Author's response to reviews

Title: Cross-sectional associations between residential socio-environmental exposures and cardiovascular diseases

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Version: 3 Date: 13 December 2014

Author's response to reviews: see over
Dear Dr. Els Clays,

Thank you for your communication of October 13th 2014 indicating that we should submit revisions of our paper, "Cross-sectional associations between residential socio-environmental exposures and cardiovascular diseases", MS 1633238668138590.

We have carefully read and considered each of the comments and suggestions for revision provided by the three reviewers. We have revised our manuscript in accordance with the reviewer's suggestions and feel that the manuscript is much improved. Attached is a document outlining, point by point, how we addressed the reviewer's comments.

We hope our manuscript is now suitable for publication. We look forward to hearing from you.

Best regards,

Antony Chum
Dr. Susan Elliott’s comments

1. There is no question that this manuscript addresses a very important public health issue: the role of urban planning decisions/directions/policies in shaping chronic disease in our modern day world.

*We thank Dr. Elliott for her endorsement of our paper.*

2. My concern is that a lot of the literature on which the work is based might be considered dated and hence some more recent literature that has indeed addressed these issues in Canada, Ontario and in Toronto specifically has been missed. In my opinion, it would be very useful if the authors went back and revisited/updated the literature in order to shore up the foundation for the conclusions they draw and the (potential) contributions they can make.

For example, in the BACKGROUND, the authors state: "With increasing recognition that urban planning initiatives may have an impact on health disparities through modifications to urban infrastructure and built environment [references provided are 2003 and 2004 - over a decade old], the present study aims to inform research on healthy urban planning by clarifying the associations between a broad range of neighbourhood-level planning related factors and cardiovascular risk."

There are a number of more recent references that would have helped form a stronger foundation for this work from within the realm of medical geography. See, for example, Dan Harrington’s MLM analysis of determinants of CVD in Ontario and Dora Pouliou’s work on socio-environmental factors affecting BMI in Canadian cities as well as Jennifer Dean’s work on urban health. I would also suggest that the authors review the volume of empirical papers published with and by John Eyles on determinants of population health at the local level.

*We thank Dr. Elliot for providing a rich list of recent Canadian studies of neighbourhood influences on obesity and other CVD-related risk factors, which have helped to strengthen our background section and literature review. In the background section, we added:*

"...A number of newer Canadian studies have, however, explored a broad range of socio-environmental [1-3] and political/policy-level [4] factors associated with obesity, which is an independent risk factor for CVDs [5]. These studies represent significant advancement of our understand of the environmental influence on obesity (as well as the spatial composition and built environmental components of obesogenic environments); however, a knowledge gap still exist in terms of the strength of associations between a broad range of neighbourhood characteristics and clinical cardiovascular diseases." (p.2)

*To the neighbourhoods and CVD risk section, we added:*

“...A number of more recent Canadian studies have also found neighbourhood level factors independently associated with obesity including low neighbourhood-level education and dwelling values [1] and low density land uses and low levels of..."
walkability [2]. On the other hand, a study of the Canadian city of Hamilton found no social and physical environmental characteristic (determined by residents’ open-ended responses of their likes and dislikes) to be significantly associated with being overweight, i.e. $BMI \geq 25$” [6].

**Dr. Mark Rosenberg’s comments**

1. While the authors might be correct that this is arguably the first paper to associate CVD with individual and neighbourhood level variables using multi-level modelling, it is far from the first paper to demonstrate cross-sectional results of individual and neighbourhood level variables using multi-level modelling to explain a variety of general (e.g., self-assessed health or quality of life) or specific health outcomes.

   *We thank Dr. Rosenberg for his endorsement of our paper, and we now carefully acknowledge that while there have been previous multilevel studies of various chronic disease risk factors, they were limited to area-level socioeconomic status, and limited work explored the effects of other social and built environmental factors. Our study is the first to “investigate multiple neighbourhood influences guided by opportunity structure theory in an integrated approach to understand the association between the built environment and CVDs”*. (p.4)

2. Second, what is missing from this paper and indeed many previous papers is a coherent theory to guide the choice of variables. What this paper does as do many of the other papers of this genre is follow past practice but this is not the same as having a coherent theory or model to guide variable selection.

   *We have added the following to describe the theoretical framework that informed our study and choice of variables:*

   “Our study uses a population health perspective to explore determinants of CVD [8], which aims to explain health outcomes simultaneously at the level of individuals (e.g. diet, physical activity, and other health behaviours) and the broader environment” (p.2)

   “We considered the theory of neighbourhood opportunity structure in the selection of area-level predictors [7], which refers to the distribution of social, economic, service, and built environmental resources required for individual health. The theory considers a broad range of area-level characteristics that engender health at the local scale, and we emphasize those that are most likely related to cardiovascular disease development including physical features (e.g. air quality and traffic), the availability of healthy environments (e.g. areas for leisure and physical activity), services to support daily lives (e.g. availability of healthy food options), and sociocultural features of a neighbourhood (e.g. crime rates)... This is the first study to combine multiple neighbourhood influences guided by opportunity structure theory in an integrated approach to understand the association between the built environment and CVDs.” (p.4)
“Our study supports the neighbourhood opportunity structure theory by showing significant associations between a range of socio-environmental characteristics and CVDs at the local level. Previous studies primarily focused on negative aspects of neighbourhoods, e.g. economic deprivation [9-12] and neighbourhood social disorganization and disorder [13-15], and limited work explored the effects of other social and built environmental factors. On the other hand, our study demonstrates the importance of measuring and modeling a broad range of environmental factors including community resources (e.g. access to healthy food and access to parks/recreational areas)” (p.10).

3. Third, what is mainly absent from the analysis are the statistics that explain the partial and overall fit of the models. In much of the previous research using multi-level modelling of which I am aware, what has often been case is that the socio-economic and behavioural factors linked to the individual explain most of the explained variance and the neighbourhood factors which are retained in the models explain only a small proportion of the variance. It also common that the overall variance explained is relatively small. In fact the Model 4 results which the authors tend to discount in their discussion seem to support this observation that neighbourhood factors might not be as important as behavioural factors. This point is also supported by the smoking variable (not discussed) which is significant and has higher odds associated with increased CVD than any of the neighbourhood characteristic variables except the distance to a major road and noise variables.

We have now added a number of partial and overall model fit statistics (see table 2):

a) Variance Partition Coefficient (i.e. the proportion of variance found in all neighbourhood-level variables) estimated by the Goldstein et al. model linearization approach [16].

b) The model fit statistic, Pseudo-Akaike Information Criterion (smaller number is better).

As per Dr. Rosenberg’s suggestion, we added information about a) health behavioural risk factors of CVDs and b) qualified the proportion of variance explainable by neighbourhood level factors in our manuscript:

“Out of the two health behaviour adjustment variables included (i.e. smoking and alcohol use), only smoking significantly increased the odds of MI (OR=1.89; p<0.01) and CVDs (OR=1.43, p<0.01). The percentage of variance of the outcome found in all neighbourhood-level variables, calculated by the variance partition coefficient [16], is 6.11% for MI and 7.19% for all CVDs.” (p.9)

“Individual behavioral risk factors including smoking and obesity, treated as adjustment variables in our models, are significant risk factors for CVDs – and the mechanisms for how these factors influence CVD risk are well documented [17, 18].” (p.10)
References


