

PEER REVIEW HISTORY

BMJ Open publishes all reviews undertaken for accepted manuscripts. Reviewers are asked to complete a checklist review form (<http://bmjopen.bmj.com/site/about/resources/checklist.pdf>) and are provided with free text boxes to elaborate on their assessment. These free text comments are reproduced below.

ARTICLE DETAILS

TITLE (PROVISIONAL)	Socioeconomic and behavioural determinants of overweight/obesity among adults in Botswana: A cross-sectional study
AUTHORS	Keetile, Mpho; Navaneetham, Kannan; Letamo, Gobopamang; Bainame, Kenabetsho; Rakgoasi, Serai; Gabaitiri, Lesego; Masupe, Tiny; Molebatsi, Robert

VERSION 1 – REVIEW

REVIEWER	Dr Felistas Mashinya University of Limpopo South Africa
REVIEW RETURNED	24-Feb-2019

GENERAL COMMENTS	<p>Authors should pay attention to detail particularly with referencing style.</p> <p>The discussion section should be concise and provide reasons for any differences in findings when compared to other sub-Saharan countries which has not really come out in the initial submission.</p> <p>REVIEWER'S COMMENTS:</p> <p>Title: Socioeconomic and behavioural determinants of overweight/obesity in Botswana: A cross-sectional study</p> <p>Overall Comment on the Paper An interesting article that reports on one of the world's biggest health challenge. Below are my comments according to each section:</p> <p>Abstract: Pages 2 -3. Design Line 16-17: This information should be moved to Setting as it relates to urban and rural areas where study was conducted. Line 29-31: Units should be indicated in "BMI≥25". Line 31: "Questionnaire" spelling is wrong. Line 20-33: This information should rather be moved from Design to Outcome measures. Participants Line 42: Start sentence in words not figures. Include any exclusion and inclusion criteria. Outcome measures Line 51: ORs should be written in full first. Results Line 6 -18: Levels of significance are not indicated. Conclusion</p>
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	<p>Line 25: Write as “-----as key factors associated with overweight/obesity”.</p> <p>Strengths and Weaknesses of the study- Page 4 Line 8: The word ‘behavioral’ should be written in the British style consistently throughout document. Check the spelling on Key words and throughout the article.</p> <p>Introduction – Page 5 Line 44: Abbreviate “sub Saharan Africa” before subsequent use. Line 49: Write abbreviations in full the first time you use them e.g. “Human immunodeficiency virus (HIV)”</p> <p>Methods – Page 7 Line 18: Write as “---one city and two towns---” similar to what is stated in abstract. Line 25: The author should clearly explain whether the questionnaire was self-developed or adopted in whole or modified from standardized questionnaire, as this will also determine the validity and reliability of this tool. Line 45: Provide a ‘Reference /source’ for BMI categories used. Line 50: Put units for BMI</p> <p>Patient and Public involvement- Page 8 Line 7: “crossectional” should be written correctly Line 13: Were both assent and consent obtained in cases of teenagers (15-17years) included in this study? If any participated, it should be clearly indicated. Line 18: The word ‘ensure’ not ‘insure’ is more appropriate in this context. Include any exclusion and inclusion criteria.</p> <p>Measurement of variables – Page 8 I suggest that the author combines the Method (page 7) and Measurement of variables (page 8) under a section called Methodology as the current layout separates them yet they both relate to how data was collected. The suggested layout is as follow:</p> <p>Methodology Section Study design and setting Sample size calculation and sampling technique Patient and Public involvement Data collection i) Questionnaire administration ii) Anthropometric measurements and BMI calculations</p> <p>The instruments used in anthropometric measurements should be stated indicating company and country of origin. Formula used on BMI should be given alongside the categories. The variable Fruit and vegetables should be clearly stated how it was determined (giving the calculation formula) alongside the categories. Line 60: Page 9: The author should put the provide the reference for Principal component analysis for Wealth index.</p>
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The author should state ways in which bias was minimised in this study.

Control variables – Page 10

This section should be labelled as Variables in the study.

This will allow the author to describe the outcome variable, predictors, co-variates, potential confounders etc.

Line 14-20: This statement should rather be moved to the statistical analysis section.

Statistical analysis

Explain how missing data were addressed.

Which tests were used in descriptive analysis?

The level of significance considered in this study should be included in this section.

Results – Page 12

Sample Characteristics

Table 1: The statistical test used for the results presented in this Table should be indicated below the table.

Some variables have total % indicated as 100% while others eg sex that is not indicated.

The absolute number column (N) should start followed by the % column; this would read much better than the current layout.

Line 5-26: Page 13: This paragraph is a direct repetition of all table content. It should rather

present the main takeaway from the table.

Line 45-51: This paragraph is a repetition of methods. Focus is on providing the findings as

methods have already been given.

Page 14: Table 2: The N column should come first followed by % column, as this layout reads better.

The 100% Totals given in Table 1 are not presented in this table which shows inconsistencies in reporting similar results.

In Table 2; remove the question marks (?) on Smoking and Fruit and Vegetable variables.

In Table 2: The total of 1147 for Poor physical activity is incorrect; instead it is 1178.

Prevalence of overweight/obesity

Page 15: Line 10: Use “Overweight/obesity”, for consistency.

Table 3: Interchange the columns N and %; as previously suggested. Add the heading overweight/obese to the % column (see below). This will make it easy and quick to understand this table.

Variable	Number of participants (N)	Overweight/obese %	p-value

In Table 3; % column: Be consistent with the number of decimal places. Refer to age 35-44years; urban villages; self-employed compared to others.

In Table 3; the variable ‘Smoking; poor physical activity and Fruit and vegetable consumption’ should be bold for consistency.

In Table 3 and Table 4; “Poor Fruit and vegetable consumption” is used as variable name, while in Table 2, the same variable is referred to as “Fruit and Vegetable intake”. The same name should be used throughout the article to avoid confusion.

