Author's response to reviews

Title: Association of Car Ownership and Physical Activity across the Spectrum of Human Development: Modeling the Epidemiologic Transition Study (METS)

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Author's response to reviews: see over
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Mr. Proel Vargas
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Editor, BioMed Central

RE: Cover Letter and Response to reviews
MS 2076795494136017 - Association of Car Ownership and Physical Activity across the Spectrum of Human Development: Modeling the Epidemiologic Transition Study (METS)

We would like to thank the editor and reviewers for their excellent comments and suggestions and the invitation to resubmit our manuscript. We believe our responses have strengthened the paper and clarified some issues that were not clear before. Below are our detailed responses to each requested revision.

Regards,

David A. Shoham, PhD
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Reviewer 1

Minor Essential Revisions:

1. I have only one main suggestion to increase the relevance of the study for researchers working in other sites. Whereas the results from the U.S. are discussed in terms of the environment (an inner suburb with little public transportation), we have very little information about the infrastructure, environment, and lifestyle in the other study areas. This might be particularly important for providing context for the only slight relationship between car ownership and MVPA in South Africa (peri-urban; 5.6 fewer minutes MVPA for car owners) and for the exception observed in Jamaica (urban) in Table 4, Model 1. Describing the environments and how they relate to the results would help to increase the generalizability or applicability of the findings.

We refer readers to a previous publication (http://www.biomedcentral.com/1471-2458/11/927) that delves into the issues raised by the reviewer. Specifically, we stated:

- **Ghana**: The in-country study sites include the town of Nkwantakese in the Afigya-Kwabre District of the Ashanti Region of Ghana and its surrounding villages. The town is situated to the southwest of Agona Ashanti the District Capital, and is about 20km from Kumasi with a population of approximately 17,000.
- **South Africa**: Khayelitsha is the 3rd largest township in South Africa and is adjacent to the city of Cape Town. The population is about 500,000 with 80 percent of the residents living in temporary housing and 40 percent unemployed.
• **Jamaica**: The study site in Jamaica is in Kingston, the capital and largest city with a population of 651,880.

• **Seychelles**: In Seychelles, individuals have been recruited from the main island of the archipelago, Mahé, which includes approximately 75,000 inhabitants for a surface of 155 km². Mahé can be qualified as semi-urban and its economy is mainly driven by tourism, industrial fishing and services. Seychelles is located approximately 1,600 km east of Kenya in the Indian Ocean, and approximately 2,000 km north of the island of Mauritius, and has a total population of about 87,000.

• **Maywood**: Maywood, in the US, is an African-American working class community adjacent to the western border of Chicago, Illinois, with a population of approximately 24,903 people.

We have added this information into the description of the study population.

The samples were not meant to be representative of the countries they were drawn from, but rather characteristic of African-origin populations of those countries, which we have noted in the text. The following table summarizes the country’s population we are attempting to characterize, the site-specific characteristics, and the proportion of that country that we live in similar environments.

<table>
<thead>
<tr>
<th>Nation (Population)</th>
<th>Site Characteristics</th>
<th>Proportion nation’s population living in similar conditions</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA (black)</td>
<td>urban area</td>
<td>91.0%</td>
<td>2010 Census Summary File 1, Tables PS and P8.</td>
</tr>
<tr>
<td>Jamaica</td>
<td>urban area</td>
<td>54%</td>
<td>statinja.gov.jm/PressReleases/pressreleasecensus.aspx</td>
</tr>
<tr>
<td>South Africa (black)</td>
<td>township</td>
<td>55%</td>
<td><a href="http://www.futurefact.co.za/system/files/filedepot/2/Presentation%20Futurefact%202007%20The%20New%20Urban%20Geography%20The%20Changing%20Face%20of%20Suburbia.pdf">http://www.futurefact.co.za/system/files/filedepot/2/Presentation%20Futurefact%202007%20The%20New%20Urban%20Geography%20The%20Changing%20Face%20of%20Suburbia.pdf</a></td>
</tr>
</tbody>
</table>

**Other Minor Essential Revisions:**

2. *The Abstract says Jamaica had the lowest MVPA levels. Isn’t it actually the U.S.?*

Thank you for catching this.

3. *For consistency, PA should be changed to MVPA in the Results and Conclusions of the Abstract. Check throughout the manuscript to be sure that, when referring to the measure used in the study, the text reads MVPA rather than PA.*

Thank you for pointing this out. We made the requested search and changes. We have also clarified that MVPA is the focus of this research because it is predictive of cardiovascular health.
4. Page 8 line 7: What do you mean by “dimensions of control”?

We meant a measure of social class. This was clarified.

5. Page 9 line 2: Change “indicator” to “indicators”

Changed

6. Page 9, Results, Demographics; Table 1; and Table 2: Please report p-values for differences among study sites.

All p-values are <0.001 for the variables in Table 1 except for sex. The significant differences in age are due to the small standard errors for age. In Table 2, the overall summary p-values for mean number of goods owned and whether the household owns 13 or more goods are both p<0.001. We have added this information.

7. Page 10 line 10: “Seychelles and the Jamaica were intermediate.” First: “the Jamaica”? Typo? Second: Jamaica is very similar to the U.S. Seems it makes more sense to write: The highest activity of moderate or higher intensity was recorded in South Africa (37.6 min/day; SD=31.1) and Ghana (35.3 min/day; SD=23.1), while the lowest was in the US (24.3 min/day; SD=29.8) and Jamaica (24.6 min/day; SD=20.7); Seychelles was intermediate.

This is a good suggestion and we accepted it.

