.9,26.8,32.5 and 28.7% respectively. For all ages obesity prevalence was higher among female participants. Among males obesity prevalence was significantly high among men with tertiary or higher education (11.9%) than men of other education groups, while for women it was higher among women with primary or less education (25.4%), followed by secondary education (22.7%) and tertiary or higher education (20.2%).

Among males obesity prevalence was more pronounced among government employees (9.4%), followed by self-employed (8.9%), non-government employees (7.6%) and lastly unpaid workers (2.4%). Meanwhile among females, obesity prevalence was high among self-employed (28.8%) and government employees (27.7%), followed by non-government employees (24.9%) and lastly unpaid workers (21.4%). Quite conversely the results indicate that obesity was more prevalent among respondents who were not current smokers of any tobacco products than among smokers for both males (7.3%) and females (24.6%). On the other-hand obesity was more marked among hazardous alcohol drinkers for both males

(11.8%) and females (23.7%). When considering physical activity, quite contrariwise obesity was slightly high among men who reported that do some moderate-intensity sports, physical fitness or recreational activities that cause small increases in breathing (6.9%) than among those did not (5.8%). For females, obesity was prevalent among women who did not do any physical fitness activity (24.1%) than among those who did physical fitness activities (20.4%). Moreover, results also indicate that obesity was prevalent among respondents who eat vegetable serving in one/more days of the week for both males (6.1% compared to 3.4%) and females (24.2% compared to 21.5%) than among those who do not.

Determinants of overweight\obesity

Table 4 presents the adjusted odds ratios estimated from logistic regression models by including the demographic, socio-economic and risk factors as covariates for obesity and overweight. The binomial dependent variable was respondent's status of obesity and overweight measured using BMI (yes=1 and no=0). Results in table 3 are included in three models separately for males, females and the total sample. The results of model 1 indicate that females have greater risk of obesity and overweight than males. For example, the probability of having obesity and overweight among females was 3.7 times higher than among males, when controlling for age and socio-economic and other risk factors. The results also show that the probability of being obese and overweight increases with age. For instance, respondents aged 35-44 (OR, 2.13), 45-54 (OR, 2.68) and 55-64 years (OR, 1.36) were more likely to be obese and overweight than respondents in ages 25-34 years. Furthermore, results indicate that obesity and overweight was more prevalent among government employees (OR, 4.39) and non-government employees (OR, 1.54) than among unpaid workers after controlling for other covariates.

Results indicate that in the total sample, respondents with secondary education (OR, 1.85) were more likely to have obesity and overweight than those with primary or less education. Quite inversely, respondents who reported eating vegetables at least in one or more days of the week (OR, 1.41) were more likely to obese and overweight than those who did not have a vegetable serving at all. Lack of physical activity was not associated with obesity and overweight prevalence in the total sample, while hazardous alcohol drinkers were 1.29 times more likely to be obese than non-drinkers. Daily smokers (OR, O.35) were less likely to have obesity compared to non-smokers.

Model II results indicate that the odds of being obese and overweight increases with age among male respondents, for instance male respondents in ages 35-44 (OR, 1.18), 45-54 (OR, 3.68) and 55-64 years (OR, 2.86) were more likely to be obese and overweight than those in ages 25-34 years. Government employees (OR, 1.56), non-government employees (OR, 2.16) and self-employed (OR, 1.55) males were more likely to be obese and overweight than unpaid workers. Men with secondary (OR, 1.64) and tertiary education (OR, 6.21) were 1.6 and 6 times respectively, more likely to be obese and overweight than men with primary education, when controlling for other covariates. Males who reported that they ate vegetables in anyone or all days of the week (OR, 0.66) and those were daily smokers (OR, 0.73) were less likely to be obese and overweight compared to men who did not take vegetables at all and those who reported that they were daily smokers, respectively. Meanwhile results also indicate that lack of physical activity as a risk factor was not significantly associated with the probability of being obese and overweight.

Model III presents the adjusted odds ratios for logistic regression analysis for females only. As observed among males, as age increases among females, the probability of being obese and overweight increases. For instance women in ages 35-44 (OR, 1.65), 45-54 (OR, 2.16) and 55-64 years (OR, 1.27) were more likely to be obese and overweight than those in ages 25-34 years. When considering employment status, the odds of having obesity and overweight were significantly higher among government employees (OR, 2.27), non-government employees (OR, 1.57) and self-employed females (OR, 1.31), respectively than among unpaid workers. Females with secondary and tertiary education were more likely to have obesity and overweight than those with primary or less education. Just like among males, female respondents who ate vegetables in at least anyone of the days of the week (OR, 1.29) were more likely to be obese and overweight than those who didn't. Among females, lack of physical activity was not associated with obesity and overweight prevalence. Female hazardous drinkers (OR, 1.44) showed high odds of having obesity and overweight compared to non-drinkers, while daily smokers (OR, 0.48) were less likely to be obese and overweight among females, like among males.