	<p>Table 4 Title suggestion: “Odds ratios for the association of Overweight/obesity with socioeconomic and behavioural variables in the study population, NCD study 2016”.</p> <p>Discussion - Page 21 With respect to the aim of this study; the author should highlight the important findings of this study. Line 27 -55: Page 21: This paragraph should be written in a more concise manner without repetition. E.g. Line 32-37 is repeated in 51 to 55. Line 10: Page 22: Put Reference on sentence “For instance, acculturation, through complex sociocultural pathways, affects weight gain among both men and women”. Line 48-56: Page 22: This paragraph should be condensed into a single sentence as all three sentences mean the same. Line 60: Page 22: Use ‘show’ not ‘shows’. Line 48: Page 23: Should read as “-----attainment were more likely to be obese than those with low education⁵¹. Line 3-13: Page 24: Relationship of work status and wealth with overweight/obesity in neighbouring countries such as South Africa and Zimbabwe should be compared to these study findings. Line 17: Page 24: Put “that” in sentence to read as “It was noted that the odds-----“ Line 15-31: Page 24: The author should also discuss studies that have reported the contrary as smoking is known to suppress appetite and has also been associated with low BMI in some studies. Line 34 - 59: Page 24: The author should also point out recent studies that have not found any association of physical activity and BMI and others that have found positive association of physical activity and BMI.</p> <p>Acknowledgements Participants for this study should be included under this section. Ethical Approval This section should be stating that Ethical approval was obtained and then provide the Certificate number and not merely stating that documents were submitted.</p> <p>References The referencing is inconsistent. The following references: 5; 8; 11; 12; 13; 15; 19; 21; 22; 23; 24; 25; 26; 27; 28; 30; 32; 33; 34; 35; 37; 38; 39; 41; 42; 44; 45; 46; 47; 48; 49; 50; 51; 52; 53; 54; 55;56; should be corrected with respect to any one of the following issues: Punctuation of author’s initials. Number of authors’ names before putting et al. The use ‘&’; and or not at all before the last author name. Some journal names are italised while others are not. The author should follow the exact journal style of referencing.</p>
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REVIEWER	DR. IGBOANUSI CHINEDU JOHN-CAMILLUS MBBCh, MPH, MIAD, MLCJ, Cert (M&E), FWACP DR IGBOANUSI Chinedu John-Camillus MBBCh, MPH, MIAD, MLCJ, Cert (M&E), FWACP Consultant Public Health Physician DEPARTMENT OF PUBLIC HEALTH HEADQUARTERS 2 DIVISION MEDICAL SERVICES/HOSPITAL, 2 DIVISION, NIGERIAN ARMY, ADEKUNLE FAJUWI CANTONMENT, IBADAN NIGERIA
REVIEW RETURNED	16-Mar-2019

GENERAL COMMENTS	Concerning ethical clearance, the author did not state whether it was finally given nor did he include the reference number. He merely stated that the ethical clearance formalities were completed before the commencement of the study and that the study proposal was submitted to the appropriate authorities. This in no way is same as the ETHICAL CLEARANCE being finally given. He has to clarify this. Next point is on study limitations. It is not just enough to list the limitations. The author should equally elaborate on measures put in place to either reduce or eliminate them.
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REVIEWER	Dr Valerian Mwenda National Cancer Control Programme, Ministry of Health, Kenya
REVIEW RETURNED	07-Apr-2019

GENERAL COMMENTS	The topic is of public health importance, the paper is generally well written and the study question adequately answered. Revisions are needed though, especially in the use of non-scientific phrases, examples: alarming rate, being a woman, as well as use of 'more likely' when the measure of association is odds ratio.
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REVIEWER	Richard Wamai Northeastern University, Boston USA.
REVIEW RETURNED	25-Apr-2019

GENERAL COMMENTS	Overall: This paper addresses an important topic and contributes to the literature on the magnitude and determinants of overweight and obesity in Botswana. This is a crucial topic in context of epidemiological transitions in Sub-Saharan Africa. My assessment is that the paper has merit to be considered for publication after the authors have addressed major gaps. A major criticism of this study is that there is no mention of the nationwide survey of non-communicable diseases using the World Health Organization's (WHO) STEPwise approach to chronic disease risk factor surveillance. As is seen on the WHO website (https://www.who.int/ncds/surveillance/steps/botswana/en/) Botswana has conducted 2 STEPS, in 2007 and in 2014. Why have not the authors mentioned these surveys? These studies would present the best evidence of national trends in the primary variables of their interests. Is there any reason why the authors have instead not used these data to examine the nature of the
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problem in Botswana? Are there any studies published on these two STEPS surveys?

My substantive comments are below. I hope that the authors can utilize these comments to improve their analysis of such an important topic.

Introduction

- Page 6 line 4: This sentence is listing certain “socio-economic” factors but “sex, age” should be removed as they are demographics not socio-economic variables
- Page 6 lines 49: cite sources for the first sentence in this paragraph presenting “evidence indicating increasing burden of overweight/obesity in Botswana”. The STEPS surveys should have some of this evidence.

Methods

Overall, this section needs substantive work

- Page 7 line 22: “multistage probability sampling technique” needs to (1) be explained. Was the sample intended to be nationally representative? That does not seem to be the case and would be entirely futile as the STEPS surveys would have done that already. If not, why were the specific sites selected? (2) The sampling should be explained in the next subsection now titled “Patient and public involvement”. As is now, this section should be re-titled to “Sample recruitment and ethics”. Adding the “sampling technique” should change this title to “Sampling, recruitment and ethics”.
- Page 7 line 25: “collected self-reported data on several NCDs” should be revised to specify which data were self-collected and which were measured. “Anthropometric measurements” were collected, so did the respondents report their own weight or height or status of NCDs? The way it is stated here means that is what happened.
- Page 7 lines 27-50: I think the entire text starting from “Information collected from ...” to the end of the paragraph on the bottom of this page should be moved to under the sub-section “Measurement of variables” which I advise be better re-titled as “Outcome variables and procedures”. The text under the “Measurement of variables” sub-section should then be radically edited (see specific comment and rationale for that below)
- Patient and public involvement (“Sampling, recruitment and ethics”)
 - o Change the title as suggested. The title would necessarily need to be changed because it is not clear what the term “involvement” is meant to show
 - o The word “patient” should not be used because the subjects were not patients
 - o The statement of the IRB approval is best added at the end of this sub-section
- Measurement of variables (“Outcome variables and procedures”)
 - o Page 8 lines 24 through page 8 line 10: This whole paragraph needs editing. I do not think the questions posed here need to be listed/detailed. There are standard protocols for measuring these outcomes. All the authors need to state is what the protocols they used were. That should be the justification. For example “physical activity measures” should just refer to the scientific protocols/guidelines: e.g., [2018 Physical Activity

