Reviewer’s report

Title: Low consumption of Fruits and Vegetables among Adults in Uganda: Findings from a countrywide cross-sectional survey

Version: 0 Date: 01 Dec 2018

Reviewer: Angeli Singh

Reviewer's report:

Overall comments: This is a concise and well-written manuscript with important new information for the fields of nutrition, public health and preventative medicine. It offers a strong estimate of poor fruit and vegetable intake, and provides a clear and interesting evaluation of potential risk factors. It lacks some important measurement details and would benefit with discussion on the possibility of selection bias, as evidenced by the disproportionately high number of female participants.

Title
Comments: No comments

Abstract
Summary: This is a community-based survey, utilizing the STEPwise approach, was used to assess the prevalence of adequate fruit and/or vegetable intake in Uganda. Of 3962 participants, only 12.2% reported adequate intake. Interestingly, analysis of commonly collected demographic data identified potential risk factors of being single or living in the Western region.
Comments: Well written. The first sentence in the conclusion is redundant.

Introduction
Summary: Fruit and vegetable consumption have a quantifiable impact on mortality, of which nearly 1/3 is ischemic heart disease. Given this potential area for intervention and the limited population-based dietary intake data in Uganda
Comments: Every line is relevant and provides an excellent introduction to the topic.

Study design
Summary: WHO STEPwise approach was to collect data for baseline, cross-sectional study between March and July 2014.
Comments: Although the authors make clear that the study design has been described in detail in previous papers, it would be helpful for the reader to have a few of the design components included here. I see in previous papers by the authors that a random sample of 350 enumeration areas was selected out of 78,950. From each of these enumeration areas, 14 households out of approximately 150-200 households were randomly selected from a list. Trained research assistants then visited each household and used a personal digital assistant (PDA) to randomly select one individual from the
household to complete the survey on site. Eligible subjects were household members aged 18 to 69 years, who had resided in the sampled households for at least six months preceding the date of interview. I suggest that authors include a brief statement, similar to the above, that allows the reader to understand that the goal was to interview approximately 14 individuals from each enumeration site, resulting in 4,900 surveys.

Measurements
Summary: Participants answered interview questions on the frequency of fruits and vegetables per week, and number of servings eaten on one of those days. Height, weight and blood pressure, and blood glucose were also measured.

Comments:
1. How was the "typical day" during the interview decided? Was it the most recent day when fruits and/or vegetables were consumed? If there was not a systemized method for determining the "typical day," please include this in the discussion on limitations.

2. What qualified as "fruits and/or vegetables"? Were these described to the participants? Please include a statement either defining "fruits and/vegetables" or defining exclusionary products (i.e. anything in a package, ketchup, potato flakes, etc.) and whether this was explained as part of the protocol.

3. Were all Steps completed on the same day and/or onsite at the location of the participant's household? Please include these details in the methods.

Statistical Analysis
Summary: Fruit and/or vegetable consumption were dichotomized by achievement of 5 servings on a given day. PRRs were used in the evaluation of potential risk factors. Weighted modified Poisson regression was use instead of logistic regression in model development.
Comments: Since there is no consensus on which risk estimate to report and how to analyze it, the authors present an adequate justification for the use of PRRs and modified Poisson regression method. This is demonstrated to be useful in high prevalence clustered exposures. Specifically, lines 117 and 118 argue that a weighted modified Poisson regression is preferred over logistic regression analysis because it improves the estimation of the standard errors of the estimated risk ratios. The references cited referred to analyses using prospective data that compare risk estimates. Although common in clustered analyses, are there additional studies to demonstrate the use of modified weight Poisson risk estimate in cross-sectional studies rather than prospective studies? Please report here.

Results
Summary:
Comments:
1. The percentage of female participants is disproportionally high. Please report this and include in discussion.
2. Were the demographic risk factors assessed by region? Did BMI differ by region? If these were analyzed but not reported in the tables due to space, briefly mention any significant findings and include in the discussion on regional differences and possible effect modification.
Discussion

Summary: The majority of Ugandan adults do not report meeting fruit and vegetable recommendations, and this is not dissimilar to reports from other Sub-Saharan African countries. Reasons for the low prevalence include regional variations in fruit and vegetable access, agricultural focus on cash crops. Risk factors identified in this survey in marital status and region. Mechanisms for this relationship include spousal interest and control over his or her partner's diet, and cultural identities attached to food staples. Interestingly, age, gender, level of education, and knowledge about fruit/vegetable consumption were not found to be significantly related to reported fruit and vegetable consumption.

Comments: Overall, the discussion is clear and useful, but is missing some key points:

1. As mentioned in the measurements section, please discussion what constituted a typical day in the limitations.

2. Please discuss the high proportion of female participants in this study its implication towards food recall. What sort of bias and in what direction might it influence the point estimate if mostly females are reporting fruit and/or vegetable intake? In Table 2, I see that there was no detected difference between male and female participants. Who are the men that are not included in this sample? Please discuss this possible selection bias in limitations. In addition, please compare with other studies published from this survey to determine if distribution of sex amongst food responders was similar to other item responders.

3. If significant associations between demographic risk factors and regions, such as BMI mentioned above, please discuss the role of possible effect modification.

4. Lines 177-180: The authors discuss the estimated 105.5 kg of available fruit and vegetables per person per year in the Africa region. Is there such an estimate for Uganda? Even more so, is there an estimate for each region in Uganda? If so, please include here. In addition, is this low availability of fruits and vegetables different from the past? Please include prior WHO and FAO data to establish whether there has been an overall change in the availability.

5. Lines 234 -236: There are two problems with the statement presented in these lines. First, the authors state that there is substantial evidence to suggest that nutrient intakes are similar between weighed records and recall questionnaires; however, the topic of this paper is fruit and vegetable consumption so it would be relevant if the statement could reflect that. Second, the authors reference a study (Bingham, 1994) that compares seven different dietary assessment methods that, contrary to the authors' implication, actually reports significant vegetable intake differences between the 16-day weighed food record (the gold standard) and the Oxford food frequency questionnaire, the Cambridge food frequency questionnaire, the 7d season checklist and the 7d season checklist with portions (Table 6). I suggest redirecting this reference to highlight that even though the validity of the individual survey question on fruit and vegetable consumptions remains to be validated in the study population, the validity of other forms recall measures of fruit consumption is supported in a European population by the Bingham study. Vegetable intake, however, remains uncertain.

Conclusions

Summary: There is low fruit and vegetable consumption, overall, and this may be associated with
marital status and regional variation. Public health initiatives should consider impediments to healthy fruit and vegetable consumption. Agricultural policy-makers should also consider the consequences to the public's diet.

Comments:
Lines 240-241: The statement "There is a need to promote nutritional education for people to appreciate the value of fruits and vegetables in their diet in terms of its quantity and quality" is not supported by the data in this study (Table 3). However, there is a need to better understand the level of people's understanding of fruits and vegetables, and whether nutritional education may be an appropriate focus on the improvement of the Ugandan dietary behaviors. I suggest changing the original statement to qualify as such.

References:
Comments: Line 332. An extra period before the word "Prevalence."

Tables and figures:
Comments: No concerns

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Please indicate the quality of language in the manuscript:
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