Discussion

There is evidence of the marked increase of non-communicable diseases and their risk factors in Botswana. Recent efforts by Ministry of Health and World Health Organization in carrying out surveillance of NCDs and their risk factors are apparent evidence towards combating and

managing their impact on morbidity and mortality of Botswana population. This study used data derived from the WHO STEPS 2007 to understand the patterns and major determinants and risk factors for obesity and overweight in Botswana. This study is the first to analyse both socio-demographic and behavioural risk factors for overweight and obesity, which are major causes for cardiovascular diseases. The study provides research evidence on patterns and determinants of obesity and overweight, in a context where there is plethora of empirical evidence on non-communicable and their risk factors.

We noted significant gender differential in the prevalence of obesity and overweight, when controlling for age and other risk factors in Botswana. Obesity and overweight were more inclined towards females, with females 3 timely more likely to be obese and overweight than men. The higher prevalence of obesity and overweight in women than in men is a consistent observation in SSA region (Department of Health 1999; Department of Health 2007; BeLue 2009). Mciza et al. (2005) observed that the socio-cultural determinants of obesity and overweight are multifarious and range from opinions of what constitutes an ideal body shape and size, with the preferred form being overweight, to food availability and portion sizes.

Some studies in SSA have associated obesity and overweight among women with 'ideal body image'. For instance, in South Africa, one possible explanation for the higher prevalence of obesity among South African black women is related to body image and a preference for a larger body size (Puoane et al. 2005). Furthermore, some studies suggest that nutrition deprivation in childhood could be a risk factor for overweight and obesity in women and not in men, although the physiological reasons underlying this suggestion are not well understood (see for instance, Case & Menendez 2009). In Botswana being overweight and obese have traditional and cultural undertones, these connotations may present complexities in the prevention and management of overweight and obesity (Letamo, 2011). The perception that overweight or obesity in women is thought to reflect on a husband's ability to care for his wife and family and reflect persons who are healthy and without HIV/AIDS (Clark et al., 1999) is also common in Botswana.

Our study has also shown that as age increases the odds of being overweight and obese were high for both males and females. Aging has been associated with considerable changes in body composition. For instance, it has been observed that after 20–30 years of age, fat-free mass (FFM) progressively decreases, whereas fat mass increases. Some data from large population studies show that mean body weight and BMI gradually increase during most of

adult life and reach peak values at 50–59 years of age for both men and women (Flegal et al. 1998; Mokdad et al. 2001; Kuskowska-Wolk & Rossner 1990; Hedley et al. 2004; Flegal et al. 2002) and that after the 60 years BMI starts to decrease again (Manson 1995). This assertion is consistent with our study findings, for instance for both men and women the odds of being overweight and obese were 2 times more in ages 35-54 years compared to ages 25-34 years. Meanwhile, at ages 54-64 years the odds of being obese declined to less than two times.

We found that in Botswana overweight and obesity are significantly associated with higher education level. Men and women with secondary and tertiary education were more likely to be obese than those with primary or lower education. There very little existing evidence concerning the relationship between education and obesity in SSA, because generally the main focus of most research has been more broadly on the links between socio-economic factors and health status. Some studies in developed countries have shown that individuals with more years of schooling were less likely to be overweight and obese (Cutler and Lleras-Muney 2006) mainly because they are more likely to exercise. Contrarily we found that high education level is associated with overweight and obesity. This could be linked to the fact that educated people have high socioeconomic status hence they can afford any food portions, and live sedentary lifestyles.

Overweight and obesity were also more prevalent among government employees and non-government employees (such as private companies' employees). The association between employment status is well documented in sub Saharan Africa. For instance, in Eritrea Mufunda et al. (2006) found this strong association, while Commodore-Mensah et al (2014) also made a similar observation in West African countries. The association between employment was also observed to have significant association with overweight and obesity in Vietnam, where women with low socioeconomic status were observed to be more overweight and obese than women with high occupational statuses (son et al. 2012). It is assumed that both men and women who are not working in government and non-government organizations are doing manual labour type of work, making them at less risk of being overweight and obese. In Botswana, government employees and non-governmental employees are susceptible to overweight and obesity mainly because of the sedentary nature of their work.

