Author's response to reviews

Title: Australian children's consumption of caffeinated, formulated beverages: a cross-sectional analysis

Authors:

Kelsey Beckford (k.beckford@deakin.edu.au)
Carley A Grimes (carley.grimes@deakin.edu.au)
Lynn J Riddell (lynn.riddell@deakin.edu.au)

Version: 3
Date: 6 November 2014

Author's response to reviews: see over
To whom it may concern,

Thank you for reviewing our manuscript, providing your feedback and allowing us the opportunity to improve the quality of our paper.

Comments and revisions are detailed below, and changes have been made within the manuscript.

With thanks,

Kelsey Beckford

Reviewer 1: Rosanna Watowicz

Major Compulsory Revisions

The justification for this study/explanation of its significance still needs to be strengthened and the conclusions do not seem to match what was actually studied. One of the arguments made in the manuscript is that the addition of caffeine to sugar-sweetened beverages may increase SSB intake (since caffeine is mildly addictive). However, SSBs are not studied separately from artificially sweetened beverages in most of the outcomes. The authors conclude that “these data add to the weight of evidence that removing or further restricting the addition of caffeine to formulated beverages could result in decreased consumption of SSB...” (paragraph 2 in Discussion). While previous studies may support that statement, this study does not provide any evidence as to whether caffeine is related to higher SSB consumption. This study only shows that a majority of CFB intake was as SSB (75-80%), but this could simply be reflective of overall patterns in SSB consumption (i.e. perhaps SSBs represent 75-80% of all formulated beverage consumption). The authors could have examined whether children consumed more caffeinated SSBs versus non-caffeinated SSBs, which may have provided some evidence that caffeine is related to increased SSB intake. Additionally, there is not a strong argument that formulated beverages containing caffeine are any more detrimental to health than beverages with naturally occurring caffeine (although this was improved since the first version).

Table 2 indicates that within the total population, 44% of all formulated beverages consumed were caffeinated, additionally consumers of these beverages had significantly higher intakes of caffeine and total energy, when compared with non-consumers (Table one). We have modified the text within the discussion to indicate that the inclusion of
caffeine in formulated beverages may be one factor promoting the consumption of these beverages, and this in turn may put consumers at risk of previously established adverse health outcomes associated with increased intakes of SSBs.

Lines 284-293: “Consumers of CFB were found to have higher energy intakes and were more likely to be overweight or obese. SSBs have been associated with overweight and obesity[20-23], and the inclusion of caffeine in these beverages has been proposed to increase consumption[26]. Previous work has indicated that removing or further restricting the addition of caffeine to formulated beverages could result in decreased consumption of SSB and may result in reduced energy intake in this age group[27]. As 44% of all formulated beverages consumed within the current study were caffeinated, removing or decreasing caffeine in beverage formulation has the potential to decrease consumption of these beverages. Over time this may help to counter the trajectory of unnecessary weight gain in children and adolescents[27].”

Minor Essential Revisions

1. **Figures are missing titles**

   Figure titles are found on page 24 to correspond with the journal submission requirements

2. **Paragraph 1 of the Background states that the allowable concentration of caffeine ranges from 150-200mg/L. However, later in the paragraph the authors state that 320 mg/L is allowed in energy and sports drinks.**

   This has been amended.

3. **Throughout the paper, the term “soft drinks” (defined in paragraph 2 of Beverages Classification) seems to be used instead of the term “formulated beverage”. This is particularly confusing given that the “soft drinks” category includes soft drinks. For example, in paragraph 1 of ‘CFB intake: CFB consumers only’, “CFB accounted for 83% of all soft drinks consumed…” it is unclear if this is referring to only soft drinks or all formulated beverages.**

   The term ‘soft drinks’ has been replaced with the term ‘formulated beverages’ as per
your suggestion. The only other reference to soft drinks in the manuscript is that in the description of the food code categories (i.e beverage classification line 152-153), where a reference to the AUSNUT database has now been included.

4. In the section “CFB intake: all participants” (first and third sentences), authors state that intakes were “increased”. Please rephrase to be reflective of a cross-sectional study. For example, CFB intake was higher with increasing age (instead of “increased with increasing age”).

The text has been revised.

Discretionary Revisions
1. In Table 1, in the rows showing gender, age, SES, and weight, it may be more interesting to show row percent instead of column percent. For example, currently the table shows that 55% of CFB consumers are male. It seems more pertinent to show that 16% of males are CFB consumers

Thank-you for your suggestion, the table remains in its current format and will take advice of the editor.

2. Figure 3 seems unnecessary since energy drinks account for such a small proportion of intake. Recommend simply describing in the text

Figure 3 has been removed and described in text as per your suggestion.

Reviewer 2: Amy Branum

Major Compulsory Revisions
1. Although the Authors have provided better clarity regarding results, it seems as if estimation of mean caffeine intake in Tables 3 and 4 could be useful in addition to the estimation of grams of CSB consumed. Since the focus of the manuscript is on beverages with added caffeine, and not all soft drinks or sugar-sweetened beverages, it seems as if this would be a natural part of the results. Is there a compelling reason for not including these estimations?

Differences in total caffeine intake between CFB consumers and non-consumers is highlighted in table one. In addition, caffeine from CFB data has been included in tables
three and four, as per your suggestion.