Guidelines Advisory Committee. 2018 Physical Activity Guidelines Advisory Committee Scientific Report. Washington, DC: U.S. Department of Health and Human Services; 2018. Available at: https://health.gov/paguidelines/second-edition/report/pdf/PAG_Advisory_Committee_Report.pdf] or WHO [Global Strategy on Diet, Physical Activity and Health. <https://www.who.int/dietphysicalactivity/goals/en/>]

o Line 33-35: "This variable was used because in Botswana, it has been observed that alcohol consumers are heavy drinkers" should be deleted here. First it is clear alcohol consumption is associated with NCDs and, furthermore, authors would have to equally justify for the other measures.

o Page 9 line 34: "recommendation by the WHO panel on diet, nutrition and chronic disease prevention". This need to be cited, and it is precisely to the point I am making above about stating the established protocols and so no need to explain every measure in detail

o Page 8 lines 41-46: "WI is a composite measure of, typically, indicators of ownership of consumer durables, housing characteristics, and access to public services". Could you add citations to this. Also, cite source for "principal component analysis"

o Page 10 line 3-5: is this last text of the sub-section based on Botswana statistics? Authors could cite the national statistical sources.

Results

- Page 13 lines 12-26: Here there is no need to re-state every outcome since these are already in the table. I suggest to just indicate the most important/significant.

- Page 13 lines 35-40: The whole sentence starting with "However, since prevalence ..." should be moved to Discussion section

- Page 13 lines 46-51: "calculated based on the general recommendation by the WHO panel on diet, nutrition and chronic disease prevention that considers poor fruit/vegetables intake as having less than 5 servings of fruits and vegetables in a week". This full text should be deleted, it is already explained in the Methods section.

Discussion

Overall, this section is far too long and needs to be cut down

- Page 21 lines 41-60: This text is repetitive. The main point is gender differential. There is no need to write that much text for this one point. Here also, authors cite study #38 to observe higher rates of overweight in men than in women. This is not accurate based on large studies, e.g., the Global Burden of Disease studies. For example, one study shows that "among adults, the prevalence of obesity was generally higher among women than among men in all age brackets" [The GBD 2015 Obesity Collaborators. Health Effects of Overweight and Obesity in 195 Countries over 25 Years. *N Engl J Med* 2017; 377:13-27]. Another study shows that "global age-standardised mean BMI in men increased from 21.7 kg/m² in 1975 to 24.2 kg/m² in 2014, and in women from 22.1 kg/m² in 1975 to 24.4 kg/m² in 2014" [NCD Risk Factor Collaboration (NCD-RisC). Trends in adult body-mass index in 200 countries from 1975 to 2014: a pooled analysis of 1698 population-based measurement studies with 19.2 million participants. *Lancet*. 2016;387(10026):1377-96.] In the US, women have consistently had higher weight than men [National Center for Health Statistics. Health, United States, 2017: With special feature on mortality.

	<p>Hyattsville, MD. 2018]; see tables (https://www.cdc.gov/nchs/data/hus/2017/058.pdf).</p> <ul style="list-style-type: none"> - Page 22 lines 6-10: The statement “For instance, acculturation ...” need to be referred - Page 22 lines 17-20: Reference #41 is cited here to support the point being made about fertility, etc. However, this reference is about smoking and is therefore not the appropriate citation here. Use for example #39. - Page 22 lines 30-38: It is not clear if the statement “Firstly, ...” is making a point from this study or another study - Page 22 lines 48-57: From “The odds of being” to end of “at ages 65+ years” the text is repetitive. It should be collapsed into a single sentence. - Page 23 lines 10-27: This full paragraph, or a large part of it, could be omitted. It is not very necessary to explain the causal mechanism for body adiposity or obesity because the study being presented is not a clinical study but an epidemiological one. - Page 23 lines 32-38: This text could be shortened to the precise point - Page 23 line 50: What does “individual’s level of development” mean? - Page 23 lines 55 through page 24 line 13: This paragraph could be improved. (1) The first sentence observes no significant differences regarding overweight/obesity and work/wealth status in the study population. What about other studies in similar settings, for example, studies in countries with similar HDI? Reference #20 (Kim and von dem Knesebeck) show clear significance due to income. How come not in this study. (2) Authors should also add support for HDI. (3) The last sentence should be corroborated in other studies. Reference #27 (Nnyepi et al) shows a nutrition transition. This phenomenon is well observed in other studies, e.g., [Popkin B. Global nutrition dynamics: the world is shifting rapidly toward a diet linked with noncommunicable diseases. <i>Am J Clin Nutr.</i> 2006;84(2):289-98; Popkin BM, Adair LS, Ng SW. The global nutrition transition: the pandemic of obesity in developing countries. <i>Nutr Rev.</i> 2012 Jan; 70(1): 3–21.] - Page 24 lines 34-60: This whole paragraph is too long. As I point out above, I do not think there is need to detail the mechanistic pathways for caloric intake and overweight/obesity. That is not the primary measure in this study. Authors can focus more on outlining the dietary patterns and changes – for example on the effect of globalization on access to fast foods – than the clinical mechanisms. Earlier authors write about “nutrition transition” in Botswana but provide no details or support for the changes. For example, it would be most interesting to read about how the diet in Botswana has changed from the past to the present (is there a common or typical meal in Botswana and what is that composed of?). <p>As I point out above, overall, the Discussion is too long. It is also should be more focused on the study findings. Rather than adding text on the mechanisms, discuss specific drivers of the observed outcomes specific to Botswana. Discuss what policies are already in place. Discuss policy implications, relevance, proposals. Discuss implications for disease transition. For example, there is the United Nations 2011 Political Declaration on NCDs (https://www.who.int/ncds/governance/third-un-meeting/en/), the 2013 WHO Global Action Plan for the Prevention and Control of NCDs 2013-2020 (https://www.who.int/nmh/events/ncd_action_plan/en/), the WHO.</p>
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	<p>Global Strategy on Diet, Physical Activity and Health (https://www.who.int/nmh/wha/59/dpas/en/), the 2003 WHO HO Framework Convention on Tobacco Control (https://www.who.int/fctc/text_download/en/). A question is: where is Botswana in these strategies? Authors should mention these. Does not the country have a strategy on NCDs?</p> <p>Limitations I think more discussion should be made, especially in light of my comments above regarding STEPS surveys</p> <p>Tables</p> <ul style="list-style-type: none"> - Table 1: Perhaps this could be better re-labelled from “sample characteristics” to “socio-demographic characteristics” - Table 1: A line is missing to separate section “Work Status in past 12 months” from next section “Wealth status”. <p>Grammar There are some grammatical and textual errors that the authors need to address. For example:</p> <ul style="list-style-type: none"> - In the Introduction, page 5, specify the acronym “SSA” right after “Sub Saharan Africa”. - Page 7 line 43: a full colon should come after “categorized into”, instead of a semi-colon - Page 8 line 26: “respondents”, not “respondent”. - Page 14 line 52: “found to be” should be deleted - Page 14 lines 57-59: “it was found that” should be deleted - Page 15 line 3: “non-smokers”, not “non-smoker” - Page 17 line 57: delete “a” - Page 24 line 29: change “is” to “are”
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VERSION 1 – AUTHOR RESPONSE

Reviewer: 1: Dr Felistas Mashinya

Comment 1.

