Author’s response to reviews

Title: Rates Of Influenza Vaccination In Older Adults and Factors Associated with Vaccine Use: A secondary analysis of the Canadian Study of Health and Aging

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Dear BMC Editorial Board and reviewers,

Thank you for the opportunity to revise and resubmit our paper. We are glad for the close attention paid to it, and wish to thank the reviewers for their assistance. Attached please find our manuscript, which has been revised according to the valuable feedback received during the peer-review. Please also see the discussion which follows of each individual point raised in the review.

1) Possibility of correlation between some of the "independent" risk factors, and how this was handled in the analysis.

There are two possible ways that individual variables and their relationships between one another could affect the analysis. The first is confounding (i.e. a third factor being associated with both the exposure and the outcome of interest, and leading to mistaken or overstated associations between the exposure and the outcome), the second is interaction (effect modification).

With regard to confounding, it is true that any associations found in the univariate analysis (presented in Table 1) could be due to confounding. The multivariable analysis (results presented in table 2) attempts to address this by adjusting each variable for the effects of all of the others - thus the estimates of effect shown in Table 2 are adjusted in so far as is possible for confounding by the other variables. The estimates of effect (odds ratios) are thus adjusted for known confounders but the possibility of confounding by other unknown and unmeasured confounders (such as general "healthy behaviour") remains. We have attempted to clarify the wording of the manuscript to make the issue of confounding and how it was dealt with more clear.

With regard to interaction, it is true that any associations found in the data set such as this could potentially interact. The same could be said of triplets, etc. There is thus a potential problem of computational intractability, due to the non-independence of the variables. We have added a description of how potential interaction between some pairs of variable for which interaction was deemed plausible was handled. As noted in the manuscript, there was no evidence of statistically significant interaction between the pairs of variables tested for interaction in the multivariable model (age and frailty, smoking and drinking, region and urban/rural dwelling).

2) Data may not reflect current practice

This has been added as suggested to the beginning of the discussion section. Our feeling is that these data provide a unique opportunity to study risk factors for vaccination in a cross-Canada sample of community-dwelling older adults, data which is not available to the same extent in more recent years.
3) Survival analysis
This aspect of the analysis has been deleted for the reasons suggested in the review.

4) Structure of the Results and Discussion sections, and suggestion to include data that had previously not been shown for the sake of brevity.
This suggestion has been carried out - the results in question have been moved to the Results section, and the data referred to have been included in Tables 3&4. We have also added discussion of their import in the Discussion section.

5) Question of whether the relationship between exercise and influenza vaccination could be (at least partly) due to confounding

In suggesting this as a possible explanation for the observed association between exercise and influenza vaccination, our thought was that there could be a third factor (general healthy behaviour) that could plausibly be associated with both the exposure variable (exercise) and the outcome variable (flu vaccination). If both of these associations hold, then the association between exercise and flu vaccination could be confounded by healthy behaviour.

6) Influenza vaccination policies in Ontario prior to the date of this data collection

We are appreciative to the reviewer for pointing out this oversight, and have made changes to the manuscript accordingly.

My colleagues and I are grateful for your consideration of our manuscript and we look forward to hearing from you about its disposition.

Sincerely,
Melissa Andrew