Author’s response to reviews

Title: Walkability and its association with prevalent and incident diabetes among adults in different regions of Germany: Results of pooled data from five German cohorts

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Author’s response to reviews:

Dear Dr. Ferreira-Hermosillo

Thank you for accepting our manuscript for initial review and giving us the opportunity to improve it.
We have revised the paper in response to the comments of the reviewers and the editor. Please find below a point-by-point response to all the comments. A revised version of the manuscript with highlighted changes made to the original version (tracked changes) is attached.

Yours sincerely,
Nadja Kartschmit

Editor Comments:
According to the reviewer’s comments and to my own evaluation, the current manuscript requires additional information:
1) Please specify if the results described in table 1 have statistical differences.
   Thank you for this comment. Please note that in all of our analyses, we did not rely on statistically significant differences. Therefore, we did not test the differences in the certain groups in table 1 regarding a significance level of alpha less than 0.05. This decision was based on the current discussion on p-values in the academic literature, for example:
2) In table 2, the confidence intervals of the adjusted RR seem to be not significant. Please specify if this RR indicate risk of T2D in those with better walkability measures.
   The 95% confidence intervals included 1 which generally indicates that p-value is not below 0.05. The estimates around one with narrow confidence intervals indicate lack of association. We found a lack of association and not a higher risk of T2D in those with better walkability measures. We have clarified this in the abstract (line 39-42) and in the results (line 217-219). Additionally, we have added further information for the reader to facilitate interpretation. The interpretation of walkability, and hence of the RR is different for the three walkability measures. For transit stations and POI, higher numbers are indicators of better walkability. For impedance, higher numbers are indicators of poorer walkability. For all analyses, we tested the risk of having T2D with increasing number of walkability measures. We have specified this under table 2 to clarify it for the reader. Additionally, we have added the standard deviations of the walkability measures under table 2 to facilitate the interpretation of the results.
3) I suggest discussing in more detail the findings of the study: what are the possible explanations of the lack of association? What is different from the observed worldwide? What is the importance of this study?
   We have amplified the discussion part (see the tracked changes in the discussion, line 235-267, line 269-305, line 312-322). We have added information on the importance of the study in the discussion part (line 335-339).

Reviewer reports:
Amutha Anandakumar, PhD (Reviewer 1):
1. What was the duration of diabetes in prevalent T2D at baseline?
   Unfortunately, this information was not available to us. Not all cohorts we have used in the pooled analysis had collected this information. Please note that the definition of diabetes was based on self-report of physician-diagnosed diabetes or antidiabetic drug intake in the 7 days prior to the examination. Hence, the data only included participants that knew about their disease and no participants that were diagnosed in the study.
2. In Table 1: The T2D subjects seem to be older than the non T2D at baseline and when they were followed up, the incident T2D during follow up were much younger than the prevalent T2D at baseline. Explain.
This is correct. Please note that the age in all groups refers to the age at baseline. In table 2 we included “at baseline” for age to clarify that age does not refer to age at diagnosis of diabetes and not to age at follow-up. Hence, the participants with incident T2D are older than the presented mean at the diagnosis of the disease. However, we did not have the exact date of the diagnosis. This is also the reason for choosing a modified Poisson regression, where no person-time is needed in order to calculate Relative Risks.

3. In Table 1: Under Education, were nobody had 11 years of education or not included by mistake?
This is correct. In our sample, nobody had 11 years of education, which is also due to the educational system in Germany. We have included one sentence about the educational system in the covariates section in the methods part to clarify this (line 181-184).

4. In Table 2: the total N of all the column seems to be wrong. Kindly correct it.
We thank the reviewer for pointing this out. We would like to clarify that the 16,008 participants refer to the complete sample of people with prevalent T2D (N = 1,256) and without prevalent T2D (N = 14,752). The same applies for incident T2D. In order to make this more friendly to the reader and visible at once, we added a row in table 1 (“sample for examining prevalent T2D and incident T2D, respectively). Additionally, for the sample on which we conducted the sensitivity analysis, we did not present the sample characteristics in table 1. In order to clarify that this was a sensitivity analysis with a different sample (only including non-movers and people over 30 years at baseline) we added a row in table 2 with “sensitivity analysis”. However, here we noticed that the numbers of participants in the analyses for the sensitivity analysis were indeed not correct. We changed the numbers accordingly.

