The Australian Beverages Council

Submission to:

NHMRC Australian Dietary Guidelines

28 FEBRUARY 2012

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Preface

The Australian Beverages Council (the Beverages Council) is the peak body representing the $6 billion non-alcoholic beverage industry. In Australia the non-alcoholic refreshment beverage industry employs over 10,000 Australians, and is a major contributor to the domestic economy through the provision and production of an extensive and innovative range of beverages. This, in turn, supports a large number of Australian producers, manufacturers and large and small businesses in addition to providing significant support and funding to community organisations.

The Beverages Council provides a single, united industry voice to a range of stakeholders including government, non-government organisations, media and general public. Membership of the Beverages Council comprises over 95% of the non-alcoholic industry's production volume, and is comprised of multi-national companies and small and medium businesses.

The Beverages Council's guiding principles focus on: Safety; Education; Accountability; Education; and Collaboration. The industry achieves this through a range of commitments to a suite of policies and positions that underpin these values; e.g., Health and Wellbeing; Marketing and Communications; Product Information; and Environment. These are clearly articulated, substantiated and monitored documents to ensure our membership adheres to best practice.

In this submission, the Beverages Council will focus on beverage industry specific issues that demonstrate the strong, proactive approach taken by our members to enable the community to make informed, healthy beverage choices. Additional information is included in the Appendix.

A full list of the Beverages Council members is included in the Appendix (Item 2).

Executive Summary

The Australian Beverages Council (the Beverages Council) considers that the currently available scientific evidence **does not support** a specific focus on limiting sugar-sweetened beverages (SSB) as a means to combat obesity.

In order to help reverse the obesity trend and reinforce overall good health, the Beverages Council believes the Dietary Guidelines should recommend the consumption of a balanced, moderate and varied diet that both limits kilojoule intake and meets nutritional needs, while encouraging physical activity to improve health and maintain energy balance.

Nevertheless, the Beverages Council understands and acknowledges that sugar is one of the most highly contested areas of the Dietary Guidelines with polarised views amongst key stakeholders.

However we believe that the effort, time and cost expended on a single food item in the search for the cause of the Australian obesity epidemic is somewhat simplistic and the approach is **not evidence based**.

The draft dietary guideline, "in particular, limit sugar-sweetened beverages" **unfairly targets one category** of the food supply that contributes a relatively small and declining proportion of total energy intake, even in children (e.g. 1.6% and 2% of total energy intake from sugar-sweetened soft drinks and fruit juice in the latest national survey). [1]

The Beverages Council fully supports the NHMRC's Chief Executive Officer, Professor Warwick Anderson's statements that:
'Consumers need the whole picture about the nutritional value of food, not just selected information from a handful of studies'.
'This is where the NHMRC's Australian Dietary Guidelines come in. They are not based on one study or two, or 10 or 20. They're based on evidence included in its 2003 dietary guidelines, and on 55,000 new studies, each scrutinised to see if it has found sufficient evidence to support its conclusions.' [2]

[1] Clifton PM,Chan L, Moss C and Cobiac L. Beverage intake and obesity in Australian children. In press
[2] The Conversation, Confused about what to eat for better health? NHMRC's dietary guidelines might set you straight, 13 December 2011

However the Beverages Council is disappointed the NHMRC systematic literature review (SLR) of SSBs and obesity **is unbalanced and does not meet** Professor Anderson's above criteria.

The Beverages Council has conducted a review of the NHMRC Evidence Statement that graded the 'consumption of sugar sweetened beverages is associated with increased risk of weight gain in adults and children' as 'B'.

As the Beverages Council outlines in Section 2, we believe that the evidence **does not meet** the NHMRC criteria for grade B. The concerns focus on the overall quality, consistency and the totality of the evidence as outlined in Section 2.

The Beverages Council has a difference of opinion with the Committee's view that the Fiorito et al., 2009 study, 'strengthened the evidence' of the B grading. The Beverages Council's review of the Fiorito study found it **does not meet** the NHMRC's definition of SSBs, as both sugar-sweetened and artificially sweetened 'sodas' were included in the sweetened beverage category. It is well documented that the failure to distinguish between diet and regular versions of beverages can potentially overestimate positive effects (because overweight and obese people drink more diet beverages).

The Beverages Council strongly believes that the SLR **did not demonstrate** strengthened evidence for a relationship between sugar-sweetened drinks and excess weight gain and that the draft Australian Dietary Guidelines would fail to meet the NHMRC's own criterion in respect of:

- The best available scientific evidence is incorporated and levels of evidence are appropriately applied;
- A range of views and opposing positions are overtly discussed.

