Reviewer's report

Title: Diabetes, Obesity, and Recommended Fruit and Vegetable Consumption in Relation to Food Environment Sub-Types: A Cross-Sectional Analysis of Behavioral Risk Factor Surveillance System, United States Census, and Food Establishment Data

Version: 1 Date: 11 August 2014

Reviewer: Colin Rehm

Reviewer's report:

Summary

Using publicly available data from the Behavioral Risk Factor Surveillance System (BRFSS) and the US census, and data from a 3rd party marketing research company this study evaluated the association between a measure of the quality of a food environment and obesity/diabetes/fruit & vegetable consumption at the census block group scale in the DC metropolitan area. The novel aspect of this analysis was the application of data reduction methods within similar food environments to characterize/identify differences in health/health behavior risk. The major problems with the paper are the inadequately described methods, which makes it difficult to assess whether the authors conclusions are justified. Below, I provide three categories of comments: major compulsory revisions, minor essential revisions and discretionary revisions that could potentially improve the paper. I have not addressed all minor editorial issues and there are a number of sentences which are not as clear as they could be.

Major compulsory revisions (in order of appearance)

1) What was the geographic scale of the food environment data? This information is critical in understanding what was done. Were these X-Y points that were then aggregated to census block groups? How were boundary effects assessed (see documentation of the CDC Modified Food Environment Retail Index for an example of how this can be addressed)? If these data were geocoded by the author’s, please provide details as to how this was done. If they were done by the data provider please provide the same information. How was the spatial surface shown in Figure 3 derived? It appears to be some sort of spatial smoother, perhaps a kernel density estimate, but this is not described in the text. Lastly, how was a summary RFE measure attached to each census block group?

2) Why were carrots, salad and potatoes excluded from the vegetable definition? According to the 2010 Dietary Guidelines for Americans and the United States Department of Agriculture, these are vegetables (though there is some debate as to whether potatoes should be included). In fact, these may be three of the most important source of vegetables, outside of tomatoes. My understanding is that
BRFSS separates these questions to reduce the cognitive burden on respondents in estimating vegetable servings. It is possible to combine these four questions into a single summary measure of vegetable consumption. Additionally, fruit juices are also a source of fruit and the same issues apply. Please provide justification for this definition including relevant citations or define this category appropriately.

3) The imputation model is inadequately described, particularly the technical details of how it was specified. Please describe the method in sufficient detail that it could be replicated by others, include references to previous applications of the model and indicate whether/how it has been validated. Are spatial parameters incorporated in the model to account for spatial autocorrelation/dependence (from Figure 4-5 it would seem some sort of spatial parameter was included)? If the dependent variable is county-level obesity (or diabetes or FV5) for the entire country, where was this data obtained from? Does this model assume that the ecologic relation between obesity and the demographic/socio-demographic factors at the county-level is the same as the block-group level? Given the modifiable areal unit problem, this assumption seems implausible. Did the model make any use of individual-level data from BRFSS? How were the design factors (stratification and weights) of BRFSS accounted for in the model? If the authors feel this information is too technical these details can be provided in an appendix (I do not think this journal has a word limit, so there is no need to be so terse), but additional information in the main text is essential.

4) In addition to the prediction model the cluster analysis is inadequately described. To a reader unexposed to this method it would be unclear why this procedure was done (i.e., in plain text, what is the scientific purpose of this procedure?). Additional methods need to be provided including the command used and whether any sensitivity analyses were done.

Minor essential revisions

5) Throughout the paper the authors refer to low, mid-low, high RFE category. I might recommend that a more qualitative description be used throughout the paper. For example, when low RFE is described the first time, define it but call it something more informative throughout. I found myself returning to the methods numerous times to recall the directionality of the score.

6) This is a cross-sectional study, yet this is only mentioned in the title, and nowhere else in the manuscript. Please add the study design to the Abstract and mention the study design when summarizing the results. Also, please discuss the limitations of this study design when you discuss study limitations.

7) As a related note, if the Hoover’s data are from 2011, they represent a food environment 1-2 years after the assessment of health status. A strict reading of this would indicate that the exposure was measured after the outcome. If the data were obtained in April 2011, but indicate the environment in 2009 or 2010, this is essential to note. Otherwise this is a limitation worth noting, though it is
unlikely to introduce substantial bias overall, though some areas may be changing rapidly (particularly areas experiencing economic recovery or gentrification).

8) Readers will wonder how you treated coffee shops, such as Starbuck’s. They are clearly going to be a large number of such establishments and there categorization is challenging. This small detail would be worth noting.

9) [Clarifying text needed] Why were ward, rather than city data used for the District of Columbia analysis? DC wards have a population of about 75,000 while many of the suburban counties have 800,000 to 1 million residents.

10) More importantly, were data from the independent Virginian cities incorporated in the imputation model? My understanding is that Virginian counties do not include the major cities such as Alexandria, Manassas or Fairfax? If the independent cities were excluded from the analysis the model would be mis-specified as a considerable portion of the population would be excluded.