Please state any competing interests or state „None declared“: None declared

Response: Thank you for the comment. The correction has been made.

Comment 2

Authors should pay attention to detail particularly with referencing style.

Response: The referencing style has been duly corrected and followed

Comment 3

The discussion section should be concise and provide reasons for any differences in findings when compared to other sub-Saharan countries which have not really come out in the initial submission (see attached comments).

Response: We have tried to make the discussion section to be as concise as possible and comparisons have been made with what other studies have found in the region.

Additional comments in the attachment (BMJ Open REVIEW COMMENTS.pdf)

Overall Comment on the Paper

An interesting article that reports on one of the world’s biggest health challenge. Below are my comments according to each section:

Response: We thank you for the encouraging comments on the manuscript.

Comments

Abstract: Pages 2 -3.

Design

Line 16-17: This information should be moved to Setting as it relates to urban and rural areas where study was conducted.

Line 29-31: Units should be indicated in "BMI \geq 25".

Line 31: "Questionnaire" spelling is wrong.

Line 20-33: This information should rather be moved from Design to Outcome measures.

Participants

Line 42: Start sentence in words not figures.

Include any exclusion and inclusion criteria. Outcome measures

Line 51: ORs should be written in full first.

Results

Line 6 -18: Levels of significance are not indicated.

Conclusion

Line 25: Write as "-----as key factors associated with overweight/obesity".

Strengths and Weaknesses of the study- Page 4

Line 8: The word „behavioral" should be written in the British style consistently throughout document.

Check the spelling on Key words and throughout the article.

2

Response: Corrections have been made on the abstract and in the manuscript as per the suggestions

Comment Introduction – Page 5

Line 44: Abbreviate "sub Saharan Africa" before subsequent use.

Line 49: Write abbreviations in full the first time you use them e.g. "Human immunodeficiency virus (HIV)"

Response: Sub Saharan Africa and other words have been abbreviated accordingly.

Comment

Methods – Page 7

Line 18: Write as "---one city and two towns---" similar to what is stated in abstract.

Response: The correction has been made accordingly.

Comment

Line 25: The author explain whether the questionnaire was self-developed or adopted in whole or modified from standardized questionnaire, as this will also determine the validity and reliability of this tool.

Response: The study questionnaire was adapted and modified from the WHO Study on Global Ageing and Adult Health (SAGE), and WHO STEPS Survey questionnaires.

Comment

Line 45: Provide a „Reference /source" for BMI categories used.

Response: A reference has been provided for BMI categories used.

Comment

Line 50: Put units for BMI

Response: The units for BMI have been put accordingly.

Comment Patient and Public involvement- Page 8

Line 7: "cross sectional" should be written correctly

Response: Cross sectional has been written appropriately

Comment

Line 13: Were both assent and consent obtained in cases of teenagers (15-17years) included in this study? If any participated, it should be clearly indicated.

Response: It has been shown that consent and assent were sought and obtained from respondents.

Comment

Line 18: The word „ensure“ not „insure“ is more appropriate in this context. Include any exclusion and inclusion criteria.

Response: The word has been duly corrected. The exclusion criteria for the study has been explained through the inclusion criteria statement which indicates that „All individuals aged 15 years and above who had successfully completed the NCD study questionnaire were included in the analysis for this study“.

Comment

Measurement of variables – Page 8

I suggest that the author combines the Method (page 7) and Measurement of variables (page 8) under a section called Methodology as the current layout separates them yet they both relate to how data was collected. The suggested layout is as follow:

Methodology Section

Study design and setting Sample size calculation and sampling technique Patient and Public involvement Data collection

i) Questionnaire administration ii) Anthropometric measurements and BMI calculations

Response: we have followed the structure suggested by Reviewer no. 4. However, if the Editor feels that we have to follows this one, we will do accordingly.

Comment

The instruments used in anthropometric measurements should be stated indicating company and country of origin.

Response: We have stated the two instruments used for anthropometric measurements-The Charder MS7301 250Kg digital scale and the Muac measuring tape. The Charder digital scale is manufactured by Charder Electronics Co. ltd from Taiwan, while the Muac measuring tape is manufactured by Ibis Medical Equipment & Systems Pvt. Ltd from India. However, we think that this detail is not necessary to be included in the text.

Comment

Formula used on BMI should be given alongside the categories.

Response: We have stated how BMI was calculated including the BMI formula

Comment

Line 60: Page 9: The author should provide the reference for Principal component analysis for Wealth index.

Response: The reference for the principal component analysis has been inserted.

Comment

The author should state ways in which bias was minimised in this study.

Response: Our study was population based because the sample was obtained from a defined population. A sample resulting from a population based study is therefore likely to be representative of the population, thereby minimising selection bias. Moreover the use of systematic random sampling across the population meant that selection bias was minimised further.

Comment Control variables – Page 10

This section should be labelled as Variables in the study.

This will allow the author to describe the outcome variable, predictors, co-variables, potential confounders etc.

Response: We have labelled as suggested by Reviewer no. 4

Comment

Line 14-20: This statement should rather be moved to the statistical analysis section.

Response: The statement has been moved accordingly

Comment Statistical analysis

Explain how missing data were addressed.

Response: None of the variables used in this study had a missing rate of more than 10%. This was within the cut-off from the literature regarding an acceptable percentage of missing data in a data set for valid statistical inferences (see, Schaffer 1999 & Bennett 2001 for example)

Comment

Which tests were used in descriptive analysis?