In addition, the SLR on added sugars and obesity **was limited, inconclusive or contradictory** (Grade D) and the Beverages Council also fails to understand how the Evidence Statement (Grade B) on sugar-sweetened beverages was used to justify the *'limiting intake of foods and drinks containing added sugars'*.

The Beverages Council believes that important dietary factors related to obesity are being overlooked by the current emphasis on sugars and soft drinks. Australia's refined sugar

consumption has decreased over the past 40 years yet obesity rates have increased. This is described as the 'Australian Paradox'. [3]

The Beverages Council provides this submission in the spirit of cooperation and with the expectation that the NHMRC will consider carefully all recommendations. We request that the veracity of our concerns be considered in a transparent and collaborative process.

We are heartened by the comments of Dr Amanda Lee, chair of the Dietary Guidelines Working Committee: *'We believe the new draft guidelines are very robust. But the most important thing is that the NHMRC goes to public consultation to ensure we haven't missed any critical research. We are open to new, quality research we may have missed.'*[4]

Stated simply, recommendations made in the 2011 Australian Dietary Guidelines are required to be based on the preponderance of the scientific and medical knowledge that is current at the time the report is prepared.

[3] Barclay AW, Brand Miller J, The Australian Paradox: A Substantial Decline in Sugars Intake over the Same Timeframe that Overweight and Obesity has Increased, Nutrients 2011, 3, 491- 504

[4] Courier Mail, Our new dietary guidelines, 14 January 2012

Key Recommendations

The Beverages Council recommends:

- the Australian Dietary Guidelines must **focus on energy balance** – the most simple, positive and effective way to address obesity is to eat less and exercise more.
- **waiting until current data** on dietary intake, weight status and physical activity levels is released from the Australian Health Survey (2011-2012), to ensure the Dietary Guidelines are relevant and meaningful to the Australian population.
- the NHMRC **reassess the 2003 Level of Evidence** (including the omitted studies) assigned to the Ludwig study in order to ensure that the starting basis for the current review of sugar-sweetened beverages (SSBs) and obesity for the new edition is scientifically accurate and meets the NHMRC standard.
- the statement related to increased risk of SSBs and type 2 diabetes to **be modified based on an objective review** of the totality of the evidence in this area.
- the NHMRC **undertakes a systematic review** of the evidence on the impact of liquids vs solid foods on energy intake and body weight.
- the NHMRC **provide definitive advice** on the search timeframe and rationale for why studies were excluded and for studies included post April 2009.
- the NHMRC **should review the excluded studies** identified in the Beverages Council's review of evidence and revise the Evidence Statement. The reason for exclusion of these studies should be provided.
- the NHMRC **reviews the Beverages Council's critique** of the NHMRC SLR Studies and the Working Committee's recorded reason for inclusion or exclusion.
- the completed NHMRC Evidence Statement Forms by Committee members **should be made publicly available** in order to assess the rationale for notable exclusion of additional studies.
- the NHMRC **removes commentary** in the systematic literature regarding industry-funded studies, or **it systematically addresses** this topic to include the totality of evidence available.
- the NHMRC **commission a review of the SLR and Evidence Statement** related to sugar sweetened beverages and excess weight gain to take into account the totality of evidence with an objective review of the quality of studies and consistency of the evidence based on issues outlined in sections 2, 3, 4 and 5.
- that dietary recommendations should **focus on understanding total kilojoule needs**, to underscore that all foods and beverages can fit into a sensible balanced diet that is

combined with regular physical activity. Education on energy balance – kilojoules in and kilojoules out – is critical.

- the **emphasis needs to be on total kilojoules** from all sources rather than solely those from any specific food or beverage.
- it is imperative that the Dietary Guidelines **be based on a careful review of the science** found in published and currently available scientific literature and the NHMRC is urged to take great care not to be influenced by opinion, conjecture or speculation.

Introduction

The Beverages Council welcomes the opportunity to respond to the draft National Health and Medical Research (NHMRC) Australian Dietary Guidelines released for public consultation on 13 December 2011.

The Beverages Council commends that this edition of the Australian Dietary Guidelines is the first edition to be supported by a systematic literature review. The NHMRC's Chief Executive Officer, Professor Warwick Anderson, in announcing the public consultation process as is required under the NHMRC Act said 'The modelling work that underpins the draft guidelines is more comprehensive than any we're aware of that has occurred in Australia or overseas.'[5]

In his preface to the draft report, Professor Anderson reinforces this viewpoint with the statement that 'The evidence for public health advice should be the best available. NHMRC is confident that the available evidence underpinning these guidelines meets the criterion and is stronger than for any previous NHMRC dietary guideline.'

The Beverages Council's members strongly support the development of dietary guidelines that are based on the preponderance of available scientific evidence. We are committed to making a positive contribution and constructively helping in Australia's fight against diet-related chronic diseases and our members fully accept the role each of us has in helping address this challenge.

