Author's response to reviews

Title: The impact of attrition on the representativeness of cohort studies of older people

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Author's response to reviews: see over
Dear Editor

Here are our responses to the reviewer’s and editor’s comments (in italics) on manuscript MS: 6086436823634815

The impact of attrition on the representativeness of cohort studies of older people Samuel L Brilleman, Nancy A Pachana and Annette J Dobson

**Reviewer’s comments**

**Major comments**

1. This paper provides examples of the amount of attrition and death likely in an example cohort study and the bias in terms of the prevalence of a risk factor from a simple hypothetical situation and example study. However, the conclusions drawn from this research are as expected and therefore not novel. The conclusions should be more specific to the results obtained.

The last sentence in the Abstract, “This is an important issue for studies of older people where attrition due to death and other health related causes is likely”, has been deleted.

It has been replaced by: “However although more than a quarter of the oldest participants in the ALSWH died in the 12 years following recruitment, differences from the national population changed only slightly.”

2. In the background, it states that the study results may not be generalisable to the target population, however the effect that the bias in prevalence of a risk factor has on the overall results has not been explored within this paper.

The following words have been deleted from the Background section of the Abstract “and the results may become less generalisable to the target population.” They have been replaced by a more specific statement of the aim: “the aim of this paper is to examine the effects of death and other forms of attrition on risk factor prevalence in the study cohort and the target population over time”

In the background section of the main text the following sentence has been removed from the end of the first paragraph:” As a consequence study results may not be generalisable to a target population which is not subject to the same forms of attrition”

It has been replaced by “In this paper we consider how different types of attrition may affect the prevalence of attrition-related risk factors and therefore how differences may evolve between the study cohort and the study population.”

3. It would be useful to have some guidance/references as to how to handle both types of attrition if it occurs. Rather than just saying it is a problem
The following paragraph has been added to the end of the Discussion.

“Attrition leads to missing data problems and as shown here and by others the missingness is not random, rather it is associated with the initial characteristics of the participants [1-5, 11]. For non-death attrition, multiple imputation of missing data may be used provided that variables associated with the different types of attrition (including, if possible the type of attrition) are included in the imputation process. Random effects models and generalised estimating equations may be used for longitudinal analysis with data missing from participants who have dropped out [12]. However for attrition due to death it is necessary to consider separately the study participants who survive and those who die, for example by analysing their data separately or using a joint model for the longitudinal responses and the probability of survival [13]. More recent work suggests analyzing the longitudinal data stratified by time of death [14]. For cohort studies of older people several of these methods may be needed to control bias due to attrition.”

4. In the methods section, how were the assumptions for the hypothetical situations derived? Are they based on realistic levels? How likely is the situation where bias is present at the beginning of the study? Can you give an example?

The following sentences have been added to the beginning of the Methods section:” The hypothetical situations we consider are based on factors that might affect the generalisability of findings related to health service use by older participants in the ALSWH (the study cohort) to women of the same age group in the Australian population (the target population) after more than a decade. There were initial differences between the two groups, for example in level of education which could affect continuation in the study, health status, relative survival and use of health services. “

5. On page 6, it says that the length of time can be arbitrary, but what is it in the hypothetical situation considered, e.g. yearly?

“for example yearly” has been added to the end of this sentence as that is indeed the time we had in mind.

6. In the ALSWH example, why was over-sampling of women from rural and remote areas intentionally.

The following words have been added “to provide reliable estimates for the less populated parts of the country”

7. Provide details of what is meant by the alcohol consumption categories.

Numbers of drinks per day have been added

8. More details of the multinomial logistic regression model should be provided in the methods section such as how the covariates were fitted in the model and how reference values were chosen when fitting covariates as categorical? Were all covariates fitted or a stepwise model used?
The following sentences have been added: “For nominal scale risk factors the category with the highest frequency was chosen as the reference. For ordinal risk factors the end category associated with the best survival was chosen as the reference. All variables associated with attrition in univariate analyses were included in the multinomial logistic regression and only those with 95% confidence intervals for at least one category were retained in the final model.”