Response: Only Chi-square test was used for bivariate analyses and this has been included.

Comment

The level of significance considered in this study should be included in this section.

Response: The level of significance for all analyses was at 5% level

Comment Results – Page 12

Sample Characteristics

Table 1: The statistical test used for the results presented in this Table should be indicated below the table.

Response: Table 1 & 2 are a univariate description of the sample while in Table 3 we have indicated the statistical test used.

Comment

Some variables have total % indicated as 100% while others eg sex that is not indicated.

Response: The total % has been included for all variables.

Comment

The absolute number column (N) should start followed by the % column; this would read much better than the current layout.

Response: The correction has been made as suggested.

Comment

Line 5-26: Page 13: This paragraph is a direct repetition of all table content. It should rather present the main takeaway from the table.

Response: We have avoided repetition and have only interpreted key results as suggested.

Comment

Line 45-51: This paragraph is a repetition of methods. Focus is on providing the findings as methods have already been given.

Response: The description of the methods-for WHO recommendation on fruit and vegetable intake has been removed from the text.

Comment

Page 14: Table 2: The N column should come first followed by % column, as this layout reads better. The 100% Totals given in Table 1 are not presented in this table which shows inconsistencies in reporting similar results.

Response: The N and % columns for table 1-3 have been interchanged. Totals given in table 1 are also presented in table 2.

Comment

In Table 2; remove the question marks (?) on Smoking and Fruit and Vegetable variables. In Table 2: The total of 1147 for Poor physical activity is incorrect; instead it is 1178.

Response: The question marks have been removed on fruit and vegetable consumption. The total has also been corrected.

Comment

Prevalence of overweight/obesity

Page 15: Line 10: Use "Overweight/obesity", for consistency.

Response: We have adopted the use of overweight/obesity consistently in the manuscript.

Comment

Table 3: Interchange the columns N and %; as previously suggested. Add the heading overweight/obese to the % column (see below). This will make it easy and quick to understand this table. Variable Number of participants (N) Overweight/obese % p-value

Response: The columns have been interchanged as suggested.

Comment

In Table 3; % column: Be consistent with the number of decimal places. Refer to age 35-44 years; urban villages; self-employed compared to others.

Response: Decimal places have been corrected accordingly.

Comment

In Table 3; the variable „Smoking; poor physical activity and Fruit and vegetable consumption“ should be bold for consistency.

Response: The variables „Smoking; poor physical activity and Fruit and vegetable consumption“ have been bolded.

Comment

In Table 3 and Table 4; “Poor Fruit and vegetable consumption” is used as variable name, while in Table 2, the same variable is referred to as “Fruit and Vegetable intake”. The same name should be used throughout the article to avoid confusion.

Response: For consistency poor fruit and vegetable consumption has been used as a variable name throughout the article and the correction has been made as suggested.

Comment

Table 4 Title suggestion: “Odds ratios for the association of Overweight/obesity with socioeconomic and behavioural variables in the study population, NCD study 2016”.

Response: Table for title has been changed as suggested.

Comment Discussion - Page 21

With respect to the aim of this study; the author should highlight the important findings of this study.

Response : Efforts have been made to focus on key findings of the study only.

Comment

Line 27 -55: Page 21: This paragraph should be written in a more concise manner without repetition. E.g. Line 32-37 is repeated in 51 to 55.

Response: The paragraph has been rephrased to make it more concise.

Comment

Line 10: Page 22: Put Reference on sentence “For instance, acculturation, through complex sociocultural pathways, affects weight gain among both men and women”.

Response: A reference has been put in the aforementioned sentence.

Comment

Line 48-56: Page 22: This paragraph should be condensed into a single sentence as all three sentences mean the same.

Response: The paragraph has been rephrased and made more concise.

Comment

Line 60: Page 22: Use „show“ not „shows“.

Response: A correction has been made.

Comment

Line 48: Page 23: Should read as “-----attainment were more likely to be obese than those with low education.

Response: The statement has been duly corrected

Comment

Line 3-13: Page 24: Relationship of work status and wealth with overweight/obesity in neighbouring countries such as South Africa and Zimbabwe should be compared to these study findings.

Response: A comparison of the relationship of work and wealth status with overweight/obesity has been made with South Africa and Namibia.

Comment

Line 17: Page 24: Put “that” in sentence to read as “It was noted that the odds-----“ Response: A correction has been made.

Comment

Line 15-31: Page 24: The author should also discuss studies that have reported the contrary as smoking is known to suppress appetite and has also been associated with low BMI in some studies.

Response: Other studies that have reported smoking as an appetite suppressant have also been discussed as suggested.

Comment

Line 34 - 59: Page 24: The author should also point out recent studies that have not found any association of physical activity and BMI and others that have found positive association of physical activity and BMI.

Response: We have included some recent studies corroborating evidence provided by our study.

Comment Ethical Approval

This section should be stating that Ethical approval was obtained and then provide the Certificate number and not merely stating that documents were submitted.

Response: The reference number for the approval has been provided as suggested.

Comment References

The referencing is inconsistent.

The following references: 5; 8; 11; 12; 13; 15; 19; 21; 22; 23; 24; 25; 26; 27; 28; 30; 32; 33; 34; 35; 37; 38; 39; 41; 42; 44; 45; 46; 47; 48; 49; 50; 51; 52; 53; 54; 55;56; should be corrected with respect to any one of the following issues:

The author should follow the exact journal style of referencing

Response: The issues on the formatting of the references have been addressed as per the referencing style of the journal.

Reviewer 2: DR. IgboanusiChinedu John-Camillus

Comment 1

Please state any competing interests or state „None declared“: Nil

Response: Thank you for the comment. The correction has been made

Comment 2

Please leave your comments for the authors below Concerning ethical clearance, the author did not state whether it was finally given nor did he include the reference number. He merely stated that the ethical clearance formalities were completed before the commencement of the study and that the study proposal was submitted to the appropriate authorities. This in no way is same as the ETHICAL CLEARANCE being finally given. He has to clarify this.

Response: Clarity has been provided in the ethical clearance section, that ethical approval was granted.

Comment 3

Next point is on study limitations. It is not just enough to list the limitations. The author should equally elaborate on measures put in place to either reduce or eliminate them.

Response: We have tried to explain what the limitation of the data means for the interpretation of the data.