8. Page 11 line 13: You write Model 4. Do you mean Table 4, Model 1?
This was Model 2 in table 4. We corrected this.

9. Table 3: Significant p-value for years of education, Jamaica, 0.0143 lacks asterisk
Corrected.

10. Table 3, Footnote 2: Please define MI

Multiple imputation. We defined it.

11. Table 3, Household Income: It’s unclear to me why the data are dichotomized based on $1825/year for all sites, considering the huge range of PPP per year per household across the countries (from 886 to 11,652). Why not report country-specific tertiles or quartiles? Or, if I’ve misunderstood and there is a reason for using $1825, please clarify.

We have changed to a measure based on relative poverty based on comments from reviewer #2.
Reviewer #2: Major Compulsory Revisions

1) The authors present the GNI per capita and HDI for each of the 5 countries represented in the study. However, the samples within each of these countries were quite specific, so those GNI and HDI may not actually reflect the samples’ characteristics. In fact we see this in Table 1 when we compare the household PPP adjusted income to the GNI values. The authors need to comment on this issue and consider creating a household level measure of income to GNI to allow for cross country comparisons. In essence it would get towards measuring how where a household stands relative to the “average” household in their country may be related to MVPA in the multivariate analysis.

The reviewer raises an excellent and critical point. Study subjects in the US and South Africa tended to be far below the GNI per capita for these nations. These are two social contexts with long histories of race disparities and inequity (the legacy of slavery and Jim Crow in the US, and apartheid in South Africa). In contexts which are primarily African-origin and without a current context of race-based inequality (Seychelles, Jamaica, and Ghana), the study populations are consistent with the national GNI.

Based on Ruddle (1990), we created a relative poverty indicator for whether the study subject was above or below half the PPP-adjusted per capita GNI. We have added these measures to Table 1. We realize that median income is the preferred method for calculating relative poverty, but we did not have median income available for all sites and therefore used average GNI. Analyses show consistent results when compared to adjusting for per-person income as originally defined. For example, in the original analysis owning a car was associated with -12.58 lower minutes of MVPA; adjusting for income below half the national average changed this measure to -12.38, a difference of less than 2%. The association between poverty and minutes of MVPA also remained non-significant (beta=+0.26; p=0.875).

Finally, we note that the income per person is much closer to the US average for African Americans in 2011 ($17,880) than for the nation as a whole. We have noted this in the discussion of Table 1.

2) Please at least briefly explain why in Seychelles monitors were not worn during sleep unlike the other countries.

The overarching aim of METS is to investigate the impact of diet and daily physical activity on the development of obesity and chronic disease (cardiovascular and type 2 diabetes mellitus), so we were only interested in the PA accumulated during waking hours. As such the investigators in Seychelles felt that they could ask the participants to remove the monitors at night. In other sites, the nighttime activity was only used to assess sleep quality, not measure total physical activity.

3) Please explain how the partial days of data (participants were asked to wear monitors at all time over 6 complete and 2 partial days) were used given the 10+ hours of wear time being considered valid.

The partial days were removed from the activity analysis, so participant activity data were included if it included at least 4 days of 10hrs of valid data.

4) In the multiple imputation approach to derive income for missing values, the authors are assuming that debt does not exist. They should explicitly say so.
Yes, this is an accurate statement. Servicing debt might even be considered a type of negative income. However, since debt is directly related to wealth (and only indirectly to income), we believe the assumption is warranted.

5) Was there no question asking about ownership of motorcycles/ moped or another forms of motorized vehicles that are not cars or trucks??

Yes, these questions were asked, but very few people owned monocycles/ moped (3.6% overall, with highest ownership in the US at 6%) or bicycles outside of the US and Jamaica (10 to 16% at the other sites). Furthermore, bicycle ownership was strongly associated with car ownership across all sites, with the probability of owning a bicycle given that the household owned a care being 51%, vs. 17.6% given no car ownership.

6) Why didn’t the authors also look at light PA or “lifestyle PA” levels (see Matthews, 2005) ? When thinking about the substitutes for cars/trucks, there are varying alternative modes of transportation like walking, cycling, taking public transit (tuk-tuks, buses, metro/subway, etc.) that are not necessarily moderate intensity PA.

The overarching aim of the study is to look at moderate to vigorous physical activity and its relationship to obesity and chronic diseases (CVD, diabetes). We therefore focus on MVPA which is the salient measure and is the one used, for example, by the WHO in making public health recommendations (e.g., 150 minutes/week of MVPA or 75 minutes of vigorous activity).

7) The authors have also taken a very simplistic look at household car ownership and have not tried to account for who actually has access to the cars/trucks, and whether it is exclusive use, partial use, scheduled use, etc.

We did have a question on whether the car was one shared by the household, or was the personal vehicle of the respondent. Results are consistent with the original analysis when only personal car ownership is included instead of household car ownership; from Table 4, household car ownership is associated with 12.6 minutes fewer MVPA (p<0.001), while only personal car ownership is associated with 16.1 minutes fewer MVPA (p<0.001). If we define a new variable, “only household car without personal car”, this is associated with 6.4 minutes fewer MVPA, while personal car is associated with 18.6 fewer minutes of MVPA. Furthermore, personal car by site interactions were similar to the original analysis in Table 5; for example, the original car ownership variable was associated with 24.3 (SE=3.2) fewer minutes MVPA in the US site, while personal car ownership was associated with 23.8 (SE=2.6) fewer minutes MVPA. We have summarized these analyses in the results.

8) Overall, I am puzzled about the meaningfulness of the cross-country comparisons and the external validity of the findings given the vary select nature of the samples from each country. One potential way to allay this concern is based on my suggestion in comment #1.

Please see the response to Reviewer #1

Minor Essential Revisions:
1) Table 4 should include notes that states what variables went into the multivariate models.

We have added this as a note.