Unlike other previous studies on non-communicable diseases in developed countries and sub Saharan Africa (Popkin & Gordon-Larsen 2004, Hiscock et al. 2012) risk factors such as lack

of physical inactivity and daily smoking were not found to have a significant effect on the increased odds of being overweight and obese for the general population. This was also true in separate analysis for both men and women. Lack of association between physical inactivity and overweight/obesity underscores the need for using objective instruments or measures to ascertain activity levels rather than the self-reported measure used during the Botswana WHO STEPS[4] survey. The inability to estimate time spent doing physical activity may have posed challenge during data collection leading to over-reporting. It is highly unlikely that physical activity levels in Botswana had increased dramatically in 2007.

Concerning the relationship between smoking and overweight/obesity, some cross sectional studies have also found that smoking to is associated with lower odds of being obese and overweight (Peer et al. 2014). This has been attributed to the appetite suppressant properties attributed to nicotine. However, this relationship is more intricate with heavy smoking associated with overweight/obesity, mainly due to the greater ratification of unhealthy lifestyle behaviours in heavy smokers (Chiolero et al. 2008). There is perhaps the need for research to disentangle the relationship between smoking and overweight/obesity in Botswana.

Hazardous alcohol consumption was associated with increased odds for being overweight/obese for both men and women in the study. Evidence on the relationship between alcohol consumption is at best mixed. Recent epidemiological evidence show that light-to-moderate alcohol intake is not associated with adiposity gain while heavy drinking is more consistently related to weight gain (Traversy & Chaput 2015), while among cross-sectional studies, a common trend appears to be that alcohol intake is not associated with body mass index (BMI) in men, while either negatively or not associated with BMI in women (Sayon-Orea 2011) Meanwhile, Our study results indicate that the odds of having obesity were higher among men than among women alcohol consumers. This is consistent with French et al's (2010) observation that the association between alcohol intake and body weight is generally stronger in men than women.

Study limitations

[4] The question used to measure physical activity is based on self-reported information and may lack objectivity. There is need for more apt,objective and standardised measures rather than self-reports to ascertain the validity of measure used for physical activity.

Our analysis is based on data derived from a cross-sectional survey and this has precluded conclusions about causal associations between overweight/obesity and the associated determinants. Moreover, our study data was from secondary source hence was limited to behavioural risk factors for overweight/obesity. Despite these limitations our study provides vital insights into prevalence of overweight/obesity and also on the behavioural factors associated with obesity among Batswana adults.

Conclusion

The high levels of overweight/obesity among Batswana adult men and women are of great concern. We found that overweight/obesity is significantly associated with high sex, age, high socioeconomic status (high education level and employment status), hazardous alcohol consumption, while other risk factors such as daily smoking and poor vegetable consumption were not associated with overweight/obesity.

Table 1-Measurement of Socioeconomic and Behavioural Factors

Risk factor	Measure/question
Current daily Smoking	Do you currently smoke tobacco products daily? Yes is coded 1 and 0 otherwise.
Hazardous drinking	During each of the past 7 days, how many standard drinks of any alcoholic drink did you have each day. Hazardous drinking is defined as 40-59.9 g (4-< 6 drinks) of pure alcohol on average per day for men and 20-39.9g (≥2-<4 drinks) for women. A standard drink contains approximately 10g of pure alcohol. 3 or more drinks per day for both genders has been coded 1 to denote hazardous drinking and 0 otherwise.
Lack of physical activity	Do you do any activity that involve moderate intensity sports, fitness or recreational activities that cause large increases in breathing or hearth rate like for at least 10 minutes? Yes is coded 1 and no given a code of 0
Poor vegetable consumption	In a typical week, how many days do you vegetables? If individuals reported that they did not eat any vegetables in any one of the 7 days of a week, then its poor vegetable consumption and given code 1 and 0 if otherwise
Socioeconomic factors	i) Sex – male coded 1 female 0 ii) Age- 25-34 coded 1, 35-44=2, 45-54=3, and 55-64=4 iii) Education- primary or less=1, secondary=2 and tertiary or higher =3 iv) Race- Motswana=1 and other races=2 v) Employment status=government employee coded=1, non-government employee=2,self-employed=3 and unpaid worker=4

Table 2 Distribution of the study population by demographic, socioeconomic and behavioural factors for males and females.