The Beverages Council appreciates the significant time and effort the Dietary Guidelines Working Committee has put into the development of the draft report which appropriately and frequently acknowledges the importance of energy balance, appropriate energy intake and physical activity in maintaining a healthy weight. For instance:

'The previous guidelines and many international public health organisations, including the WHO, emphasised the major role of fat consumption in the development of obesity and of reducing fat intake in the dietary management of obesity or overweight. More recently WHO has shifted its emphasis, saying that there is convincing evidence that energy balance is critical to maintaining healthy weight, and ensuring optimal nutrient intakes, regardless of macronutrient distribution and percentage of total fat'.[6]

The report, however, clearly targets individual macro or micro nutrients and specific foods. In Guideline 2, the report recommends that Australians 'Limit intake of foods and drinks containing added sugars. In particular, limit sugar-sweetened drinks.' [7]

The Beverages Council believes that important dietary factors related to obesity are being overlooked by the current emphasis on sugars and soft drinks. Australia's refined sugar

[5] Providing the evidence for healthier Australian diets: Public consultation on draft Australian Dietary Guidelines, Media release, NHMRC 13 December 2011
[6] Page 115 Australian Dietary Guidelines NHMRC 2011
[7] Page 3 Australian Dietary Guidelines NHMRC 2011

consumption has decreased over the past 40 years yet obesity rates have increased. This is described as the 'Australian Paradox'. [8]

The emphasis needs to be on lowering total energy intake with a focus on overconsumption of any energy source – alcohol, fat, protein, starch or sugars; and increasing energy expenditure through physical activity.

Our submission examines and encompasses:

- Dietary Guidelines must focus on energy balance;
- The Dietary Guideline recommendation to specifically focus on limiting sugar-sweetened beverages for adults and children is unsupported by the scientific evidence; and
- Dietary Guidelines need to reflect current beverage consumption behaviour, contribution to total energy intake and trends over time in beverage intake that is consistent with both industry and government data.

The submission outlines the issues that are of significant concern to the non-alcoholic beverage industry and provides constructive and common-sense recommendations to support our common goal of promoting healthy balanced dietary patterns as well as reducing obesity in Australia.

These comments are provided in good faith and with the expectation that the Government and NHMRC will meticulously consider our submission. The Australian public relies on and expects public health dietary guidance to be based on sound scientific evidence.

The Beverages Council is committed to and looks forward to working constructively with the NHMRC in securing evidence based Dietary Guidelines for all Australians.

[8] Barclay AW, Brand Miller J, The Australian Paradox: A Substantial Decline in Sugars Intake over the Same Timeframe that Overweight and Obesity has Increased, Nutrients 2011, 3, 491- 504

Dietary Guidelines Must Focus on Energy Balance

To address obesity, the overriding goal of the Australian Dietary Guidelines should be to improve energy balance.

The Beverages Council supports the NHMRC's strong recognition of the importance of energy balance, and ensuring appropriate energy intake and physical activity to maintain a healthy weight.

"'In relation to obesity, actual dietary recommendations and measures of compliance and weight outcomes vary greatly in published studies. 'Overall energy intake is the key dietary factor affecting weight status.[9]

"Healthy body weight results from an appropriate balance between energy intake and expenditure (of which physical activity is a component)".[10]

Research shows that energy intake in Australia has increased as the percentage of Australian adults participating in physical activity has declined. [7] Simply put, Australians consume more kilojoules than they expend resulting in a significant energy surplus:

Energy intake increased in the decade or so to 1995 by 3-4% in adults. This increase equates to an additional 900kj to 1400kj per day across all groups. Without compensatory increases in energy expenditure, these changes are enough to result in the significant observed increase in mean body weight.[11]

The proportion of Australian adults reporting recommended levels of physical activity declined from 62% in 1997 to 57% in 2000, with no subsequent reliable national data available for comparison.[12]

Given this context, rather than targeting specific foods and nutrients, the Australian Dietary Guidelines should concentrate on the consumption of a balanced and varied diet that both limits kilojoule intake and meets nutritional needs while encouraging physical activity for health as well as to maintain proper energy balance. Such an approach is supported by the preponderance of the scientific evidence.

In addition, more recent data will be available from the Australian Health Survey in 2011-2012 providing up-to-date trend information on energy intake and expenditure. These data are critical for providing relevant and meaningful dietary guidelines for the Australian population that is based on current behaviour instead of out-dated sixteen year old data.

The Beverages Council **recommend** that the Australian Dietary Guidelines must focus on energy balance – the most simple and effective way to address obesity is to eat less and exercise more.

