We thank you for the opportunity to revise and resubmit our manuscript and we thank the reviewers for their valuable suggestions to improve it. Please find enclosed a revised version of our manuscript.

The enclosed version of the manuscript has been prepared taking into account the suggestions of the reviewers with changes to the text highlighted using red font.

The comments have greatly helped us to further improve our manuscript and we hope it is now suitable for publication in Nutrients.

Kind regards,
On behalf of the co-authors,

Maria Gabriela Matias de Pinho
Reviewer 2

Comments and Suggestions for Authors

- The article is important and new developments of residential neighbourhood definition is important and worthwhile to be published. However, the aim of the article is very broad looking into three aims mentioned under introduction (more information below), but different topics are not presented carefully. The article would benefit from dividing in two articles. One more methodical oriented article, which is connected to the different forms of neighbourhood definition and one about the association between restaurant density and home cooking.

Response: We thank the reviewer for the positive comments and for the time dedicated to give his/her feedback.

Regarding the reviewer’s suggestion of splitting the article in two, we would like to stress the fact that we have done so indeed. The association between density of restaurant and home cooking was already explored in depth in a previous publication titled “Spatial access to restaurants and grocery stores in relation to frequency of home cooking”, please follow this link to see this publication https://www.ncbi.nlm.nih.gov/pubmed/29338756

The current manuscript has, on purpose, a more methodological focus, and the association between density of restaurant and home cooking was chosen to explore different definition of neighbourhoods because of the results we found in that previous publication.

- Aim 1) Whether Density of restaurants differ considering different forms in defining residential neighbourhood. This is a very important aim. It is nicely deduced in the introduction. However, no results are presented and the discussion about this topic is scarce. Please show similarity or differences between the presented four different forms of neighbourhood definitions.

Response: we thank the reviewer for this suggestion. We have now added Table 4 that shows Spearman correlation coefficients for the measures of density of food retailers in the four neighbourhood definitions used. We also mention this analysis in the results section (Lines 290 – 295):

“Table 4 shows spearman correlation coefficients for the density of food retailers in the four neighbourhood definitions used. Almost perfect correlations (p=0.9) were found for densities of restaurants, grocery stores and other food retailers within a 1600-metre buffer. Almost perfect correlations were often found as well between density of other food retailers and grocery stores. The lowest correlation values were found for administrative neighbourhood as compared to the other measures used”.

And discussion section

(Lines 347 – 349):

“This was also demonstrated in the correlation analysis between the exposure measures used, where lowest correlation values were found for administrative neighbourhood as compared to the other measures”.
“Correlation analysis also showed almost perfect correlations for all exposure measures within a 1600-metre buffer. In this case, the existence of a threshold effect of exposure may also be considered. I might be that presence of food retailers within a 1600-metre buffer is more evenly distributed across the foodscape then when using smaller buffer sizes. Thus, it may not be possible to detect variation in the sample anymore. Very strong correlations were also found for density of other food retailers and grocery stores. This finding is plausible given the fact that part of the food retailers present in the other food retailers category are also present in the grocery stores category”.

- Aim 2) Association between restaurant density and home cooking meals. This topic is very shortly deduced in the introduction, results are presented but the discussion should go more in depth.

Response: we thank the reviewer for this suggestion. In the introduction section we indeed emphasised the evidence gaps regarding neighbourhood definitions, as our intention was to focus on how methodological decision may affect associations between the food environment and health outcomes. However, we have now added some sentences in the introduction in order to better explain our choice for exploring the association between density of restaurants and home cooking. The added sentences are as follows (Lines 85-92):

“Indeed, a previous study using data from the European SPOTLIGHT survey showed that lower neighbourhood access to restaurants, but not greater access to grocery stores, was associated with a higher frequency of home-cooking. Therefore, exposure to restaurants may be an important environmental determinant of home cooking, and we hypothesise that, in the current study, lower neighbourhood access to restaurants will be associated with a higher frequency of home-cooking. Previous literature has also indicated that the relationship between environment and health behaviours may be modified by sociodemographic characteristics such as age, income and education [18,19].”

- Aim 3) About potential interaction: it is wrong formulated At the moment it is written: Whether these “inverse association”... However, there is no association. Therefore it is tricky to already suppose a result before having it. Please rewrite this aim or delete it.