Reviewer 3: Dr Valerian Mwenda

Comment 1

Please state any competing interests or state „None declared“: None

Response: Thank you for the comment. The correction has been made

Comment 2

The topic is of public health importance, the paper is generally well written and the study question adequately answered. Revisions are needed though, especially in the use of nonscientific phrases, examples: alarming rate, being a woman, as well as use of 'more likely' when the measure of association is odds ratio.

Response: Thank you for the compliments. We have revised the use of phrases and statements to make them more „scientific“ as suggested.

Reviewer 4: Richard Wamai

Institution and Country: Northeastern University, Boston USA.

Comment 1

Please state any competing interests or state „None declared“: None declared

Response: Thank you for the comment. The correction has been made

Comment2

Patient and Public Involvement:

We have implemented an additional requirement to all articles to include 'Patient and Public Involvement' statement within the main text of your main document. Please refer below for more information regarding this new instruction:

Authors must include a statement in the methods section of the manuscript under the subheading 'Patient and Public Involvement'. This should provide a brief response to the following questions: How was the development of the research question and outcome measures informed by patients' priorities, experience, and preferences? How did you involve patients in the design of this study? Were patients involved in the recruitment to and conduct of the study? How will the results be disseminated to study participants? For randomised controlled trials, was the burden of the intervention assessed by patients themselves? Patient advisers should also be thanked in the contributorship statement/acknowledgements. If patients and or public were not involved please state this.

Response: The „Patient and Public Involvement“ statement has been inserted in the methods section. No patients were involved in developing the research question, outcome measures and overall design of the study. The study adopted a cross-sectional design. Additional comments in the attachment (bmjopen-2019-029570 _Reviews.pdf)

Overall comment

This paper addresses an important topic and contributes to the literature on the magnitude and determinants of overweight and obesity in Botswana. This is a crucial topic in context of epidemiological transitions in Sub-Saharan Africa. My assessment is that the paper has merit to be considered for publication after the authors have addressed major gaps. A major criticism of this study is that there is no mention of the nationwide survey of noncommunicable diseases using the World Health Organization's (WHO) STEPwise approach to chronic disease risk factor surveillance. As is seen on the WHO website (<https://www.who.int/ncds/surveillance/steps/botswana/en/>) Botswana has conducted 2 STEPS, in 2007 and in 2014. Why have not the authors mentioned these surveys? These studies would present the best evidence of national trends in the primary variables of their interests. Is there any reason why the authors have instead not used these data to examine the nature of the problem in Botswana? Are there any studies published on these two STEPS surveys? My substantive comments are below. I hope that the authors can utilize these comments to improve their analysis of such an important topic.

Response: Thank you for the kind comments. We have included the prevalence rates for overweight/obesity during the 2007 and 2014 Botswana-World Health Organization STEPwise surveys to provide evidence of overweight/obesity trends as suggested. There is no evidence of studies published on socioeconomic and behavioural determinants of overweight/obesity using the two nationwide surveys; consequently the current study is relevant. We have provided evidence of such gap, which the current study is trying to fill.

Comment

Introduction

- Page 6 line 4: This sentence is listing certain "socio-economic" factors but "sex, age" should be removed as they are demographics not socio-economic variables

Response: The sentence has been corrected to read „socioeconomic and demographic factors“.

Comment

- Page 6 lines 49: cite sources for the first sentence in this paragraph presenting "evidence indicating increasing burden of overweight/obesity in Botswana". The STEPS surveys should have some of this evidence.

Response: Evidence of overweight/obesity trends from the two STEPS surveys has been provided and citation has been included.

Comment

Methods

Overall, this section needs substantive work

- Page 7 line 22: "multistage probability sampling technique" needs to (1) be explained. Was the sample intended to be nationally representative? That does not seem to be the case and would be entirely futile as the STEPS surveys would have done that already. If not, why were the specific sites selected? (2) The sampling should be explained in the next subsection now titled "Patient and public involvement". As is now, this section should be re-titled to "Sample recruitment and ethics". Adding the "sampling technique" should change this title to "Sampling, recruitment and ethics".

Response: Thank you for the comment. We have explained the various stages of probability sampling technique which were used to arrive to the target sample. We have also indicated that the survey was not nationally representative but that results are pertaining to the study population which is an indicative of national population. The section title has also been changed to „Sampling, Recruitment and Ethics“ in line with the suggestion.

Comment

- Page 7 line 25: "collected self-reported data on several NCDs" should be revised to specify which data were self-collected and which were measured. "Anthropometric measurements" were collected, so did the respondents report their own weight or height or status of NCDs? The way it is stated here means that is what happened.

Response: Clarity has been provided that anthropometric measurements were taken from respondents through objective measurements, it was not self-reported. Only information on risk factors was collected through self-reports.

Comment

- Page 7 lines 27-50: I think the entire text starting from "Information collected from ..." to the end of the paragraph on the bottom of this page should be moved to under the subsection "Measurement of variables" which I advise be better re-titled as "Outcome Variables and procedures". The text under the "Measurement of variables" sub-section should then be radically edited (see specific comment and rationale for that below).

Response: The section has been edited as suggested. Moreover the section has been re-titled to read Definitions and Measurement of variables.

Comment

- Patient and public involvement ("Sampling, recruitment and ethics")
o Change the title as suggested. The title would necessarily need to be changed because it is not clear what the term "involvement" is meant to show
o The word "patient" should not be used because the subjects were not patients o The statement of the IRB approval is best added at the end of this sub-section

Response: The title Patient and Public Involvement has been left as is part of the journal requirement to have a statement on that. The statement on IRB approval has been duly put under the subsection Sampling, recruitment and ethics.

Comment

- Measurement of variables (“Outcome variables and procedures”)

o Page 8 lines 24 through page 8 line 10: This whole paragraph needs editing. I do not think the questions posed here need to be listed/detailed. There are standard protocols for measuring these outcomes. All the authors need to state is what the protocols they used were. That should be the justification. For example “physical activity measures” should just refer to the scientific protocols/guidelines: e.g., [2018 Physical Activity Guidelines Advisory Committee. 2018 Physical Activity Guidelines Advisory Committee Scientific Report. Washington, DC: U.S. Department of Health and Human Services; 2018. Available at: https://health.gov/paguidelines/secondedition/report/pdf/PAG_Advisory_Committee_Report.pdf] or WHO [Global Strategy on Diet, Physical Activity and Health. <https://www.who.int/dietphysicalactivity/goals/en/>]

Response: Thank you for the comment. The whole paragraph has been duly edited and standard protocols for measuring NCD risk factors have been followed.