11) Provide more details on the BRFSS design and methods. Does it include only landline telephones? The number of modules, while informative is not relevant here. How did you classify individuals who were told they had pre-diabetes/borderline diabetes or diabetes during pregnancy. How did you define obesity? Everybody knows it is #30 kg/m2, but this should still be included. How were missing data handled?

12) In the methods it is important to note the number of block groups included in the analysis and the number of individuals (from the BRFSS individual-level data).

13) Providing the qualitative interpretation of RFE when it is introduced is essential. The description of how it was categorized is wordy and confusing.

14) Line 297, the statement about causal inference should probably be moved to a more prominent location in the limitations paragraph. Also, what limitations specifically preclude this interpretation? Assume the authors are referring to cross-sectional design, but this needs to be made explicit.

15) The RFE measure has limitations. It does not include fruit/vegetable stands or farmer’s markets and the inclusion of “restaurants” as a “good” food source is arbitrary. Are the menu offerings at a national casual family restaurant chain really more healthful than a fast food restaurant? They are more expensive and take your order at the table, but there is no reason these two things would be more healthful than ordering at a counter. It might be useful to note that there is currently no “gold-standard” measure for food environment measures. Providing references showing that RFE (or similar measures) is associated with health behaviors (at the individual and ecological-scale) would be useful.

16) Line 304-307, I agree that this is an important contribution of work like this, but this study was conducted at the census block group level only, so it is unclear how it contributes.
17) Line 311, why do you think that these results extend elsewhere? While I do not disagree, this is an untestable question, but some rationale should be provided.

18) Table 1 and also Table 2 & 3, add text clarifying what very low RFE means (i.e., healthier food environment).

19) Table 1, what does market density, etc. mean? Stores per area or per population?

20) Table 2, what does density mean in the table title?

21) Please refer to “markets” as “supermarkets” throughout to avoid confusion; some may think you are discussing farmer’s markets.

22) Table 3, what values are in parentheses? I assume that they are standard deviations. A 95% CI might be more useful for evaluating the precision of the prevalence estimates.

23) Table 3, p-trends were not estimated for the clustering analysis results as indicated by the footnote.

24) Table 3, the last paragraph methods section indicate that pairwise differences were estimated with the very low RFE group as the reference category but I could not locate the results of these tests in the table. Pairwise tests would also be useful for interpreting the results from the RFE-stratified cluster results (the global test is less useful here).

Discretionary revisions

25) Line 76, it is unclear what “a large influence” means here? In the absence of quantifying the effect (and comparing to other upstream determinants), it might be better to remove “large”.

26) Line 82-3, “lack inclusion of or proximity to” is unnecessarily wordy way of saying that low SES areas don’t have grocery stores. Line 83-84, the structure implies that the higher prevalence of obesity in low SES areas is directly attributable to food environment, though there a number of alternative explanations.

27) Line 84-87, the demographics of DC and current health status seem out of place here. Also, in the context of this study the health of DC residents is of no more interest than the health of those in the suburbs. It might be interesting to note that there are dramatic disparities within the region should such small-area data be available. For example, I know that DC has previously presented Ward specific prevalence estimates of obesity indicating the high prevalence of obesity in southeast DC and northeast DC and very low prevalence in Georgetown and northwest DC (see http://doh.dc.gov/sites/default/files/dc/sites/doh/page_content/attachments/2nd%20Draft%20CHNA%2006%2004%202013%20-%20Vol%201.pdf, page 36. Smaller area estimates presented here would be more compelling than
the DC average, which washes over these differences.

28) Please list the food environment categories directly after listing them on page 2, line 101-102. The number of each type should also be indicated in parentheses following by their definition with reference to their North American Industry Classification Scheme number (please define the acronym). Specifically, "specialty food stores" requires a more complete definition.

29) When introducing the RFE please define it before providing additional details on its calculation (move line 109-111 to line 107).

30) In the list of SES variables starting on line 130 some variables do not have a letter proceeding the variable.

31) Please briefly note that FV data was only available for 2009 as this data is only collected in odd years (readers will be curious about this).

32) Line 234, replace “mitigating” with “confounding”.

33) Line 250-51, the meaning of this sentence is unclear.

34) Line 262 (“A possible…”), this seems like a non sequitor. It’s unclear how this fits in with the limitations paragraph.

35) Line 264, please describe what the potential biases in the ecologic analysis might be.

36) Line 298, “Observations” are not studied per se. It might be more clear to say that this question has not been widely studied.

37) Table 3, the number of block groups within each category might be a useful addition to this table.

Level of interest: An article whose findings are important to those with closely related research interests

Quality of written English: Needs some language corrections before being published

Statistical review: Yes, but I do not feel adequately qualified to assess the statistics.

Declaration of competing interests:

I declare that I have no competing interests.