Response: we agree with the reviewer that this aim was not clear enough. We believe that we clarified that by making our hypotheses more explicit as follows (Lines 85 - 92):

“Indeed, a previous study using data from the European SPOTLIGHT survey showed that lower neighbourhood access to restaurants, but not greater access to grocery stores, was associated with a higher frequency of home-cooking. Therefore, exposure to restaurants may be an important environmental determinant of home cooking, and in the current study we hypothesise that lower neighbourhood access to restaurants will be associated with a higher frequency of home-cooking. Previous literature has also indicated that the relationship between environment and health behaviours may be modified by sociodemographic characteristics such as age, income and education [18,19].”

In addition, we added the word “hypothesised” to the aim 3 as follows (Lines 101 – 103):
“3) whether these hypothesised inverse associations were stronger for older individuals, lower income and lower educated individuals and for those who had lived longer in a neighbourhood”.

- To my understanding the interaction in a not existing association is unimportant. I like to suggest an aim about different personal predictors (like sex age, SES, or education and or income) that might explain variation in ego-centred neighbourhoods, This aim fits to the first aim but not to the second one.

Response: We appreciate the reviewer’s reflection on this. However, from our understanding, in order to know whether an interaction is important for an association or not, we first need to test it. It may well be that, strong interaction effects may cancel out a main association. Indeed, an association that has opposing effects in different subgroups would result in a null-result or non-existing association in the main analysis. Identifying such interaction effects can only be done through testing and stratification, and should be done regarding a significant main effect. We would also like to highlight we present in Table S3 the associations of the study covariates across the four different neighbourhoods types.

- Furthermore, I have some problems in your choice of “Restaurants” you put together. Fast-food and Kebab stores and restaurants with a dining room. In my opinion these are different types of restaurants. In a fast food restaurant, you are going because you do not like to cook. It is really a substitution of home cooking. A dining restaurant is another type where you celebrate some special events, or you have enough money to pay for it. It is not really a substitution of home cooking but more a supplement of home cooking. Furthermore, the quality of food is different. Fast food restaurants serve fatty foods with a lot of energy and less amount of vegetables. However, in a dining restaurant you can also find health food.

Response: we agree with the reviewer that Fast-food and Kebab stores and full-service restaurants may be different types of food retailers, depending on country/culture. However, while this distinction is relevant with regard to the type of meals served in each of those food retailers, this is not so relevant for our research questions. All these retailers provide options for ‘out-of-home’ eating; a higher neighbourhood density of food retailers included in the category ‘restaurants’ could prevent individuals from cooking at home. To make this distinction clearer, we have now added few sentences in the methods section as follows (153 - 160):

“The food retailers analysed in this study were classified by the data provider, Locatus, and further categorised into three groups: restaurants, grocery stores and other food retailers (Table 1). Given our outcome ‘frequency of home cooking’, we included in the restaurant category food retailers that most likely sell meals to be eaten away from home such as restaurants, fast food outlets and kebab shops. In the grocery stores category, we included food retailers that mostly sell ingredients to be prepared at home [22]. In the ‘other food retailers’ category, we included all food retailers that are not restaurants, i.e., food retailers such as bakery, cheese and nut stores, but also the food retailers listed under ‘grocery stores’”.

- Furthermore, when thinking about your confounders, you should have in mind that low income will lead to use more fast food and less dining restaurants. Therefore, your adjustment is not adequate as you put different restaurant types that are differently correlated with your potential confounders in
the same category. I am not surprised that you do not find the suggested association; a more in-depth analysis is necessary. This should be considered in the analyses or at least discussed.

**Response:** As we were interested in the potential explanatory role of the density of out-of-home eating options in the frequency of cooking at home, we think it is justified to combine these different types of restaurants. But because we are aware of the potential differential role that these out-of-home eating options represent for different subgroups in the population, we tested effect modification by age, income and education.

**Introduction:**
The introduction is nicely written however it over pronounce methodical topics (Aim 1) and Aim 2 is only fairly introduced.

**Response:** we have addressed this remark in the previous comment about our aims.

**Method description.**
- The method description is wired. It shows that the writer knows a lot about the used method. But it is not reader friendly. There is too much unimportant information. But sometimes the important information is still is missing. A method part is like a cake receipt. You need to describe what you do. In a cake receipt, you do not like to read a medical explanation why eggs are unhealthy. You need the simple information: Put two eggs into a bowl. The method part is similar. It confuses the reader when they need to read what was not done and why. Please start the paragraphs with the information what was done and then discuss why?

