Author's response to reviews

Title: Collecting household water usage data: telephone questionnaire or diary?

Authors:

   Joanne E O'Toole (joanne.otoole@med.monash.edu.au)
   Martha I Sinclair (martha.sinclair@med.monash.edu.au)
   Karin Leder (karin.leder@med.monash.edu.au)

Version: 4 Date: 29 September 2009

Author's response to reviews: see over
Dear Editors,

Re: Original revised Article entitled: ‘Collecting household water usage data: telephone questionnaire or diary?’.

Please find attached our revised manuscript entitled ‘Collecting household water usage data: telephone questionnaire or diary?’ All referees’ concerns have been addressed and we thank the referees for their comments. Referee comments have been reproduced below and our responses and actions relating to them are shown in red text (italics).

We have also included additional supporting documentation (Appendix 1: Computer Assisted Telephone Interview questions and Appendix 2: diary cards) as requested by reviewer 3 and editors.

As noted in prior correspondence, the manuscript is an original work, has not been previously published and is not under consideration for publication elsewhere. There is no competing financial interest of the authors and all authors of the manuscript have read the manuscript, have agreed that this revised manuscript is ready for submission to a journal and accept responsibility for the manuscript’s content.

Yours Sincerely,

Joanne O’Toole
Reviewer's report
Title: Collecting household water usage data: telephone questionnaire or diary?
Version: 3 Date: 10 September 2009
Reviewer: Kieran McCaul

Reviewer's report:
Minor essential revisions
First, the axes on the Bland-Altman plots need to have more values on them. Simply labelling the maximum and minimum values doesn’t help. Also the Y-axis should be labelled more informatively. The label “difference” should be “Difference: CATI – Diary”. Also the line of zero difference needs to be drawn on each figure.

The axes on the Bland-Altman plots now have more values on them and both the X and the Y axis have been labelled more informatively. The line of zero difference is drawn on each figure and represented as a dashed horizontal line. The legend to the figures has been changed in accord with the addition of the line of zero difference.

Discretionary revisions
The increase in variance associated with increase in the average that can be seen in the Bland-Altman graphs is perhaps not that unexpected since the respondents are being asked to estimate a count. Counts follow a Poisson distribution and a characteristic of this distribution is that the mean and the variance are the same. Hence the variance-average relationship in the graphs is not unexpected.

You would probably get a better indication of what was going on if you took the natural log of these counts before computing the average and the difference. What you should be focussing on is evidence of bias in the figures. If you fit regression lines to the points in these figures, you would be hoping to get a horizontal line near the zero difference line.

A regression line that was parallel to the zero-difference line, but above or below it, would indicate general bias in one of the instruments.

A regression that was not parallel to the zero difference line would indicate differential bias. This is what you see in Figure C.

To me, the results for washing machine loads and garden watering don’t look that bad, probably because these two activities tend to be done by one person in a household. The counts of toilet flushing suggest that the CATI response tends to underestimate the Diary response when the average count is high. In other words, in large households a single respondent underestimates the total flushes.

Natural log of the counts was taken before computing the average and the difference but did not provide additional information. Hence, ‘raw’ counts have been used as in the earlier manuscript. Comments made by the reviewer under ‘discretionary revisions’ have been incorporated into the text of the discussion.

Page 14/15: ‘…A comparison of diary and CATI results (Figure 1c) showed differential bias namely, that the CATI estimate (single respondent) combined with
an assumption of identical toilet flushing behaviour by all persons in the household, overestimates the total flushes in large households. ..'

. Page 16: ‘...For estimates of garden watering frequency and the number of laundry machine loads per week, the diary, compared with the CATI, showed general positive bias (i.e. the diary response was consistently higher)...

