Author’s response to reviews

Title: Skipping breakfast among 8-9 year old children is associated with teacher-reported but not objectively measured academic performance two years later

Authors:
Kylie Smith (k.j.smith@utas.edu.au)
Leigh Blizzard (Leigh.Blizzard@utas.edu.au)
Sarah McNaughton (Sarah.McNaughton@deakin.edu.au)
Seana Gall (Seana.Gall@utas.edu.au)
Monique Breslin (Monique.Breslin@utas.edu.au)
Melissa Wake (Melissa.Wake@rch.org.au)
Alison Venn (Alison.Venn@utas.edu.au)

Version: 1 Date: 08 Apr 2017

Author’s response to reviews:
7 April 2017

Dear Dr Bao,
Thank you for the opportunity to submit a revised version of our manuscript entitled ‘Skipping breakfast among 8-9 year old children is associated with teacher-reported but not objectively measured academic performance two years later’ (NUTN-D-16-00140). We have addressed the reviewers’ comments, as outlined in our response to reviewers. The changes made to the manuscript have been highlighted in yellow.

Thank you in advance for your time and consideration of our work. I look forward to hearing from you.

Best wishes,
Kylie Smith
Editor Comments:

Based on comments from reviewers, this decision is made based on the understanding that any revised manuscript will need to be formally assessed by a statistical advisor.

Reviewer #1: Comments to the author:

This is well-written paper on breakfast skipping behaviours in children and it's associations with teacher and objectively reported academic performance longitudinally. It is a novel paper that fills a gap in the literature.

I have only minor comments for the authors:

Abstract:
1. The conclusion at present is confusing, it doesn't match the conclusion of the main body of the paper and it brings in a new concept (poverty) which isn't mentioned earlier in the abstract. I suggest revising.

REPLY: We have revised the Abstract’s conclusion to make it more consistent with the conclusion of the main text, and removed the reference to poverty.

CHANGE TO TEXT: (Page 4, lines 10-22) ‘In this national sample of 8-9 year old Australian children, skipping breakfast occurred at low levels, and showed little association with measured academic performance two years later. This contrasted with teacher perceptions of lower academic performance among skippers than non-skippers, most likely reflecting confounding. This underscores the importance of objective measures of academic performance to avoid inflated effect estimates and, potentially, unnecessary and costly population interventions.’

Background:
2. Paragraph 1: requires references for the first and second sentences.

REPLY: The first sentence of the background has been removed and references have been added to the revised manuscript to support the statements in the second sentence.

CHANGE TO TEXT:
(Page 5, line 8) ‘Skipping breakfast has been linked to reductions in in cognition and academic performance [1-3]…’

3. Paragraph 2: please highlight that this systematic review was conducted in 2009.
REPLY: In the revised manuscript we now report that this review was conducted in 2009.
CHANGE TO TEXT: (Page 5, line 21) ‘A systematic review, published in 2009, examined 45 studies…’

4. Paragraph 3: please highlight that this systematic review was conducted in 2013.
REPLY: This detail has been added to the revised manuscript.
CHANGE TO TEXT: (Page 5, line 41) ‘A 2013 review examined…’

5. Paragraph 2 & 3: Please add more details re: outcomes assessing in these reviews to clearly show/highlight the similarities and/or differences between the 2009 and 2013 review.
REPLY: The 2009 review included a range of cognitive outcomes including memory, attention and test grades. The 2013 review focused on classroom behavior and school grades, which the authors proposed were more relevant to everyday situations.
CHANGE TO TEXT:
(Page 5, lines 21-25) A systematic review, published in 2009, included 45 studies that examined the association between skipping breakfast and cognitive performance, including memory, attention and test grades.

(Page 5, lines 41-48) A 2013 review examined the association between skipping breakfast and classroom behavior or academic performance (school grades or standardized achievement tests) among children and adolescents (aged 5 to 19 years) [1].