5. Were the T2D participants were age categorized and tested for the association with walkability?
Since, at baseline, the prevalent T2D were older than the incident T2D, the authors need to split them into different age categories and check their association with walkability measures. We would like to thank the reviewer for pointing this out. We have stratified the analysis by age categories. We did not observe consistent associations for any of the age groups, confirming the results of the main analysis. We have included this additional analysis in the methods (line 205-207) and results part (line 228-230) and as Additional file Table 1.

6. Since the studies took place between 2002 and 2016, were there any changes in the Geoinformation system Map in German?
The walkability measures were compiled later than the collection of baseline data and this might have led to misclassification, since it is most likely that the measures changed over time. We have addressed this possible limitation in the discussion section (line 323-328).

7. Was there any statistically significant difference between the prevalent T2D at baseline and non T2D in the three walkability measures such as Impedance, Transit stations and Points of interest. Kindly mention the same.
Please note that in all of our analyses, we did not rely on statistically significant differences. Therefore, we did not test the differences in the certain groups in table 1 regarding a significance level of alpha less than 0.05. This decision was based on the current discussion on p-values in the academic literature, for example:
However, we included a sentence on the descriptive differences of walkability measures in people with
and without T2D in the results section (line 214-216). Please note, that the main finding of our study was, that we did not observe any differences concerning walkability measures for people with and without T2D.

8. The authors need to explain in detail about how the walkability measures were assessed and how they were scored and used in the analysis.

We would like to thank the reviewer for this important notice. We have re-written the part on walkability measures in the methods section and added more detailed information on how the measures were assessed (line 120-170). Please note that we have z-standardized the walkability measures and evaluated them separately in each of the regression models and did not use them as a score.

9. More studies need to be referenced and discussed in the discussion section.

We would like to thank the reviewer for pointing this out. We have amplified the discussion part and added more studies (see the tracked changes in the discussion, line 235-267, line 269-305, line 312-322).

Cemile Bozdemir Ozel (Reviewer 2):

1. Authors reported that they found a weak association between higher walkability and lower body mass index in their previous study (I think same pooled). Higher BMI is associated with diabetes incidence. I would have expected the results may similar to the obesity study data. What can be the features that make the difference should add to the discussion?

We thank the author for pointing this out. We think that the already weak positive effect on BMI may simply not be strong enough to have any observable effects on T2D, since T2D lies further down the causal chain. We have amplified this in the discussion (line 295-304).

2. Authors should give me more information about walkability measurement in the methods section?

We would like to thank the reviewer for this important notice. We have re-written the part on walkability measures in the methods section and added more detailed information on how the measures were assessed (line 120-170).

3. Could income level and social status have influenced the incidence of diabetes?

Yes, this could have been the case. We have discussed this issue in the discussion section (line 312-322).

4. Could there be any change in the values of walkability measurements (due to built environment, cafe, fast food restaurants vb.) between 2006-2016?

This is correct. It is most likely that the measures changed over time, but that these changes rather occur in a proportional way. The walkability measures were compiled later than the collection of baseline data and this might have led to misclassification. We have addressed this possible limitation in the discussion section (line 323-328).

5. Authors should improve the discussion by comparing the results of studies with different results in the literature.

We would like to thank the reviewer for pointing this out. We have amplified the discussion part and added more studies with different results and possible explanation for these results (see the tracked changes in the discussion, line 235-267, line 269-305, line 312-322).

6. An important limitation of this study is lack of the physical activity level. This limitation should be added to the limitation section.

Thank you for pointing this out. We did not adjust for walking and cycling and not for BMI, because these variables can be seen as mediators on the causal path of the association between walkability and T2D and should not be adjusted for. However, we evaluated the role of practicing sports as possible confounder in the association. We hypothesized that people living in walkable neighborhoods would have better structural opportunities to use sports facilities than people living in areas with poorer walkability. This is because people who practice sport would tend to move to areas where they have the opportunity to practice sports. Hence, we adjusted the association for practicing sports. The results were consistent with the main results, as we did not observe a change in the association after
adjustment. We have included this additional analysis in the methods (line 205-207) and results part (line 228-230) and as Additional file Table 2. Additionally, we have included the descriptive statistics of the variable of practicing sports in table 1.

Minor
1. Baseline BMI values should add in the demographic table
Thank you for this notice. We have added the mean BMI values for the certain groups in table 1.