2. **In addition, there is still some confusion on presenting results for all children versus just caffeine reporters versus CSB consumers. In the Results section the percentages of all caffeine consumers and all CSB consumers are described but Table 2 is among all children, not just caffeine consumers, and Table 3 is just among CSB consumers. It is hard to know what the most important comparisons are but it seems as if it should be between caffeine consumers and CSB consumers since non-CSB consumers also include the 22% of children who did not consume caffeine at all.**

The results are presented as the total population (n=4,487) for tables 1 and 2 and Figure 1. The results have further been broken down into CFB consumers only (n=642) for tables 3-5 and figures 2-4, to extrapolate differences in consumption across age group and SES. Due to the extremely skewed nature of CFB consumption within this cohort, it was not possible to examine these differences within the population as a whole. This breakdown also allowed for the examination of the differences in caffeine and energy intakes between those who consumed these beverages and those who did not. No data are presented within caffeine consumers as a whole, as the primary focus of this paper was to specifically examine the intakes of formulated beverages containing added caffeine due to the previously established links between the beverages themselves and adverse health outcomes.

3. **Methods, Beverage Classification section, p. 8, lines 166-167: The Authors mention here that caffeine consumption from CFBs were deducted from total caffeine from food sources but how were coffee and tea treated since they were excluded from the CFB designation?**

This sentence is referring to how caffeine from food sources was determined, through the deduction of caffeine from all beverages (using aggregation by food code outlined in beverage classification section of the methods) from mean daily caffeine intake. This has been clarified through the adjustment of this sentence to read: lines 166-168: *“This amount was then deducted from total daily caffeine intake, to determine caffeine intake from food sources.”*
4. **Results section: p. 10, lines 201-203:** The change to the sentence regarding the percentage of participants consuming CFB (15%) versus any caffeine (78%) is helpful but it still seems like a big discrepancy given that such a large proportion of caffeine among youth typically comes from soft drinks. *It is possible that this relatively low percentage is a result of how you classified CSBs but it still seems low.*

This is the first data examining the level of consumption of these beverages within a population of Australian children and adolescents. In accordance with the Food Standards Australia and New Zealand Food code, the inclusion of caffeine in formulated beverages is restricted to cola beverages or sports/energy drinks. Thus the comment that “a large proportion of caffeine among youth typically comes from soft drinks” may not be reflective of what occurs within the Australian food environment (as per the current data) due to differences in regulation of the addition of caffeine to beverages. For example, in countries such as the United States, caffeine can be added to beverages such as Sprite and 7Up, which is not permitted in Australia. In addition, the low percentage of consumers within this cohort could be reflective of the overall lower intake of formulated beverages when compared to countries such as the US (Grimes CA, Riddell LJ, Campbell KJ, Nowson CA. *Dietary salt intake, sugar-sweetened beverage consumption, and obesity risk.* Pediatrics. 2013;131(1):14-21; Grimes C, Wright J, Liu K, Nowson C, Loria C. *Dietary sodium intake is associated with total fluid and sugar-sweetened beverage consumption in US children and adolescents aged 2-18 y: NHANES 2005-2008.* The American Journal Of Clinical Nutrition. 2013; 98(1): 189-196).

5. **Discussion section: p. 13, lines 284-286:** It is unclear how the results of the paper add to the evidence that removing or restricting caffeine could result in decreased consumption of SSB, especially since SSBs were not directly assessed as part of the analysis. *It is recommended that this sentence be deleted.*

This section has been modified

6. **Discussion section p. 14, lines 291-293:** Here the Authors state that total caffeine intakes were below recommended intake levels but they did not assess this among children who reported greater CSB consumption just overall CSB consumers and non-consumers. *It seems plausible that caffeine intakes could be greater than*
recommended among the heavier consumers of CSBs. Also, because the amount of intake is downplayed here it asks the question of why intake of these beverages is problematic. In the section on intervention it is recommended that children’s consumption of CSB should be lowered, but why if overall intake is low and are only consumed by a relatively small percentage of children overall? The Authors have not made a compelling case why CSB consumption is this population may be problematic.

In response to your comment, we have examined the total daily caffeine intake of the top tenth percentile of CFB consumers, and have determined the median (IQR) to be 104(82-127)mg/day. This has been added to lines 242-245: “Of the top tenth percentile of CFB consumers (n=64), median (IQR) intake of total daily caffeine was 104(82-127) mg/day. The majority (69%) of the consumers within the top tenth percentile fell within the 14-16 year old age group.” We also examined caffeine intake on a mg/kg basis, amongst the 90th percentile consumers, and found that consumption still fell within recommended ranges. However, as indicated in tables 1, CFB consumers consumed significantly more caffeine than non CFB consumers, and on average 42mg of caffeine was provided from CFB (table 3). Thus the addition of caffeine to formulated beverages, significantly increases the amount of caffeine children and adolescents are consuming. As CFB have become more available in recent years it is important to continue to track the amount of CFB consumed within this age group to ensure caffeine levels do not start to exceed current recommendations. In addition, research into the impact of caffeine (even moderate doses as observed in this study) on the developing brain is required to further strengthen the evidence base underpinning current recommendations. We have modified the text within the discussion, lines 303-305: “The results from this study provide important baseline data for tracking changes in consumption over time. By monitoring consumption patterns over time, potential areas for intervention can also be identified.”

7. **Figure 3:** I maintain that this Figure is not particularly insightful since the overwhelming majority of CSBs are classified as non-energy drinks. Given the number of tables and figures in this paper I would suggest just mentioning in the text that energy drinks accounted for less than 5 percent of intake and varied little by age.

Figure 3 has been removed, and the results described in text.