Methods:
6. Paragraph 1, page 6, line 58: specify here that baseline was in 2004.
REPLY: To avoid confusion with the baseline data collected on breakfast skipping for this paper (taken at Wave 3 of LSAC), we have amended the sentence in question to indicate that 2004 was the first wave of the study.
Children were recruited for Growing up in Australia: the Longitudinal Study of Australian Children (LSAC) during 2004, aged 4-5 years (Wave 1, N=4,983).

7. Paragraph 1, page 7, line 32: please clarify why Wave 3 may have been skipped for the NAPLAN test.
REPLY: Permission to link with the NAPLAN test was first requested in Wave 3. If the child did not participate in LSAC’s Wave 3, then permission was requested in Wave 4. The text has been reworded in the revised manuscript to make this clearer.

CHANGE TO TEXT: (Page 7, lines 39-42) ‘permission to link with the child’s NAPLAN results at wave 3 (or wave 4, if the child did not participate in wave 3).’

8. Page 8, line 12: please specify how many children skipped breakfast more than once
REPLY: This detail has been added to the revised manuscript.

CHANGE TO TEXT: (Page 8, line 22) ‘because so few children skipped breakfast more than once (n=17).’

REPLY: This sentence has been reworded in the revised manuscript to make it clearer.

CHANGE TO TEXT: (Page 8, lines 52-54) ‘NAPLAN data for 4,159 children were linked to the LSAC dataset…’

10. Page 9, line 31: please clarify what you mean by "the outcomes were considered as covariates"
REPLY: For each outcome, we examined whether the sociodemographic variables associated with skipping breakfast and all other outcome variables (behavior, teacher-reported performance and the standardized tests) could be acting as confounders. For example the behavior variables were considered as covariates in the analysis examining the association between skipping breakfast and academic performance. We have clarified this in the revised manuscript.
CHANGE TO TEXT: (Page 9, lines 44-51) ‘Covariates considered for inclusion in the adjusted models included variables associated with skipping breakfast and the other outcome variables (for example the behavior variables were considered as covariates in the analysis examining the association between skipping breakfast and academic performance).’

11. Page 9, line 52: please list/summarise the 7 indicators of household hardship.
REPLY: In the revised manuscript we now list all seven indicators that were included in the household hardship score.

CHANGE TO TEXT: (Page 9, lines 14-26) Parent/caregivers were asked to report if they had experienced any of the following situations in the previous 12 months because they were short of money: inability to pay bills on time; unable to pay mortgage or rent on time; went without meals; were unable to heat or cool the home; pawned or sold something because needed cash; sought assistance from welfare or community organization; unable to send child to kindergarten/preschool/child care for as much time as they would like (potential score 0-7) [16].

Results:
12. The numbers in-text do not appear to match the numbers in Figure 1 (i.e. 2332 is mentioned in-text but doesn't appear in Figure 1)
REPLY: In Figure 1 we reported the number of participants with each of the outcomes at Wave 4, but did not report the total sample size, which may be confusing to the reader. We have now added the total sample size and a footnote to the revised Figure 1. Please note, in the original manuscript we did not report those who were excluded due to missing covariate data (n=52). The sample size for the analysis is 2,280. We have corrected this error in Figure 1 and throughout the manuscript.

CHANGE TO TEXT: See Figure 1.
(Page 12, line 4) ‘Of the 4,331 eligible children, 2,280 were included in the main analysis (Figure 1).’

13. The section regarding ethnicity on page 11 at lines 53-60 would be better suited for the methods or discussion, not results.
REPLY: We have moved this sentence to the methods section in the revised manuscript.
Ethnicity was considered as a potential confounder in the analysis, but was not included in any of the final models as it did not change the coefficient of breakfast skipping by at least 10% when included in the model (our criterion for including a potential confounder [18]).

