

PEER REVIEW HISTORY

BMJ Open publishes all reviews undertaken for accepted manuscripts. Reviewers are asked to complete a checklist review form ([see an example](#)) and are provided with free text boxes to elaborate on their assessment. These free text comments are reproduced below. Some articles will have been accepted based in part or entirely on reviews undertaken for other BMJ Group journals. These will be reproduced where possible.

ARTICLE DETAILS

TITLE (PROVISIONAL)	Anthropometric measurements of general and central obesity and the prediction of cardiovascular disease risk in women: a cross-sectional study
AUTHORS	Goh, Louise; Dhaliwal, Satvinder; Welborn, Timothy; Lee, Andy; Della, Phillip

VERSION 1 - REVIEW

REVIEWER	Masaharu Kagawa Institute of Nutrition Sciences, Kagawa Nutrition University, Saitama, Japan
REVIEW RETURNED	30-Oct-2013

GENERAL COMMENTS	<ul style="list-style-type: none">- p6, line 29. Why only focused on females?- p6, line 29. How the participants selected? Random sampling/stratified or snowball sampling??- p6, line 29. What are the proportion of ethnic groups?- p6, line 29. It is usually considered the elderly is above 65 yo and often considered adult from 18 yo. Since a health risk alters between the life stage, the authors should explain why this age range was selected that may makes difficult to interpret the effect of aging?- p7, line 5. Not clear about the difference between the general CVD and simplified general CVD risk score models. Also it is unclear why the total cholesterol and HDL cholesterol levels were replaced by BMI.- p8, line 38. While the authors utilized a different models in the study, it may be better to briefly describe the differences in the each model, including characteristics of the study population, age range and health status.
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REVIEWER	Scott Lear Simon Fraser University, Canada
REVIEW RETURNED	30-Oct-2013

GENERAL COMMENTS	<p>The authors present their findings of comparing multiple anthropometric indices with cardiovascular disease risk using risk factor scores. While the research question is not entirely novel, it does provide useful insight into the often confusing area of which measure to use for identifying individuals at high CVD risk.</p> <p>I feel this work can add value to the literature but suggest the</p>
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	<p>following revisions be made:</p> <ol style="list-style-type: none"> 1. The Discussion as written reads more like a review instead of presenting your findings in the context of current literature and what your study can add to or complement previous work. The authors need to re-write the Discussion to inform the reader what is the relevance of your research findings. 2. The first sentence of the Conclusion of the manuscript and the abstract are not supported by the results. There is nothing in the study to indicate that including anthropometric measures into CVD risk scores is needed. 3. The Methods would benefit from more description of the NHF Risk Factor Prevalence Study (one or two sentences) and the methods used to collect the study variables. 4. While generally clear, the manuscript would benefit from a thorough proofreading as certain word choices are inappropriate and/or repeated numerous times which impedes the flow of the manuscript. Some examples: <ol style="list-style-type: none"> a) Page 8, line 50, what does the word 'higher' refer to in this sentence? b) Edit the third paragraph on page 5 as there is a number of uses of 'another study' and other similar phrases in that paragraph. c) Consider merging paragraphs 2 and 3 on page 17. d) Use present tense in the Results section when referring to tables and figures. e) Remove 'pandemic' from the first sentence. 5. Add in the prevalence of diabetes and the mean risk factor scores in Table 1. 6. Were participants excluded if they were taking medications for the CVD risk factors? If so, please stat. If not, how was this handled in the analyses? For example, if a participant has low blood pressure due to anti-hypertensives, then their risk score would under-estimate their true risk.
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VERSION 1 – AUTHOR RESPONSE

Reviewer Name Masaharu Kagawa

Institution and Country Institute of Nutrition Sciences, Kagawa Nutrition University, Saitama, Japan

Please state any competing interests or state 'None declared': None declared

- p6, line 29. Why only focused on females?

Response: We thank the reviewer for the comment. This study focused on females as numerous studies have been published on males and research on females is lacking. Gender differences also exist in body fat distribution and this translates to a difference in CVD risk. The difference in risk between females and males has also led to the development of CVD risk score models specifically for females: general CVD risk score model and Reynolds risk score.

- p6, line 29. How the participants selected? Random sampling/stratified or snowball sampling??

Response: This statement has been added to the Study cohort and measurements section to address this comment. The participants of the National Heart Foundation study consisted of residents on the federal electoral rolls of December 1988 in North and South Sydney, Melbourne, Brisbane, Adelaide, Perth, Hobart, Darwin and Canberra in a systematic probability sampling by sex and 5-year age groups.

- p6, line 29. What are the proportion of ethnic groups?

Response: This information has been included in Table 1.

- p6, line 29. It is usually considered the elderly is above 65 yo and often considered adult from 18 yo. Since a health risk alters between the life stage, the authors should explain why this age range was selected that may makes difficult to interpret the effect of aging?

Response: We thank the reviewer for the comment. The National Heart Foundation Risk Factor Prevalence Study is a population-based survey study, consisting of participants aged 20-69 years. The 10-year predicted CVD risk from the various risk score models also utilises the variable age in its calculation of risk.