**Response:** we have changed the methods section accordingly.

- Response rate is missing.

**Response:** we have now added this information as follows (Line2 128 – 129):

“Total response rate for the SPOTLIGHT study was 10.8%, and 13.7% among Dutch participants [21].”

- I do not get the explanation why the three neighbourhood confounding variables might control for self-selection bias (line188ff). I believe the mentioned confounders are important as they explain/adjust for participant’s interest in living in this area. However, you do not adjust for self-selection.

**Response:** we believe those variables partially control for self-selec-tion because one’s neighbourhood preferences may influence the choice for a certain neighbourhood (self-selection into a neighbourhood), and therefore the exposure to the chosen neighbourhoods’ characteristics. As such, an observed association between the presence of food retailers and frequency of cooking at home may (partially) be due to an individual’s preference to live in that neighbourhood. For example,
an association between higher density of restaurants and frequency of home-cooking may actually reflect an association between an individuals’ preference for living in a neighbourhood with more restaurants and home-cooking.

Result

Please delete the first paragraph of the result section (Line 239-241). It is senseless

Response: we thank the reviewer for pointing that out. This sentence was left there by accident and has now been removed

Otherwise, the results are nicely presented. However, to answer the first aim some information is missing. For the first aim, I would like to have a comparison between all four different forms of neighbourhood definition. How are they correlated? Do the calculated tertils of restaurant densities given the different neighbourhood categorisations defines similar groups?

Response: we thank the reviewer for this suggestion. We have now added Table 4 that shows spearman correlation coefficients for the measures of density of food retailers in the four neighbourhood definitions used. We also mention this analysis in the results section (Lines 290 – 295):

“Table 4 shows spearman correlation coefficients for the density of food retailers in the four neighbourhood definitions used. Almost perfect correlations (ρ=0.9) were found for densities of restaurants, grocery stores and other food retailers within a 1600-metre buffer. Almost perfect correlations were often found as well between density of other food retailers and grocery stores. The lowest correlation values were found for administrative neighbourhood as compared to the other measures used”.

And discussion section (Lines 354 – 361):

“Correlation analysis also showed almost perfect correlations for all exposure measures within a 1600-metre buffer. In this case, the existence of a threshold effect of exposure may also be considered. I might be that presence of food retailers within a 1600-metre buffer is more evenly distributed across the foodscape then when using smaller buffer sizes. Thus, it may not be possible to detect variation in the sample anymore. Very strong correlations were also found for density of other food retailers and grocery stores. This find is plausible given the fact that part of the food retailers present in the other food retailers category are also present in the grocery stores category”.

Discussion:

Please delete the first paragraph of the result section (Line 290-292). It is senseless.

Response: This sentence was also left there by accident and has now been removed.
The discussion needs more content related discussion. Why it is important to talk about the association between density of restaurants and home cooking. Please try to think about the sociology in living in such a neighbourhood and its effect on home cooking. Why this correlation should be there? Why you do not find it? You discuss a lot about the statistical measurements, but you miss to discuss your considered exposure (density of restaurants). Why it was chosen? What does it explain? What are the predictors for using a dining restaurant or using a fast food restaurant?

**Response:** We thank the reviewer for those reflections. We would like to clarify that we did not explore in depth the association between density of restaurants and home cooking in the discussion, because the main focus of this paper was on methodological decisions regarding neighbourhood definitions. However, we included some sentences in the discussion section exploring potential explanations for the lack of associations. (Lines 374 – 379):

“One potential explanation for this lack of association may be a lower variability in the dichotomous outcome measure used for these analyses, as compared to the three categories used in the analysis with the complete sample. This is also evidenced in the sensitivity analysis showing descriptive statistics for participants excluded from the full sample. This analysis showed that a higher percentage of Dutch participants reported to cook 6-7 days per week as compared to the full sample, possibly leading to a lower variation in the outcome variable”.

And lines 385 – 390:

“The definition of home-cooking may also be different among the Dutch and the European sample. The somewhat crude questionnaire question used to evaluate the frequency of home cooking could perhaps not have captured nuances in the definition of home cooking by the participants. However, there is no validated measure to assess the frequency of home cooking in surveys. Questionnaire items inquiring how frequently individuals or family members prepared home-cooked meals are commonly used in the literature [14-16,36]”. 