Comment

o Line 33-35: “This variable was used because in Botswana, it has been observed that alcohol consumers are heavy drinkers” should be deleted here. First it is clear alcohol consumption is associated with NCDs and, furthermore, authors would have to equally justify for the other measures.

Response: The statement that says „alcohol consumers in Botswana are heavy drinkers“ has been removed from the text, and a more concise explanation of how alcohol consumption has been measured using WHO standard protocols has been made.

Comment

o Page 9 line 34: “recommendation by the WHO panel on diet, nutrition and chronic disease prevention”. This need to be cited, and it is precisely to the point I am making above about stating the established protocols and so no need to explain every measure in detail.

Response: Citation has been made for the statement on –recommendation by the WHO Panel on diet, nutrition and chronic disease prevention.

Comment

o Page 8 lines 41-46: “WI is a composite measure of, typically, indicators of ownership of consumer durables, housing characteristics, and access to public services”. Could you add citations to this. Also, cite source for “principal component analysis” o Page 10 line 3-5: is this last text of the subsection based on Botswana statistics? Authors could cite the national statistical sources.

Response: Citation has been provided for „principal component analysis“. The sentence is not based on the national statistical sources.

Comment

Results

- Page 13 lines 12-26: Here there is no need to re-state every outcome since these are already in the table. I suggest to just indicate the most important/significant.

Response: Correction has been made and outcomes have not been re-stated.

Comment

- Page 13 lines 35-40: The whole sentence starting with “However, since prevalence ...” should be moved to Discussion section 3.

Response: The sentence has been deleted and moved accordingly.

Comment

- Page 13 lines 46-51: “calculated based on the general recommendation by the WHO panel on diet, nutrition and chronic disease prevention that considers poor fruit/vegetables intake as having less than 5 servings of fruits and vegetables in a week”. This full text should be deleted, it is already explained in the Methods section.

Response: The sentence has been deleted accordingly.

Comment

Discussion

Overall, this section is far too long and needs to be cut down

- Page 21 lines 41-60: This text is repetitive. The main point is gender differential. There is no need to write that much text for this one point. Here also, authors cite study #38 to observe higher rates of overweight in men than in women. This is not accurate based on large studies, e.g., the Global Burden of Disease studies. For example, one study shows that “among adults, the prevalence of obesity was generally higher among women than among men in all age brackets” [The GBD 2015 Obesity Collaborators. Health Effects of Overweight and Obesity in 195 Countries over 25 Years. N Engl J Med 2017; 377:13-27]. Another study shows that “global age-standardised mean BMI in men increased from 21.7 kg/m² in 1975 to 24.2 kg/m² in 2014, and in women from 22.1 kg/m² in 1975 to 24.4 kg/m² in 2014” [NCD Risk Factor Collaboration (NCD-RisC). Trends in adult body mass index in 200 countries from 1975 to 2014: a pooled analysis of 1698 population based measurement studies with 19.2 million participants. Lancet. 2016;387(10026):1377-96.] In the US, women have consistently had higher weight than men [National Center for Health Statistics. Health, United States, 2017: With special feature on mortality. Hyattsville, MD. 2018]; see tables (<https://www.cdc.gov/nchs/data/hus/2017/058.pdf>).

Response: Efforts have been made to shorten, and make precise the discussion section of the article. Repetition on the gender differential point has been removed, and discussion based on study #38 has been removed. We have also cited „The GBD 2015 Obesity Collaborators. Health Effects of Overweight and Obesity in 195 Countries over 25 Years. N Engl J Med 2017; 377:13-27“ since it corroborates findings of this study.

Comment

- Page 22 lines 6-10: The statement “For instance, acculturation ...” needs to be rephrased

Response: The statement has been rephrased.

Comment

- Page 22 lines 17-20: Reference #41 is cited here to support the point being made about fertility, etc. However, this reference is about smoking and is therefore not the appropriate citation here. Use for example #39.

Response: Reference #41 has been removed from this part.

Comment

- Page 22 lines 30-38: It is not clear if the statement "Firstly, ..." is making a point from this study or another study

Response: The statement has been deleted.

Comment

- Page 22 lines 48-57: From "The odds of being" to end of "at ages 65+ years" the text is repetitive. It should be collapsed into a single sentence.

Response: This text has been collapsed accordingly

Comment

- Page 23 lines 10-27: This full paragraph, or a large part of it, could be omitted. It is not very necessary to explain the causal mechanism for body adiposity or obesity because the study being presented is not a clinical study but an epidemiological one.

Response: We thank you for the observation. This paragraph has been removed as suggested.

Comment

- Page 23 lines 32-38: This text could be shortened to the precise point - Page 23 line 50: What does "individual's level of development" mean?

Response: The part on level of individual level of development has been removed since it does not add value to the text, and the whole text has been made brief and precise.

Comment

- Page 23 lines 55 through page 24 line 13: This paragraph could be improved. (1) The first sentence observes no significant differences regarding overweight/obesity and work/wealth status in the study population. What about other studies in similar settings, for example, studies in countries with similar HDI? Reference #20 (Kim and von dem Knesebeck) show clear significance due to income. How come not in this study. (2)

Response: The paragraph has been improved by including what other studies from neighboring countries have been found.

Comment

Authors should also add support for HDI. (3) The last sentence should be corroborated in other studies. Reference #27 (Nnyepi et al) shows a nutrition transition. This phenomenon is well observed in other studies, e.g., [Popkin B. Global nutrition dynamics: the world is shifting rapidly toward a diet linked with non-communicable 4 diseases. Am J Clin Nutr. 2006; 84(2):289-98; Popkin BM, Adair LS, Ng SW. The global nutrition transition: the pandemic of obesity in developing countries. Nutr Rev. 2012 Jan; 70(1): 3-21.]

Response: We thank you for further evidence on nutrition transition. Meanwhile we have combined the said sentence with the previous sentence to make the point more precise and concise. As a result more relevant information on HDI and overweight/obesity has been provided and the last sentence has been deleted.

