## PEER REVIEW HISTORY



## ARTICLE DETAILS

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| **TITLE (PROVISIONAL)** | Sex differences in macronutrient intake and adherence to dietary recommendations: findings from the UK Biobank |
| **AUTHORS** | Bennett, Elizabeth; Peters, Sanne; Woodward, Mark |

## VERSION 1 – REVIEW

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| **REVIEWER** | Santiago Navas-Carretero<br>Head of Personalized Nutrition Research Line.<br>Centre for Nutrition Research.<br>University of Navarra, Pamplona.<br>Spain |
| **REVIEW RETURNED** | 30-Oct-2017 |

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| **GENERAL COMMENTS** | I find the manuscript presented of high interest towards the re-shaping or improvement of nutrition policies, not only in the UK, but also in Europe, and the most important strength of the present research is the sample size, which allows to evaluate gender differences on dietary intake appropriately.<br>However, I have some comments and suggestions that may help to enhance the manuscript's value:<br>1.- Variables evaluated: Although I acknowledge the data are not essential for answering your research question, I do really miss some anthropometrical variables included in the current analyses. At least BMI, as a recognized screening tool for obesity assessment, would have been useful, in order to try to associate gender differences with ponderal status of the population. Even if it's true that volunteers usually underestimate their dietary intakes, there is also an issue with women reporting intakes, where they tend to over-report, which may in part explain their non-adherence in macronutrients intake.<br>2.- If data on anthropometrics are not available at this stage from the UK Biobank, I would report this lack of data as a limitation, even if not directly related with the primary assessment performed.<br>3.- Please check on Figure 2 (OR), as in the risk row, I think the middle number must be "1" instead of "0".<br>4.- Given the low rate of other ethnicities, thus the impossibility for generalising the outcomes, I would suggest to remove them from the analysis for this article, and re-evaluate differences. |

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| **REVIEWER** | Monica Serra<br>Emory University, USA |
| **REVIEW RETURNED** | 19-Nov-2017 |

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| **GENERAL COMMENTS** | The objective of this study was to examine energy and nutrient intake differences between men and women from the over 200,000 adults aged 40-69 years. Due to the role of diet in non-communicable disease the need to understand dietary patterns is crucial to help develop and inform diet modification recommendations. The authors observed that women consume more sugar, total fat, and saturated fat above the recommendation then men, while men consumed less polyunsaturated fat, carbohydrates, and protein below the recommendations than women. However, much of the manuscript focuses on sex differences based upon absolute intake of calories. Due to the influence of body size on caloric intake, it appears relevant that nutrient data reported in the text and tables should be corrected for body weight.<br><br>1) What was the purpose of stratifying by sex (and in the etable age)? It appears that this would be more relevant if the paper focused on disease disparities between genders.<br>2) More description is needed on the diet assessment method. Am I correct in gathering that this was a recall, but participants were limited in the items that they could select from 200 common food items? How were they instructed to pick alternatives? Were the items grouped by food group (i.e. dairy, poultry, etc.) so that they could easily select another item? How far apart were the recalls collected if more than one was complete? Were any of these participant actively attempting to restrict calories?<br>3) How often did exclusion of diet records due to "implausible" energy intakes occur? How many were kept because activity was available?<br>4) How does the assessment of obesity affect these results? Are obese individuals more likely to over consume than overweight?<br>5) How was socioeconomic status assessed? Are the physical activity data available? How many METs were achieved on average? Do those that perform greater activity consume more calories? |

## VERSION 1 – AUTHOR RESPONSE

Response to comments by the editor and reviewers

Manuscript: bmjopen-2017-020017 entitled "Sex differences in macronutrient intake and adherence to dietary recommendations: findings from the UK Biobank"

Editor's comments

1. Please revise the 'Strengths and limitations' section of your manuscript. This section should contain up to five short bullet points, no longer than one sentence each, that relate specifically to the methods.
Response: We have revised this section accordingly.