Reviewer’s report
Title: Collecting household water usage data: telephone questionnaire or diary? 
Version: 3 Date: 11 September 2009 
Reviewer: Gertjan Medema 

Reviewers report: 
The paper “collecting household water usage data: telephone questionnaire or diary?” from Joanne O’Toole, Martha Sinclair and Karin Leder is very clearly written and addressed, as the authors state, with important data gaps for the assessment of the (distribution of) exposure of the human population (in an Australia city) to contaminants in water through non-potable water use. The authors have made a commendable effort to include the details of the methods they have used. This is very valuable for researchers who wish to study exposure in similar (or other) settings. Overall, the collected data are only part of the exposure data needed in QMRA and it would have been very interesting to study human behaviour as this has a large impact on exposure (for example persons with automatic watering systems spent probably less time in the garden during watering than persons that have to do the watering themselves).

Major Compulsory Revisions
The discussion and conclusions now focus solely on the data collection methods. The collected water usage data themselves are equally valuable and should be highlighted in the discussion and conclusions.

Further information about the collected water usage data have been provided (an additional table is provided and median values as well as average and standard deviation values have been given in existing tables) and the value of data themselves are now highlighted in the conclusions. Also, the scope of the paper is stated to primarily address the comparison of data collection tools.

In background as follows:

‘...The objective of this study was to compare household water usage results obtained using two data collection tools, a computer assisted telephone interview (CATI) and a 7-day water activity diary, in order to assess the effect of different methodological survey approaches on results....’

In conclusion as follows: ‘....The collection of water usage data is important to address data gaps for the assessment of the distribution of exposure of the human
population in specific localities to contaminants in water through non-potable water use....”

Minor Essential Revisions

P13. Exposure estimates
Is the first conclusion that CATI and diary show highest agreement for most commonly performed water-using activities? It seems that number of toilet flushes is very different in CATI and diary.

The reviewer is correct in pointing out that toilet flushing is one of the most commonly performed water-using activities hence the conclusion should not be broadly made that there is highest agreement for most commonly performed water-using activities. The text has now been changed as follows:

Pg 14: ‘Lower levels of agreement between CATI and 7-day diary results were obtained for less frequently performed water-using activities with the exception of toilet flushing (frequently performed but also showing poor agreement) or where standard durations (e.g. as might occur with automatic pre-programmed systems) or frequently applied settings were not used....’

Appropriate changes have also been made elsewhere in the text:

ABSTRACT ‘.....Results of this study showed that the level of agreement between CATI and diary responses was greater for more frequent water-related activities except toilet flushing and those where standard durations or settings were employed...’

Pg 16: ‘...The observation of greater concordance between CATI and diary responses for more frequent and standard water-related activities except toilet flushing may reflect the greater likelihood that standard frequencies, durations and settings are known to all adult household members...’

P15. Last paragraph, second sentence. This appears to be incorrect in the statistical sense. When discordant results between CATI and diary would be equally likely to be lower of higher, there would not be a difference between the CATI and diary. The authors seem to refer to the fact that for some parameters the CATI yields higher results than the diary and for other parameters this is the reverse. The suggestion that this may be due to natural variations in water-related activities is too one-sided. Recall bias may possible explain the differences. I suggest rephrasing and discussion of the potential impact of recall bias.

The reviewer has indentified the ambiguity in the text as written. Accordingly, the second sentence, last paragraph has been deleted to avoid confusion. As correctly surmised by the reviewer, the intention was to convey that the CATI for some parameters (e.g. toilet flushing, hose and sprinkler duration, fixed manual watering system duration) gave higher results but for other parameters, the reverse occurred
i.e. the diary (e.g. for garden watering frequency and number of washing machine loads per week) gave higher results. The wording has now been changed to clarify this.

Pg 14: ‘...Overall, when considering all individual water uses and the relative performance of the diary and CATI, diary responses were not consistently higher or lower than CATI responses...’

Also, recall bias has been mentioned as explaining the differences in addition to natural variations (from week to week) and problems associated with individual making estimates for the household etc as follows:

Pg 16: ‘...Such differences between responses for CATI and diary may be associated with one or more factors including: recall bias of the CATI respondent [13]; natural variation in water-related activity that occurs from week to week (CATI and diary responses ‘referenced’ different 7-day periods); the survey period may not have been over a sufficient period to ‘capture’ the exposure of interest (e.g. if garden watering was performed every 1.5 weeks it may not have been included in either (or both) of the diary or CATI survey periods); computations to convert single respondent results to household results (not all household members behave in the same way); failure to complete diaries prospectively as intended or to record all activities and events [14]..”