9. Why were different categories used for the country of birth in the cohort compared to the target population?

This has now been simplified to the two categories actually used in the paper and explained as follows: “two groups: non-English speaking countries and other, because of the relevance of language to use of health services and to correspond to the assumption in the hypothetical situations that the prevalence of the risk factor is less than a half.”

10. On page 8, what is the proportion of all women that was included in the Australian National Health Survey?

The proportion of the population included in the Australian National Health Surveys varies across surveys and between the various States and Territories so there is no simple answer to this question. However the fact that there are only about 900 women in the target age group in National Health Survey (mentioned in the Methods section headed “Population data”) compared to over 12,000 participants in the ALSWH in this age group shows that the overall proportion is very small. We do not think this detailed explanation is warranted in the paper.

11. On page 9/10, provide the direction of the association when describing the figures. Also provide what happens if the association is in the opposite direction for Figure 4.

The direction of association is specified in the original manuscript for Figures 2 and 3. More explanation has now been added for Figure 4.

12. The results reported in the text from the multinomial model are selective, is there any reason for this? It should be stated that the odds are compared to those responding. The 95% CI for physical activity categories included 1 for the women lost to follow-up and therefore should not be included in the associated list of risks factors in the text.

This paragraph has been revised to include these suggestions. It is now: “Compared to women who responded to Survey 5 those most likely to have died by Survey 5 had no formal educational qualification, were underweight, did little or no physical activity, rarely or never drank alcohol, were ex-smokers or current smokers, and reported having poorer health at Survey 1. Those who were overweight at Survey 1 were less likely to have died. Women most like to withdraw due to frailty reported having poorer health at Survey 1, and drank alcohol rarely or never. Women most likely to
withdraw due to reasons other than frailty were born in a non-English speaking country, had lower levels of education, did little or no physical activity and had poorer health; they were less likely to be obese. Women most likely to be lost to follow up were born in a non-English speaking country, were ex-smokers or current smokers, and reported having poorer health at baseline.”

13. It is unclear why the low-risk drinkers in table 2 were the reference category?

Please see our response to comment 8.

Minor revisions
1. Page 4 line 5, needs and “AND” instead of a comma. This has been corrected

2. Page 6 line 4 from bottom, need to be “through TO SURVEY 5” This has been corrected

3. Page 7, kilograms per metre squared is usually written as kg/m2. This needs to be amended. This has been corrected

4. Avoid using the abbreviation NHS. This has been corrected

5. On page 11/12 say that the prevalence in the cohort was lower than in the target population as this is not entirely clear at present. This has been done.

6. Label the figures as a) and b) for the left and right panels. This has been corrected everywhere.

Discretionary revisions

1. The hypothetical situations considered are rather limited and the research would have been improved with a more comprehensive hypothetical study, for example, looking at different levels of prevalence, prevalence levels that change over time in the population and also the impact on the overall results of the cohort study from the differences in the prevalence.

We have stated the aim of this paper more specifically and would prefer not to expand the paper considerably as would be necessary for the study suggested by the reviewer.

Editor’s comments
Please also do the following:

(1) Include the aims of your study within the background section of your abstract
The following sentence has been added to the background section of the Abstract
“The aim of this paper is to examine the effects of death and other forms of attrition on risk
factor prevalence in the study cohort and the target population over time.”

(2) Document, within your manuscript, whether the data used for your study is openly
available. If not, please clarify whether you have received ethics approval.

The following sentence has been added: “The study was approved by the ethics committees of
the University of Newcastle and the University of Queensland and informed consent was received
from all respondents and the data are openly available.”

Thank you for considering our manuscript and for the many helpful comments which we believe have
now improved the paper. We look forward to your opinion.

Yours sincerely

Annette Dobson

for the authors