Reviewer's report

Title: Neighbourhood safety and area deprivation modify the associations between parkland and psychological distress in Sydney, Australia

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Reviewer: Thomas Astell-Burt

Reviewer's report:

OVERVIEW:
Your manuscript describes a test of the hypothesis that association between green space and mental health is modified by perceived safety and area-level socioeconomic circumstance. You use cross-sectional data pooled from three rounds of the NSW Population Health Survey (2007, 2008, and 2009) and link to this the percentage land-use within postcode areas which corresponds to parkland. You apply logit regression which accounts for clustering within postcode areas to find evidence that green space is not associated at all with mental health among people who feel safe, and no association among residents of the least disadvantaged postcode areas. You find that green space is associated with poorer mental health for residents of the most deprived postcodes, but only among residents who do not feel safe in their surroundings. Green space was only associated with lower psychological distress for residents of so-called ‘2nd disadvantaged’ postcode areas with 20-40% green space, compared to those in similar socioeconomic circumstances with access to less green space. You conclude that perceived safety and area-level socioeconomic circumstances are significant modifiers of the association between green space and psychological distress, and that neighbourhood perception is more important for mental health than the amount of green space which a person can access.

MAJOR COMPULSORY REVISIONS:

INTRODUCTION
1. You assert that the main rationale for the study is that few before have investigated the aforementioned hypothesis. However, this only arrives in the fifth paragraph of the ‘Introduction’ which is very general and lacks a detailed synthesis of the literature.

2. For instance, there appears to be an uncritical acceptance that green spaces can increase physical activity (Introduction, paragraph 2) and social interactions (Introduction, paragraph 3); the literature is far from unequivocal on this subject.

3. There is no mention of perceived safety until it is declared the focus of the study, and only a very limited reference to potential effect modification via area deprivation.

4. The rationale for the study is emphasised in that few studies have been set in
the city of Sydney in Australia, yet there is no indication as to why the findings should be any different to those already published.

5. It is therefore unclear from the outset how your study seeks to extend current knowledge, which is not helped by a lack of critical engagement with the literature (especially on perceived safety) to clearly outline the research gap that you propose needs to be addressed.

METHOD

6. Your analysis of the Kessler scale of psychological distress via logit regression accounting for the nesting of individuals within geographic areas is sensible, though more detail is needed on the selection of independent variables and how they were fitted into the model (e.g. stepwise selection?).

7. The analysis is handicapped by the reliance upon postcode areas. Postcodes in Australia are large (and in some cases, very large) in terms of population and geography. They are not satisfactory proxies for health-relevant processes operating spatially, and as such, the selection of postcodes for this important analytical step (adjusting for clustering) is an important limitation that deserves greater attention in the text than is awarded at present. Details of the postcode mean, median, standard deviation, min and max of the total census population and geographical area need to be included so the Readers can make an informed judgement over whether this large scale was appropriate.

8. The selection of postcode areas as the unit of analysis for constructing exposure to green space is also of substantive concern, as their size both in terms of population and geography, plus their irregular shape, could lead to a not inconsiderable misclassification of exposure. Your detail of Mesh Blocks is useful, but you do not provide details of which year these units were relevant. Furthermore, the text of ‘Methods’ paragraph two is potentially quite misleading for readers, especially those unfamiliar with Australian census geography, as the detail on Mesh Blocks (e.g. ‘smallest geographical unit’) implies the use of reasonably fine-grained green space data, but sweeps over the aggregation process that results in a rather coarse measure of green space exposure at the postcode area scale.

9. The categorisation of green space into 0-19%, 20-40% and >40% is left unsubstantiated; what was the thought-process behind this classification? Why was this preferred to a continuous variable of green space? Can this be justified theoretically or empirically? Has the choice of this classification influenced your results?

10. In the first paragraph of ‘Methods, Statistical Methods’ you state that interactions with green space were found for area deprivation and perceived safety, so results are presented according to perception status and deprivation tertile. It is not clear whether you are therefore presenting the interaction terms fitted within a single model, as a large pre-defined categorical variable, or whether you have stratified your models by one or more of these variables. You
need to make this part clearer and it would be more appropriate to report this strategy in the Results section of the paper after reporting an analysis of the main effects (i.e. pre-stratification or before fitting interaction terms).

RESULTS
11. The first and second paragraphs of the ‘Results’ section are useful but may be more appropriately located in the ‘Methods’ section where the data and sampling should be described in full.

12. Paragraph three of ‘Results’ describes key findings from Table 1. However, there is no mention of how the prevalence of psychological distress varies by green space exposure in either. This descriptor should be prominent within Table 1 and ought to the headline result that leads this paragraph.

13. You have not provided the main effect of green space on psychological distress in the ‘Results’ section. This is an important and surprising omission given the aim of the paper and does not help the readers, who are left guessing as to the direction and size of the effect.

14. Paragraph four and five of the ‘Results’ contains information replicated in Table 2, which therefore means that this paragraph can be simplified so the key results are clearly explained without statements of parameters. The space can be used more effectively, for example, to report whether there was correlation between green space, deprivation and perceived safety (which you have not done so far in the text).

DISCUSSION
15. Paragraph two of the ‘Discussion’ section reports that you were unable to detect an association between green space and psychological distress. I assume this to be a statement of the main effect between each variable. This is the first mention of this result in the text! The parameters must be clearly and prominently reported in the ‘Results’ section.

16. This point then raises the interesting, though maybe unconventional choice of fitting interaction terms (or whichever method was chosen) when no main effect of green space on psychological distress was initially observed. You should elaborate on why you chose this avenue of enquiry.

17. Furthermore, the lack of a main effect should be discussed in detail. What could the reasons be to explain why none was found? Does this mean your emphasis on ‘effect modification’ is not valid if there was no ‘effect’ of green space on psychological distress prior to the fitting of interaction terms?

18. The positive effects of green space on psychological distress among people in deprived neighbourhoods with low safety ratings is interesting and ought to be discussed in more detail than at present.

19. The only point at which a beneficial association for psychological distress was identified in your results was for people who felt unsafe, lived in the so-called
‘2nd disadvantage’ category of postcode, and had between 20% to 40% exposure to green space. This result appears somewhat tenuous, and discussion of how this could occur (‘Discussion’, paragraph five) is disappointingly short.

20. This result is all the more unconvincing because Table 2 reports an odds ratio of 1.92 (albeit somewhat statistically insignificant) for the equivalent group resident in areas with more than 40% green space. A potentially non-linear relationship perhaps? More discussion is essential.

21. The penultimate paragraph in the ‘Discussion’ section does not award sufficient attention to the reliance of postcodes as the unit of clustering and green space. This, along with other limitations, need to be more fully developed in the sense of how they could have influenced (or biased) your results.

MINOR ESSENTIAL REVISIONS:

22. Page 10: I assume that there is typo in the following: ‘residents who perceived that their neighbourhood was an unsafe safe place’

DISCRETIONARY REVISIONS:

23. Consider dropping the use of IRSED as an acronym and using something a little more intuitive in its place.

24. Consider re-labelling the ‘2nd disadvantage’ category in Table 2.

Level of interest: An article of insufficient interest to warrant publication in a scientific/medical journal

Quality of written English: Not suitable for publication unless extensively edited

Statistical review: Yes, and I have assessed the statistics in my report.

Declaration of competing interests:

I declare that I have no competing interests