Reviewers' Comments to Author

Reviewer: 1

1. Variables evaluated: Although I acknowledge the data are not essential for answering your research question, I do really miss some anthropometrical variables included in the current analyses. At least BMI, as a recognized screening tool for obesity assessment, would have been useful, in order to try to associate gender differences with ponderal status of the population. Even if it's true that volunteers usually underestimate their dietary intakes, there is also an issue with women reporting intakes, where they tend to over-report, which may in part explain their non-adherence in macronutrients intake.
Response: Thank-you for these important suggestions. We have added analyses on sex differences in dietary intake across levels of BMI. We agree that there may be differences between men and women in the way and extent to which they over- or underreport dietary intake. While this could not be examined in the present study, in the discussion section we state that:
Several analyses of NDNS data have found significant underreporting in this study with a higher rate of underreporting of energy intake in women (19, 31). Hence, our observation that more women than men exceeded their estimated average energy requirement may be an underestimate of the true sex difference in excess energy intake.

2. If data on anthropometrics are not available at this stage from the UK Biobank, I would report this lack of data as a limitation, even if not directly related with the primary assessment performed.
Response: Data on BMI are available and are now used in an additional subgroup analyses in which we stratified the analyses by categories of BMI. The results are described in the revised manuscript and in eTables 3, 8 and 9.

3. Please check on Figure 2 (OR), as in the risk row, I think the middle number must be "1" instead of "0".
Response: We have changed this error. Thank you.

4. Given the low rate of other ethnicities, thus the impossibility for generalising the outcomes, I would suggest to remove them from the analysis for this article, and re-evaluate differences.
Response: Thank you. The aim of this study was not to examine whether sex differences in dietary patterns differed across ethnic groups. However, we agree with the reviewer that the present findings are from a study that primarily included Caucasian individuals and therefore may not be generalizable to other populations. In the limitations section, we have mentioned that the study participants were all from the UK and primarily had a Caucasian background.

Reviewer: 2

1. Much of the manuscript focuses on sex differences based upon absolute intake of calories. Due to the influence of body size on caloric intake, it appears relevant that nutrient data reported in the text and tables should be corrected for body weight.
Response: Thank you for this suggestion. We agree that it would be of value to assess the sex differences in dietary intake in the light of sex differences in body size. Therefore, we have added new analyses to determine whether the sex differences in dietary intake differed across BMI levels. We have added the results from these analyses to the revised manuscript and included new eTables 3, 8 and 9.

2. What was the purpose of stratifying by sex (and in the eTable age)? It appears that this would be more relevant if the paper focused on disease disparities between genders.
Response: There are substantial differences between men in women, and across age-groups, in the occurrence of diet-related diseases such as obesity, diabetes, cardiovascular diseases, and cancers. However, sex differences in dietary intakes and dietary behaviour are not well characterised. We

therefore aimed to examine sex differences in dietary intake and adherence to dietary guidelines and to evaluate whether these sex differences differed by age.

3. More description is needed on the diet assessment method. Am I correct in gathering that this was a recall, but participants were limited in the items that they could select from 200 common food items? How were they instructed to pick alternatives? Were the items grouped by food group (i.e. dairy, poultry, etc.) so that they could easily select another item? How far apart were the recalls collected if more than one was complete? Were any of these participant actively attempting to restrict calories?
Response: We have provided additional information in the revised manuscript. A demonstration version of the 24-hour recall questionnaire can be found at the following website: https://questionnaires.ceu.ox.ac.uk/diet/show/index.html.
'Information about dietary behaviour was collected using 24-hour dietary recall questionnaires. The questionnaires contained questions on the intake of over 200 food and drink items, grouped into broad categories, over the last 24 h. Where the foods did not match the items listed exactly, participants were encouraged to try and choose a food or a combination of foods that most closely resembles what they had; and to not duplicate food items. Participants were asked whether what they ate and drank yesterday was typical, and if not, the reason; and whether they routinely followed a special diet, and if so, what kind of diet. So that the replies could be coded automatically to provide estimated daily nutrient intake, open-ended questions were avoided, although some free text boxes were available for use when the options listed did not cover a particular food item. The e-mail invitations were issued on specific days of the week in order to capture variations in intake between week days and week-end days. For the first and second round of e-mail invitations, participants were allowed 3 days to complete the questionnaire, after which time the link had expired; this was extended to 14 days for the third and fourth round of e-mail invitations. These questionnaires were first introduced as part of the assessment visit towards the end of the recruitment phase, and were also completed remotely via the internet for those participants who have provided UK Biobank with e-mail addresses.'