14. Page 12, line 35: the values for writing and numeracy in the final model for the difference between skippers and non-skippers do not match Table 4.
REPLY: Thank you for pointing out this error. We have corrected the numbers in the text.

CHANGE TO TEXT: (Page 13, lines 14-16) the differences in scores between skippers and non-skippers were less than 3% (range 0.8 for writing to 13.2 for numeracy).

15. Tables: please give an indication of the sample size in the heading of each table.
REPLY: The number of participants in each group (never skipped or ≥1 skip) is reported for each variable within the table, as the sample sizes vary due to missing data. In the revised manuscript we now also report the total sample size in the title of each table.

CHANGE TO TEXT:
Table 1. Baseline characteristics of breakfast skippers and breakfast consumers, aged 8-9 years (N=2280)
Table 2. Longitudinal associations between skipping breakfast aged 8-9 years and teacher-reported academic performance aged 10-11 years (N=1924)
Table 3. Longitudinal associations between skipping breakfast aged 8-9 years and teacher-reported behavior aged 10-11 years (N=1665)
Table 4. Longitudinal associations between skipping breakfast aged 8-9 years and national standardized test (Year-5 NAPLAN) results (N=2158)
Supplemental Table 1. Differences between children who were included and excluded from the analyses (N=4,331)
Supplemental Table 2. Cross-sectional associations between skipping breakfast aged 8-9 years and teacher-reported academic performance aged 8-9 years (N=1,953)
Supplemental Table 3. Cross-sectional associations between skipping breakfast aged 8-9 years and teacher-reported behavior aged 8-9 years (N=1952)
Discussion:

16. Page 14, paragraph 3, lines 40 onwards: This could be revised and separated into two paragraphs (1, national standardised tests; 2, teacher-reported assessment) to assist with clarity of the argument

REPLY: The purpose of this paragraph is to discuss possible reasons for the different results between the standardized tests and the teacher-reported assessment. We have reworded the paragraph and hope this is now clearer.

CHANGE TO TEXT: (Page 15, line 38 to page 16 line 12) ‘There are several potential explanations as to why skipping breakfast was associated with poorer teacher-reported academic performance but not with the national standardized tests. Skipping breakfast was weakly associated with reading and numeracy in the national standardized tests, but the associations attenuated after adjusting for SES and other confounders. Residual confounding is a possible reason for the association between skipping breakfast and teacher-reported assessment, which was subjective and may have been influenced by other factors associated with skipping breakfast such as perceptions of the home environment and family support. This highlights the importance of using objective measures of academic performance. It is also possible that some children may perform differently in formal test situations than in other teacher-assessed classroom tests and assignments.’

17. Page 15, paragraph 3, lines 33 onwards: Provide information regarding the age of participants in these studies to assist with comparison to between studies and with your study.

REPLY: These studies were conducted in 9-14 year old children. We had already reported this on Page 16, line 40, so have not amended the manuscript further on this point: ‘The prevalence of skipping breakfast was lower than in other international studies using national data [9, 10, 22] with only 10% of children skipping breakfast at least once. This could be explained by the young age of our cohort, as skipping breakfast increases with age [9, 23] and previous studies included older children (9-14 years old).’

CHANGE TO TEXT: None.

18. Page 15, line 60: In what population was this systematic review conducted? Please specify.
REPLY: This systematic review included studies of children, adolescents and adults. This information has been added to the revised manuscript.

CHANGE TO TEXT: (Page 17, lines 9-12) A recent systematic review, of studies conducted with children, adolescents and adults, reported there…

Conclusion:

19. The last sentence is long and could be split into two. The idea about breakfast programs improve diet quality and nutrient intake also does not feature anywhere else in the discussion. If this is to remain in the conclusion than it should be discussed/raised earlier in the manuscript.

REPLY: The text referring to diet quality and nutrient intake has been deleted, which has shortened this sentence.

CHANGE TO TEXT: (Page 17, lines 52-55) The following text has been deleted ‘…where breakfast programs may have the ability to considerably improve diet quality and nutrient intake.’

