Reviewer's report

Title: The role of multilevel factors in geographic differences in bicycle crash risk: a prospective cohort study

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Reviewer: Gregory Howard

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A nice analysis of a complex dataset, but I found it a bit hard to interpret.

I came to the article with the expectation that this major city would have higher rates of cycling than its surroundings and therefore (assuming "safety in numbers") a lower rate of injury. But as you describe in the Discussion -- and somewhat less clearly in the Introduction -- Auckland, like many less dense American cities, does not fit that pattern of mode choice, being somewhat less dense and more car-oriented. In fact, however, given the actually *lower* rates of bicycle transportation in the city, the higher rates of injury there are not inconsistent with "safety in numbers", although puzzling at first glance (the numbers may actually be too low everywhere in NZ to promote increased safety).

MAJOR COMPULSORY REVISIONS

None.

MINOR ESSENTIAL REVISIONS

1. Relating to the above point, that Auckland has higher injury rates: I found the attribution of some of the risk of injury to "residing in urban areas" (quoted from the Abstract, and with similar phrasing elsewhere) to be a confusing and groundless generalization; in fact, the the "urban area[s]" refers only to Auckland. "Urban residence" (a term also used in the Abstract) is much nearer the mark, but "Auckland residence" would be still more exact. It would be unfortunate for a reader to conclude that the study found "urban areas" generally to have higher rates of injury.

2. I do not agree that the Amoros (2011) study supports the conclusion that "on-road bicycle crashes occur more often in urban areas", if you mean that the risk of injury is higher in urban areas, since Amoros does not have exposure data and does not calculate rates. You may mean that more crashes are on-road than off-road crashes, in which case, please clarify.

DISCRETIONARY REVISIONS

1. The significance of "off-road cycling" is lost on me -- does that refer to mountain biking trails for recreational riding, or off-road cycle paths for...
commuting, or both? Or might it be the latter in Auckland, and the former outside the city? Well-designed off-road commute paths or cycle tracks might be expected to lower injury rates, whereas recreational off-road trail riding could go either way depending on difficulty and the skill of the cyclist. If off-road riding is primarily one or another type of riding, please describe that.

This question relates to my general unease that the data described probably conflates a number of subpopulations of cyclists: for example, recreational mountain bikers, recreational road bikers, and transportation riders. The problem of "off-road" riding (trails vs commutes) is a good example of what may be very different behaviors in this cohort. Future work distinguishing between these groups may help us understand the underlying patterns of risk better.

2. I would have liked to see the beta estimates for the various components of each model; please consider supplying this as supplementary data. From Table 3 I cannot tell (for example) whether "Years of cycling" or "Mainly use road bike" contribute to or detract from injury rates.

3. The linkage of crashes appears to be very good (the ACC seems like a remarkable dataset!). However, differential reporting by different groups of cyclists could bias the data; in the USA, I would be concerned that some groups are less trusting of the police and less likely to report accidents, for example. When the authors say, "this [police report] database contains information on all police-reported bicycle collisions involving a motor vehicle", is there any data on what percentage of crashes is actually reported?

Later on, I see that "minor" crashes which are self-reported but do not appear in these databases constitute two-thirds of self-reported crashes. You do not mention self-reporting before that and it would have been clearer to point out earlier in the paper that you do have, but do not use, self-report data. I think that police/insurance data must also be "affected by personal, social and health service factors" to some extent, but I see the point.

4. You do not mention fatalities, but this reader wonders whether and how many of the reported injuries were fatal.

5. I assume the red outline on Additional File 1 delineate the metro area of Auckland? Additional File 2 could use a title and/or brief caption. I found this table helpful in understand the Auckland patterns.

Overall, an interesting paper, but its relevance to any one type of cyclist may be confounded by very different types of cycling represented in the dataset.

**Level of interest:** An article whose findings are important to those with closely related research interests

**Quality of written English:** Acceptable
Statistical review: No, the manuscript does not need to be seen by a statistician.

Declaration of competing interests:
I declare that I have no competing interests.