- p7, line 5. Not clear about the difference between the general CVD and simplified general CVD risk score models. Also it is unclear why the total cholesterol and HDL cholesterol levels were replaced by BMI.

Response: We have revised the Risk score models section to improve clarity. Please also see:

D'Agostino RB, Vasan RS, Pencina MJ, et al. General cardiovascular risk profile for use in primary care - The Framingham Heart Study. *Circulation* 2008;117(6):743-53

- p8, line 38. While the authors utilized a different models in the study, it may be better to briefly describe the differences in the each model, including characteristics of the study population, age range and health status.

Response: We have expanded and revised the Risk score models section to address this comment.

Reviewer Name Scott Lear

Institution and Country Simon Fraser University, Canada

Please state any competing interests or state 'None declared': None declared

The authors present their findings of comparing multiple anthropometric indices with cardiovascular disease risk using risk factor scores. While the research question is not entirely novel, it does provide useful insight into the often confusing area of which measure to use for identifying individuals at high CVD risk.

I feel this work can add value to the literature but suggest the following revisions be made:

1. The Discussion as written reads more like a review instead of presenting your findings in the context of current literature and what your study can add to or complement previous work. The authors need to re-write the Discussion to inform the reader what is the relevance of your research findings.

Response: We have revised the Discussion section to highlight the relevance of our research findings.

2. The first sentence of the Conclusion of the manuscript and the abstract are not supported by the results. There is nothing in the study to indicate that including anthropometric measures into CVD risk scores is needed.

Response: We have revised the sentence. Central obesity measures are better predictors of CVD risk compared to general obesity measures in women. It is equally important to maintain a healthy weight

and to prevent central obesity concurrently.

3. The Methods would benefit from more description of the NHF Risk Factor Prevalence Study (one or two sentences) and the methods used to collect the study variables.

Response: We have expanded the Study cohort and measurements section to address the comments.

4. While generally clear, the manuscript would benefit from a thorough proofreading as certain word choices are inappropriate and/or repeated numerous times which impedes the flow of the manuscript. Some examples:

a) Page 8, line 50, what does the word 'higher' refer to in this sentence?

Response: We have revised the sentence to improve clarity.

b) Edit the third paragraph on page 5 as there is a number of uses of 'another study' and other similar phrases in that paragraph.

Response: We have edited this paragraph to improve the flow.

c) Consider merging paragraphs 2 and 3 on page 17.

Response: We thank the reviewer for the comment. We prefer to keep them as separate paragraphs as they are on different anthropometric measurements.

d) Use present tense in the Results section when referring to tables and figures.

Response: We have made the revision.

e) Remove 'pandemic' from the first sentence.

Response: We have removed the word 'pandemic'.

Other minor revisions have also been made to improve the flow of the manuscript. Thank you.

5. Add in the prevalence of diabetes and the mean risk factor scores in Table 1.

Response: Participants included in this study had no history of heart disease, diabetes or stroke. Participants on associated medications were also excluded.

6. Were participants excluded if they were taking medications for the CVD risk factors? If so, please state. If not, how was this handled in the analyses? For example, if a participant has low blood pressure due to anti-hypertensives, then their risk score would under-estimate their true risk.

Response: Yes. We have stated in the Study cohort and measurements section, participants taking medications to lower their CVD risk factors were also excluded.

VERSION 2 – REVIEW

REVIEWER	Scott Lear Simon Fraser University, Canada
REVIEW RETURNED	05-Dec-2013

GENERAL COMMENTS	<p>This manuscript reports on a cross-sectional analysis of over 4000 women in which associations are compared between various adiposity measures and CVD risk as determined by various risk scores.</p> <p>The manuscript and analyses are appropriate for the research questions, and the manuscript is clearly written.</p> <p>My main concern is the limited rationale for this study given what we know about the topic already. How does a cross-sectional study advance the knowledge of this topic given the available longitudinal studies?</p> <p>The authors mention this study uses a population representative sample, however, they have excluded those with current disease and those taking medications known to effect risk factors. While there may be a reason for this, in doing so, it is no longer a representative sample. It is actually a biased sample in which those at the highest risk have been excluded.</p> <p>Given the data are 25 years old, why did the authors decide to do a cross-sectional study instead of a longitudinal one?</p> <p>Is the comparison across one SD the best way to address the research objectives? While this is a common practice, it assumes that the relationship between the determinant and outcome is the same for every determinant. Also, the distribution of the determinants may differ. For example, is a 10 cm SD for waist circumference comparable to a 2 unit SD for BMI?</p> <p>Some additional comments that may aid in future versions:</p> <ul style="list-style-type: none">• Delete the first sentence in the Introduction. While phrases like this are commonly used, it is unclear what defines 'epidemic proportions'.• This portion of line 19 on page 6 needs to be reworded: "...would also be assessed."• What does the latter part of this sentence mean: "It was derived from a much larger dataset than the Framingham, general CVD and simplified general CVD risk score models."• All methods need to be described. For example, how were lipids measured? Were they fasting samples? What about blood pressure? Was it one measure, did it follow standard practice of seated rest prior to the measure, etc.? How was smoking status defined (what defines current smoker)?• The description of the risk scores would be best served in a table than in the text, comparing the different scores. Why were these particular scores selected?• The word 'data' is plural.• Table 1- can you add in soci-economic data such as education or income?• The Conclusion section should be reduced to one paragraph. The call for future prospective studies is not warranted given the plethora of existing studies, some of which the authors cite.
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VERSION 2 – AUTHOR RESPONSE

Reviewer: Scott Lear
Simon Fraser University

This manuscript reports on a cross-sectional analysis of over 4000 women in which associations are compared between various adiposity measures and CVD risk as determined by various risk scores.