Reviewer #2: Comments to the author:

This manuscript describes a study investigating associations between skipping breakfast and academic performance, longitudinally, in 8-9 year old children.

Overall the manuscript is well written and presented.

1. The background is succinct providing some rationale for conduct of the study however there is no justification for the selection of this particular age group of children, or was it convenience? For the other literature presented in this section there is no indication of age for many of the studies. Does the age at which the children are investigated impact on the outcomes?

REPLY: In the revised background section we now report the age range for participants included in each study. To our knowledge no studies have examined whether the association between breakfast skipping and academic outcomes differ by age and we now recommend that future studies examine this. The LSAC study was used as a convenience sample and this information has also been added to the revised manuscript.

CHANGE TO TEXT:
‘The review focused on school-aged children but the age of participants included ranged from 3 years to a mean age of 21 years.’

‘…among children and adolescents (aged 5 to 19 years)…’

‘However, LSAC – a convenient data source to examine these hypotheses - did not have an overt focus on diet…’

‘Further research is also needed to determine whether the association between skipping breakfast and academic performance differs by age and whether there are particular ages at which skipping breakfast has greater impacts on academic performance.’

2. Noted in the methods, a comment on how breakfast skippers were defined. Please provide rationale for the assumption that skipping on one day is indicative of usual pattern or breakfast? It seems a long bow to draw especially when you also comment that so few children skipped on more than one day. 

REPLY: We agree with the reviewer that skipping breakfast on one day may not be indicative of usual patterns. Data were collected over three days, which allowed us to identify children who had irregular breakfast patterns. We were unable to classify the children into finer categories of breakfast skipping (skip 1 day, 2 days or 3 days) as very few children skipped breakfast on more than one occasion (page 8, line 22). The revised Limitations section now notes that some children who were classified as skippers may go to school without breakfast one or two days per week but others may skip breakfast less frequently. We also report in the discussion that our results should not be considered generalizable to samples with a high percentage of children who regularly go without breakfast (page 14, lines 24-27).

CHANGE TO TEXT: (Page 14, lines 36-49) Breakfast data were collected over three days. While this allowed us to identify intermittent skippers better than would have been possible with data collected on just one day, this may still not fully reflect children’s usual breakfast habits.
3. Paragraph at bottom of page 10 indicates that children were allowed to be included if they were missing one diary but figure 1 indicates that a large number of children were excluded because they had missing data for one or more breakfast occasion. Is this referring to the same thing? If so, please clarify. Further to that point, Supplemental Table 1 indicates that 1927 children have data regarding breakfast status which is not clear in the figure and again appears to contradict the comment about inclusion if missing one diary. I may have this wrong but I believe this needs more clarity.

REPLY: In Supplemental Table 1 we wanted to compare the percentage of participants who skipped breakfast among those who were included in the main analysis and those who were not. For this we used breakfast consumption on the day of the parent/caregiver interview, as we had nearly complete data for this measure. In the sensitivity analysis we included those who had breakfast data at the interview and at least one diary (could be missing breakfast data from the other diary). We have added footnotes to Supplemental Table 1 and Figure 1 to help clarify.

CHANGE TO TEXT: Figure 1 1488 of these children (those with breakfast data from the interview and one diary) were included in a sensitivity analysis.

Supplemental Table 1 1 Breakfast consumption reported by the parent/caregiver at the face-to-face interview was assessed using the question “Did <study child> eat breakfast today?”. This measure of breakfast consumption was used for this analysis as nearly all participants (those included and excluded from the main analysis) had data for this question.

4. Table 1 reports n=250 skipped but Supplemental Table 1 indicates n=69 skipped. Further, the text indicates 2.9% skipped which is not consistent with n=250. Please clarify.