Similar comment on p20 Conclusions, first sentence.

The first sentence of the conclusions has now been deleted.

P9 last paragraph: 2nd category should be ‘Poor to fair’

The classification of kappa measurements in the methods section (P9 last paragraph) has been changed.

Figure 1: explain what the different sizes of the data points indicate in the legend.

The meaning of the different sizes of data points is now given in the legend of the provided figures as follows:

‘....The larger the data points (circles) the higher the number of households that recorded these values....’

Table 3: Include title of second data column (Diary response)

This was an inadvertent omission and the title of the second data column is now provided.

Table 4: although this table is valuable for the comparison of the CATI and diary response, it would also be valuable to include a description of the average
number of flushes and its standard deviation (as for garden watering and laundry)

An additional table (Table 5) has now been provided

The quality of the figures should be improved.

The quality of figures has been improved with additions, as also requested by reviewer 1.

Discretionary revisions
The use of average and standard deviation as descriptive statistics suggest that the distribution of water use is normal. This may not be true for some of the water uses. Was this tested?

The median value has now been added to data tables to provide more information about the distribution of water use obtained using each of the water collection tools.

P3 Background
The first sentence is correct if it refers to the formal risk management process, but not correct if it refers to the more generic meaning of risk management. Suggest rephrasing.

This first sentence has now been rephrased as requested.

I suggest to accept this paper after the essential revisions are made. The paper is important to those closely related to this field of research. I (and previous reviewers) have reviewed the statistics.
I declare that I have no competing interests.

Reviewer’s report
Title: Collecting household water usage data: telephone questionnaire or diary?
Version: 3 Date: 30 August 2009
Reviewer: Stephen Luby
Reviewer’s report:

Major Compulsory Revisions
The conclusions are not supported by the results. Specifically, “Differences in CATI and diary responses confirmed the significant natural variability and the complexity of factors influencing water-related exposures.” is not supported by the data. The study demonstrates that the two methods found different results, but it’s data on genuine consumption was not collected it is a matter of unsupported speculation that the difference in results stem from natural variability.

The sentence: “Differences in CATI and diary responses confirmed the significant natural variability and the complexity of factors influencing water-related exposures.” has now been deleted
“Results showed the diary to be the preferred collection method for exposure data as diary responses were not subject to recall bias and the diary allowed collective recording, rather than an individual's estimation, of household water usage.” The study design did not permit an assessment of recall bias, therefore the authors cannot draw a conclusion about the relative validity of these methods. Indeed, this statement could have been made in the absence of any data, that is before the study was done. It is not a conclusion drawn from sound inference of the study results.

The conclusion that: “Results showed the diary to be the preferred collection method for exposure data as diary responses were not subject to recall bias and the diary allowed collective recording, rather than an individual's estimation, of household water usage,” has no longer been asserted. As per the reviewer’s suggestion, a statement about diary responses not being subject to recall bias and about the collective reporting using the diary versus individual reporting for the CATI is made but independently of any assertion that this can be concluded from this study.

Pg 17: ‘....The prospective recording of water-related activities using a diary is also another advantage of using a diary collection method compared with a CATI. Diary responses are not subject to recall bias (assuming prospective completion) hence it is probable that the diary information provides the more accurate figure, compared with the CATI. Recall bias may be responsible for either under or overestimation as respondents may forget relevant episodes or they may report an episode from outside the period of interest as if it had happened within the period (forward telescoping) or vice versa (backward telescoping) [13]..’

“. . . technological advances, such as webbased capabilities, will enable the use of diaries to become more economic.” This is a speculation, not a conclusion based upon the data. Importantly, the study presented no data on the use of the Internet for collecting such information.