The manuscript and analyses are appropriate for the research questions, and the manuscript is clearly written.

My main concern is the limited rationale for this study given what we know about the topic already. How does a cross-sectional study advance the knowledge of this topic given the available longitudinal studies?

Response: We thank the reviewer for the comment. Our study examines the relationship between risk factors and CVD risk score, expressed both as a continuous variable and as a categorical variable using the cut-offs recommended in literature. To date, anthropometric measurements of central obesity are not incorporated into existing CVD risk score models despite what we already know about its role. The measures of general and central obesity also have not been compared against each other in relation to CVD risk. Additionally, CVD risk calculated from multivariable risk score models is superior to simple counting of risk factors, as reported in some papers.

Reference:

Chen L, Peeters A, Magliano DJ, et al. Anthropometric measures and absolute cardiovascular risk estimates in the Australian Diabetes, Obesity and Lifestyle (AusDiab) Study. *Eur. J. Cardiovasc. Prev. Rehabil.* 2007;14(6):740-45

The authors mention this study uses a population representative sample, however, they have excluded those with current disease and those taking medications known to effect risk factors. While there may be a reason for this, in doing so, it is no longer a representative sample. It is actually a biased sample in which those at the highest risk have been excluded.

Response: Excluding individuals with heart disease, diabetes and stroke is a valid method. This practice to determine 10-year CVD risk for individuals without clinical signs or symptoms of CVD is also recommended by American College of Cardiology and American Heart Association (Goff et al, 2013). Our sample is a population representative sample of females without heart disease, diabetes or stroke.

Reference:

Goff DC, Lloyd-Jones DM, Bennett G, et al. 2013 ACC/AHA Guideline on the Assessment of Cardiovascular Risk A Report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. *J Am Coll Cardiol* 2013

Given the data are 25 years old, why did the authors decide to do a cross-sectional study instead of a longitudinal one?

Response: We thank the reviewer for the comment. The study was originally designed as a cross-sectional study. Population representative samples with large sample sizes like ours are difficult to obtain and it is in the interest of researchers to explore hypotheses using existing data before undertaking larger cohort studies to investigate the role of anthropometric measurements of general and central obesity and the prediction of cardiovascular disease risk in women.

Is the comparison across one SD the best way to address the research objectives? While this is a common practice, it assumes that the relationship between the determinant and outcome is the same for every determinant. Also, the distribution of the determinants may differ. For example, is a 10 cm SD for waist circumference comparable to a 2 unit SD for BMI?

Response: Yes, it is the best way to address the research objectives given that the anthropometric measurements are measured in different units. By using SD, we are effectively normalising the data to create standard normal distributions and hence the original distribution of the determinants do not matter. The use of SD is exactly similar to using normalised scores or Z-scores, and a change of 1 SD above the mean is equivalent to a Z-score of +1.

Some additional comments that may aid in future versions:

- Delete the first sentence in the Introduction. While phrases like this are commonly used, it is unclear what defines 'epidemic proportions'.

Response: We have deleted the first sentence in the Introduction.

- This portion of line 19 on page 6 needs to be reworded: "...would also be assessed."

Response: We have reworded to "...were examined".

- What does the latter part of this sentence mean: "It was derived from a much larger dataset than the Framingham, general CVD and simplified general CVD risk score models."

Response: We have revised the sentence to improve clarity.

- All methods need to be described. For example, how were lipids measured? Were they fasting samples? What about blood pressure? Was it one measure, did it follow standard practice of seated rest prior to the measure, etc.? How was smoking status defined (what defines current smoker)?

Response: We have revised the Study cohort and measurements section.

- The description of the risk scores would be best served in a table than in the text, comparing the different scores. Why were these particular scores selected?

Response: We thank the reviewer for the comment. We prefer to describe the risk scores than present as a table. These particular scores were selected because they are widely used and have been externally validated.

- The word 'data' is plural.

Response: We have made the revision.

- Table 1- can you add in socio-economic data such as education or income?

Response: The authors feel that socio-economic data is not central to the research question and

hence should not be presented. If the reviewer still requires for this to be presented, the authors are happy to oblige.

- The Conclusion section should be reduced to one paragraph. The call for future prospective studies is not warranted given the plethora of existing studies, some of which the authors cite.

Response: We have made the revision. The plethora of existing cohort studies still mostly do not collect obesity data beyond BMI and hence the question of which anthropometric measurement of obesity are better predictors of CVD risk yet remains unanswered.