REPLY: Table 1 reports the number of children who skipped breakfast on at least one of the three breakfast occasions (face-to-face interview or two diaries, n=243), whereas Supplementary Table 1 only reports the number who did not eat breakfast on the day of the interview (n=64). As mentioned above, we wanted to compare the percentage of children who skipped breakfast among those who were included and excluded from the main analysis and the interview data was the most complete measure. We have added footnotes to Table 1 and Supplementary Table 1 to clarify. Please note (as mentioned in response to Reviewer 1 point 12 above) in the original manuscript we did not report those who were excluded due to missing covariate data (n=52).
After excluding these participants the number of skippers has decreased slightly (243 instead of 250).

The 2.9% refers to the percentage who skipped breakfast on the day of the interview, as reported in the Supplemental Table. We now refer the reader to the Supplementary Table to make it clearer where this data comes from.

CHANGE TO TEXT:
Table 1 Breakfast consumption was reported by a parent/caregiver on three separate days: by face-to-face interview and two subsequent time use diaries.

Supplemental Table 1 Breakfast consumption reported by the parent/caregiver at the face-to-face interview was assessed using the question “Did <study child> eat breakfast today?”. This measure of breakfast consumption was used for this analysis as nearly all participants (those included and excluded from the main analysis) had data for this question.

(Page 12, lines 15-20) Compared with children who were included in the analysis, those not included were more likely to have skipped breakfast on the day of the face-to-face interview (2.8% versus 6.7%, respectively, Supplemental Table 1)...

5. Table 4 - appears that the result for numeracy was significant in the fully adjusted model (P=0.037). Please comment.
REPLY: The difference in the numeracy test scores between the never skippers and the breakfast skippers was less than 3%, so while it was weakly statistically significant we do not believe it is a clinically significant result. We have amended the text in the discussion.
CHANGE TO TEXT: (Page 13, lines 47-54) Although a weakly significant difference between breakfast skippers and non-skippers was observed in one of the five NAPLAN scales (Numeracy, p=0.04), the difference between the two groups was less than 3% and unlikely to be of great importance.
6. Given the definition of breakfast skipping the results may be overstated. Please consider moderating the message in the discussion.

REPLY: The findings from this study (and another study using national Australian dietary data, manuscript under review) suggest that not many Australian children are regularly skipping breakfast. Therefore we would not expect widespread interventions that aim to reduce breakfast skipping in this or similar populations to improve academic outcomes. However, we have reported in the discussion that our findings may not be generalizable to samples where a higher percentage of children regularly go without breakfast (page 14, lines 32-34).

CHANGE TO TEXT: None.

7. Page 13 - paragraph on limitations. You comment that children who skip breakfast on one in three days may be going to school without breakfast one or two days each week. Equally they could only skip once a month or that could be the only skip in their entire school life. I don't believe that you can make such comments without some evidence to back them up, or at least consider the alternatives.

REPLY: In the revised manuscript we now report that children classified as skippers may be going without breakfast one day a month or less frequently. We also report in the limitations that ‘our results may not be generalizable to populations where children regularly go without breakfast’ (Page 14, lines 24-27) and ‘stronger associations with academic performance may be observed in children who regularly skip breakfast.’ (Page 14, lines 32-34).

CHANGE TO TEXT: (Page 14, lines 37-49). ‘Breakfast data were collected over three days. While this allowed us to identify intermittent skippers better than would have been possible with data collected on just one day, this may still not fully reflect children’s usual breakfast habits. The children who usually skip breakfast one out of three days may go to school without breakfast one or two days each week but other children classified as skippers may go without breakfast less frequently.’

Additional changes

We rerun the sensitivity analysis examining cross sectional associations between breakfast skipping and teacher reported academic performance and classroom behavior, to exclude those who were not included in the main analysis. We did this to ensure that the findings between the
main analysis and the sensitivity analysis were comparable. This resulted in only minor changes to the results (Supplemental Tables 2 and 3 have been updated to reflect these changes) and did not change our conclusions.