Variable	Males (n=1284, 32.1%)		Females (n=2719, 67.9%)	
	N-	%	N-	%
Age				
25-34	634	49.4	1168	43.0
35-44	325	25.3	690	25.4
45-54	179	13.9	508	18.7
55-64	146	11.4	353	13.0
Education				
Primary or less	517	40.3	1426	52.4
Secondary	468	36.4	928	34.1
Tertiary or higher	299	23.3	365	13.4
Type of employment				
Government employees	365	28.4	337	12.4
Non-government employees	282	22.0	598	22.0
Self-employed	169	13.2	281	10.3
Unpaid workers	468	36.4	1501	55.2
Do you currently smoke any tobacco products such as cigarettes, cigars, etc daily?				
Yes	425	33.1	239	8.8
No	859	66.9	2480	91.2
Hazardous drinking[5]				
Yes	660	48.4	269	9.9
No	664	51.6	2450	90.1
Do you do any moderate-intensity sports, physical fitness or recreational activities that cause small increases in breathing?				
Yes	344	26.8	125	4.6
No	940	73.2	2594	95.4
In a typical week on how many days do you eat vegetables?				
None	125	9.7	245	9.0
One/more days	1159	90.3	2474	91.0
Overall % obese		6%		23.9%

[5] All alcohol consumers were hazardous drinkers for both males and females

Table 3 Prevalence of overweight and obesity by demographic, socio-economic and behavioural factors among males and females

Variable	Males (n=1284, 32.1%)		Females (n=2719)	
	%	N-	%	N-
Age				
25-34	4.1	634	15.9	1168
35-44	6.9	325	26.8	690
45-54	9.5	179	32.5	508
55-64	6.3	146	28.7	353
Education				
Primary or less	4.2	517	25.4	1426
Secondary	4.0	468	22.7	928
Tertiary or higher	11.9	299	20.2	365
Type of employment				
Government employees	9.4	365	27.7	337
Non-government				
Employees	7.6	282	24.9	598
Self-employed	8.9	169	28.8	281
Unpaid workers	2.4	468	21.4	1501
Do you currently smoke any tobacco products such as cigarettes, cigars, etc daily?				
Yes	3.3	425	16.5	239
No	7.3	859	24.6	2480
Hazardous drinking[6]				
Yes	11.8	660	23.7	269
No	4.9	664	20.8	2450
Do you do any moderate-intensity sports, physical fitness or recreational activities that cause small increases in breathing?				
Yes	6.9	344	20.4	125
No	5.8	940	24.1	2594
In a typical week on how many days do you eat vegetables?				
None	3.4	125	21.5	245
One/more days	6.1	1159	24.2	2474

[6] All alcohol consumers were hazardous drinkers for both males and females

Table 4 Adjusted odd ratios (OR) and 95% Confidence Intervals for the probability of overweight and obesity for the total population, males and females.

Variable	Model I (total) N= (4003)	Model II (males) (N=1284)	Model III (females) (N=2719)
Risk factors			
Daily smoking			
Yes	0.35*(0.29-0.41)	0.73*(0.61-0.88)	0.48*(0.42-0.54)
No	1.0	1.0	1.0
Hazardous drinking			
Yes	1.29*(1.05-1.58)	2.46*(1.81-3.35)	1.44*(1.22-1.70
No	1.0	1.0	1.0
Lack of physical activity			
Yes	0.22(0.15-0.32)	1.06(0.86-1.31)	0.55*(0.47-0.65)
No	1.0	1.0	1.0
Vegetable consumption			
None	1.0	1.0	1.0
One/more days	1.41*(1.16-1.72)	0.66*(0.49-0.86)	1.29**(1.10-1.51)
Explanatory			
Education			
Primary or less	1.0	1.0	1.0
Secondary	1.85*(1.59-2.15)	1.64*(1.22-2.19)	1.62*(1.43-1.84)
Tertiary	0.44*(0.35-0.56)	6.21*(4.75-8.11)	1.39*(1.20-1.61
Type of employment			
Govt employees	4.39*(3.58-5.39)	1.56*(1.21-2.00)	2.27*(1.97-2.61)
Non-government Employees	1.54*(1.32-1.78)	2.16*(1.64-2.84)	1.57*(1.38-1.79)
Self-employed	0.96(0.77-1.21)	1.55** (1.14-2.10)	1.31*(1.10-1.56
Unpaid workers	1.0	1.0	1.0
Control variables			
Age			
25-34	1.0	1.0	1.0
35-44	2.13*(1.81-2.49)	1.18*(0.94-1.48)	1.65*(1.46-1.87)
45-54	2.68*(2.24-3.21)	3.68*(2.79-4.85)	2.16*(1.87-2.49)
55-64	1.36*(1.09-1.71)	2.86*(2.06-3.97)	1.27** (1.06-1.52)
Sex			
Male	1.0		
Female	3.74*(3.33-4.20)		

*Statistically significant at *P>0.05*; statistically significant at *P<0.1*

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