Comment

- Page 24 lines 34-60: This whole paragraph is too long. As I point out above, I do not think there is need to detail the mechanistic pathways for caloric intake and overweight/obesity. That is not the

primary measure in this study. Authors can focus more on outlining the dietary patterns and changes – for example on the effect of globalization on access to fast foods – than the clinical mechanisms. Earlier authors write about “nutrition transition” in Botswana but provide no details or support for the changes. For example, it would be most interesting to read about how the diet in Botswana has changed from the past to the present (is there a common or typical meal in Botswana and what is that composed of?).

Response: The mechanistic pathways have been removed from the text and the paragraph has been rephrased to be concise. Some information which was deemed irrelevant has been removed from the text.

Comment

As I point out above, overall, the Discussion is too long. It is also should be more focused on the study findings. Rather than adding text on the mechanisms, discuss specific drivers of the observed outcomes specific to Botswana. Discuss what policies are already in place. Discuss policy implications, relevance, proposals. Discuss implications for disease transition. For example, there is the United Nations 2011 Political Declaration on NCDs (<https://www.who.int/ncds/governance/third-un-meeting/en/>), the 2013 WHO Global Action Plan for the Prevention and Control of NCDs 2013-2020 (https://www.who.int/nmh/events/ncd_action_plan/en/), the WHO. Global Strategy on Diet, Physical Activity and Health (<https://www.who.int/nmh/wha/59/dpas/en/>), the 2003 WHO HO Framework Convention on Tobacco Control (https://www.who.int/fctc/text_download/en/). A question is: where is Botswana in these strategies? Authors should mention these. Does not the country have a strategy on NCDs?

Response: We have constricted the discussion part to focus more on the key findings of the study. Botswana already developed national strategic plan in alignment with WHO global strategy. We have included this point in the conclusion.

Comment

Limitations

I think more discussion should be made, especially in light of my comments above regarding STEPS surveys

Response: We have made an indication on the limitation of the STEPS surveys, one of which is that STEPS surveys unlike the current study does not collect information on wealth status of individuals and also limited to a few NCDs. This is a major limitation, especially when assessing socioeconomic differences in determinants of overweight/obesity.

Comment

Tables

- Table 1: Perhaps this could be better re-labelled from “sample characteristics” to “sociodemographic characteristics”.

Response: Table 1 has been re-labelled sociodemographic characteristics.

Comment

- Table 1: A line is missing to separate section “Work Status in past 12 months” from next section “Wealth status”.

Response: A correction has been made to insert the line separating the sections.

Comment
Grammar

There are some grammatical and textual errors that the authors need to address. For example:

- In the Introduction, page 5, specify the acronym “SSA” right after “Sub Saharan Africa”. -
 - Page 7 line 43: a full colon should come after “categorized into”, instead of a semi-colon - Page 8 line 26: “respondents”, not “respondent”.
 - Page 14 line 52: “found to be” should be deleted
 - Page 14 lines 57-59: “it was found that” should be deleted
 - Page 15 line 3: “non-smokers”, not “non-smoker”
 - Page 17 line 57: delete “a”
- 5
- Page 24 line 29: change “is” to “are”

Response: All grammatical errors have been duly corrected.

VERSION 2 – REVIEW

REVIEWER	Dr Felistas Mashinya Institute of Bio Research and Training in Southern Africa, South Africa.
REVIEW RETURNED	20-Aug-2019

GENERAL COMMENTS	<p>REVIEWER’S COMMENTS:</p> <p>Title: Socioeconomic and behavioural determinants of overweight/obesity in Botswana: A cross-sectional study</p> <p>Overall Comment on the Paper Most comments were addressed. The authors need to give their attention to the following minor comments:</p> <p>Introduction Line 46-47: “Human Immunodeficiency Virus” not “Human Immuno Deficiency Virus”</p> <p>Definitions and Measurement of variables Line 34-36: provide a Reference for “Principal component analysis”</p> <p>Results Table 3: It is widely acknowledged that p-value of 0.000 be written as 0.0001.</p> <p>Determinants of overweight/obesity Line 43-51: The phrasing does not sound correct.</p> <p>Discussion Line 34: Write US and UK in full for first time. Line 31: behaviour NOT behaviour</p> <p>Limitations Authors should mention “Recall bias” that could have influenced results since most variables were based on participants recalling information.</p> <p>References</p>
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	<p>The referencing is inconsistent. The following references: 4; 5; 8; 9; 10; 14; 20; 22; 25; 27 should be corrected with respect to any one of the following issues:</p> <ul style="list-style-type: none"> • Punctuation of author's initials. • Number of authors' names before putting et al. • The use '&'; and or not at all before the last author name. • Line spacing • Some journal names are italicised while others are not. <p>The author should follow the exact journal style of referencing.</p>
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VERSION 2 – AUTHOR RESPONSE

Reviewer: 1: Dr Felistas Mashinya

Comment

Most comments were addressed. The authors need to give attention to the following minor comments.

Response: Thank you so much for the comments, we have taken care of the comments raised.

Comment

Line 46-47 "Human Immunodeficiency Virus' not Human Immuno Deficiency Virus'

Response: A correction has been made and the word is "Human Immunodeficiency Virus'

Comment

Definitions and measurement of variables:

Line 34-36: Provide a reference for 'Principal component analysis'

Response: We have inserted the reference for the principal component analysis, reference 16

Comment

Table 3: It is widely acknowledged that p-value of 0.000 be written as 0.001.

Response: All p-values of 0.000 have been written as 0.001

Comment

Determinants of overweight/obesity

Line 43-51-The phrasing does not sound correct.

Response: The phrasing has been duly corrected

Comment

Discussion

Line 34: Write US and UK in full for the first time.

Response: Abbreviations US and UK were written in full the first time they were used.

Line 31: behaviour not behavior

Response: This has been corrected throughout the manuscript.

Comment

Limitations

Authors should mention 'recall bias' that could have influenced results since most variables were based on participants recalling information.

Response: Given that the recall period for behavioural risk factors such as smoking, alcohol consumption, poor physical activity and poor fruit and vegetable consumption was during last 30 days or less from the date of the survey, the effect on the results would be low or nil.

Comment

References

The referencing is inconsistent. The following references: 4, 5,8,9,10,14,20,22,25, 27 should be corrected with respect to any one of the following issues;

Punctuation of author's initials

Number of authors' names before putting et al.

The use of '&', and or not at all before the last author name.

Line spacing

Some journal names are italicised while others are not

The authors should follow the exact journal referencing style

Response: Thanks very much for this observation. We have corrected all those references and adhered to journal's referencing style.