Agreed. The statement that ‘....technological advances such as web based capabilities, will enable the use of diaries to become more economic’ is no longer assumed as a conclusion of this study.

This article would be improved if the authors expanded on the limitations of this study, specifically the limitations on inference that can be drawn from this comparison. Most notably, since they do not have an independent measure of water consumption, the validity of both that their measurements is uncertain. There is reason to believe that the estimates are biased. An important potential source of bias in these estimates is that water is in short supply in this community and residents are being urged to conserve water. Because of this strong normative pressure, respondents might be inclined to report ideal aspirational behavior rather than actual behavior. If this area of work is important, perhaps the authors want to conclude that additional research on the validity of different data collection methods would be appropriate.
Another problem with validity is that recruiting only those participants who agree and who are motivated by the financial reward may select a population whose consumption and whose assessment of consumption is different from the general population. Indeed, the authors express concern that because of high refusal rates CATI risks becoming less representative in the future. However, the diary approach had even lower response rates, so it does not seem to resolve the difficulty with representativeness.

A section on limitations has been added and reporting of aspirational behaviour by respondents has now been discussed, as has the problem of validity and response rates.

Minor Essential revisions
The method section should make clear over what time frame the diary was collecting data. Were you collecting data on one week of water use? one day? three weeks? Also, it needs to be clear that the time frame of these two measurements (CATI versus diary) were at different times.

The time frame has now been made clear (ie 7-days for both the CATI and diary) as follows:

Pg 7: "... Computer Assisted Telephone Interview: ....to give a number estimate for the 7-days immediately prior to the interview.”

Pg 7/8 ‘Water activity diary...Each card provided for 7 days recording.’

Pg 20’... Limitations... This study was subject to a number of limitations including the sequential recruitment strategy in which householders were firstly recruited for the CATI and then (once the CATI was completed) were recruited to complete a 7-day water activity diary. This meant that the CATI 7-day period, always preceded the 7-day recording period for the diary. This limitation was countered as best as possible by confining the survey period to a maximum of 12 weeks...’

It is not clear if the time estimates for collecting data referred to the estimated time for the data collectors or for the participants. If these data were systematically collected, it would be more informative if the methods for data collection in the methods section and the results in the results section.

It has now been made clear that the time estimates are those of the researcher. Time estimates were not systematically collected; hence no change has been made to the data presentation format.

The speculation that the Internet would make the diary methodology easier to use seems to be a perspective that only considers the researchers, not people filling out the forms. Most persons will not have to live Internet connection at every place where they use water. If people are suppose to aggregate the data it generates themselves via the Internet, one would predict that the rate of participation would drop.
As per the reviewer’s comments, the suggestion is made that future web based diary collection should be explored. No speculation is made about participation rates.

**Discretionary Revisions**

The issue of accurate measurement of water consumption is relevant in our increasingly water short world. It would be useful if the authors included a copy of the CATI and the diary instruments as appendices.

A copy of the CATI and diary instruments are given in Appendices 1 and 2.

The discussion would be strengthened by a more general discussion with appropriate scholarly references for difficulties in recall.

The difficulties in recall are addressed and referenced.

Pg 17: ‘..Diary responses are not subject to recall bias (assuming prospective completion) hence it is probable that the diary information provides the more accurate figure, compared with the CATI. Recall bias may be responsible for either under or overestimation as respondents may forget relevant episodes or they may report an episode from outside the period of interest as if it had happened within the period (forward telescoping) or vice versa (backward telescoping) [13]...”

Many readers may be unfamiliar with the technology of half and full toilet flushes. It would be useful to explain the principle of these devices if they are commonly used in the study communities.

An explanation of dual flush toilet flushes (half and full) has been provided as follows:

Pg 7: ‘.....Since the 1980’s, as a water saving measure, Australian regulations have mandated that dual flush toilets are installed in new homes and when existing homes are renovated. Accordingly, respondents were asked to give a number estimate for both half and full toilet flushes per day...’

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

**Quality of written English:** Acceptable

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

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