4. How often did exclusion of diet records due to "implausible" energy intakes occur? How many were kept because activity was available?
Response: 960 participants, 547 women and 413 men, were excluded because of implausible energy intakes. We have added this to the revised manuscript.

5. How does the assessment of obesity affect these results? Are obese individuals more likely to over consume than overweight?
Response: Thank you for this important question. We have added additional analyses by BMI to address this question. We have added the results from these analyses to the revised manuscript and included new eTables 3, 8 and 9.

6. How was socioeconomic status assessed? Are the physical activity data available? How many METs were achieved on average? Do those that perform greater activity consume more calories?
Response: Socioeconomic status was assessed using the Townsend deprivation index, a measure of material deprivation within a population. We have added this to the revised manuscript. No, we did not have data on physical activity for these analyses, so we could not conduct analyses by MET.

**VERSION 2 – REVIEW**

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| **REVIEWER** | Santiago Navas-Carretero |

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| | University of Navarra<br>Centre for Nutrition Research<br>Pamplona,<br>Spain |
| **REVIEW RETURNED** | 10-Jan-2018 |

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| **GENERAL COMMENTS** | The authors have succesfully addressed the comments and questions from the first review, and I consider the current version has been enhanced and it is acceptable for publication. |

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| **REVIEWER** | Monica Serra<br>Emory University, USA |
| **REVIEW RETURNED** | 15-Jan-2018 |

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| **GENERAL COMMENTS** | The majority of concerns were addressed. However, this reviewers still maintains that for ease of interpretation the results should be expressed /kg of body weight (i.e. kcal/kg/d, g/kg/d protein). Though the reviewers stratified by BMI, one would anticipate that absolute intake of these nutrients still would be higher in men than women, but not when corrected for body size. |

## VERSION 2 – AUTHOR RESPONSE

Response to comments by the editor and reviewers

Manuscript: bmjopen-2017-020017.R1 entitled "Sex differences in macronutrient intake and adherence to dietary recommendations: findings from the UK Biobank"

Reviewers' Comments to Author

Reviewer: 1

1. The authors have successfully addressed the comments and questions from the first review, and I consider the current version has been enhanced and it is acceptable for publication.
   Response: Thank you.

Reviewer: 2

1. This reviewer still maintains that for ease of interpretation the results should be expressed /kg of body weight (i.e. kcal/kg/d, g/kg/d protein). Though the reviewers stratified by BMI, one would anticipate that absolute intake of these nutrients still would be higher in men than women, but not when corrected for body size.
   Response: Thank you for this suggestion. We have added sensitivity analyses in which the absolute intake of nutrients was divided by participants' body weight. The results from these added to the revised manuscript and included in Table 1 and eTables 10-11. We have added the following to the manuscript:

   'To assess the impact of inherent differences between women and men in body weight on energy and macronutrient intake, sensitivity analyses, overall and by age group and socioeconomic status, were conducted in which the absolute intake of each nutrient was divided by the participant's body weight.'

   and

‘When standardised for body weight, sex differences in intake of energy, total carbohydrate, and total sugar tended to increase with age and socioeconomic deprivation (eTable 10 and 11).’

## VERSION 3 – REVIEW

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| **REVIEWER** | Monica Serra<br>Emory University School of Medicine, USA |
| **REVIEW RETURNED** | 15-Feb-2018 |

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| **GENERAL COMMENTS** | The authors have addressed the remaining concerns. |