[9] Page 8 Australian Dietary Guidelines NHMRC 2011
[10] Page 108 Australian Dietary Guidelines NHMRC 2011
[11] Page 109 Australian Dietary Guidelines NHMRC 2011
[12] Page 112 Australian Dietary Guidelines NHMRC 2011

The Beverages Council **recommend** waiting until current data on dietary intake, weight status and physical activity levels is released from the Australian Health Survey (2011-2012), to ensure the Dietary Guidelines are relevant and meaningful to the Australian population.

Key Issues of Concern

1. Dietary Guideline Based On Weak Evidence

In section A2.3 on the development of the new edition of the Australian Dietary Guidelines, it states that the information in the previous guidelines was used as a basis for the review. It is understood that new evidence was assessed to determine whether associations between food, dietary patterns and health outcomes had strengthened, weakened or stayed the same since the last review of the evidence.[13]

Where the evidence base was unlikely to have changed substantially, additional review was not conducted. [14]

Consequently, the Beverages Council understands that the rationale for the review of an association between sugar-sweetened beverages (SSB) and obesity is the narrative in the 2003 Dietary Guidelines in Chapter 1.9. In this chapter, only one study published in 2001 is used to propose that the consumption of SSB could be an independent risk factor for development of obesity in children. [15]

The discussion of one study resulted in the NHMRC assigning a Level III evidence for a link between consumption of SSB and childhood obesity. [16]

The Beverages Council's review of the literature for the period 1988-2001 revealed seven additional studies that measured SSB and energy intake or BMI (Body Mass Index) of which five were not significant. Of the two studies that were significant, both were experimental cross-over studies with normal weight adults – one showed no-significant change for BMI, only for energy intake and the other study found a significant change. These studies appear not to have been considered.

There is a NHMRC requirement for guidelines that 'A range of views and opposing positions are overtly discussed' and this appears not to have been met in the 2003 edition.

The limited examination of the evidence in the 2003 guidelines would also indicate that the NHMRC requirement that 'the best available scientific evidence is incorporated and levels of evidence are appropriately applied' has also not been met.

Supporting reasons that the Ludwig[11] study be reassessed:

- Only children – does not apply to adults
- Small study and not nationally representative - ethnically diverse sample of 548 children in Boston, USA, with high BMI (majority were in 85th percentile)
- Based on self-reported body weight and height
- Based on self-reported SSB consumption

[13] Page 161 Australian Dietary Guidelines NHMRC 2011
[14] Page 158 Australian Dietary Guidelines NHMRC 2011
[15] Ludwig et al. Relation between consumption of sugar-sweetened drinks and childhood obesity: a prospective, observational analysis. Lancet. 2001 Feb 17;357(9255):505-8
[16] Page 187 Australian Dietary Guidelines NHMRC 2011

- No significant association was found between baseline consumption of SSB and incidence of obesity
- Limited statistical power - authors state that it has limited statistical power to determine obesity since only 37 children were actually obese
- Gains in height and weight in children at 11 -12 years were not uniform and the study did not control for pubertal growth changes
- Some children lost weight during the study and the change in their SSB intake was not assessed.

The following relevant studies that were not identified in the 2003 Guidelines are presented for consideration:

Reference	**Study Type**	**Outcome Measure**	**Results – Significance with respect to energy and obesity**
French et al., 1994[17]	Longitudinal, Adults	SSB & Weight 2 years	NS
Birch et al., 1989[18]	Experimental, Children (2-5 years)	SSB/Water & Energy Intake	NS
Canty and Chen, 1991[19]	Experimental, Adults	SSB/Water & EI	NS
Addington, 1988[20]	Parallel Experimental, Women	SSB/Water & BMI	NS
King et al., 1999[21]	Cross-over experimental, adult males only	SSB/Water & EI	NS
DiMeglio and Mattes, 2000[22]	Cross-over, experimental. Normal weight adults (20-24 years)	SSB/Jelly beans and BMI, 4 weeks	NS for BMI Significant for increase in Energy Intake
Tordoff and Alleva, 1990[23]	Cross-over experimental. Normal weight adults,25-30yrs	SSB & EI/BMI, 3 weeks	Increase in Energy Intake and Body Weight

[17] French SA, Jeffery RW, Forster JL McGovern PG, Kelder SH, Baxter JE. Predictors of weight change over two years among a population of working adults: The Healthy Worker Project. Int J Obes Relat Metab Disord. 1994 Mar;18(3):145-54.
[18] Birch LL, McPhee L, Sullivan S. Children's food intake following drinks sweetened with sucrose or aspartame: time course effects. Physiol Behav. 1989 Feb;45(2):387-95.
[19] Canty DJ, Chan MM. Effects of consumption of caloric vs noncaloric sweet drinks on indices of hunger and food consumption in normal adults. Am J Clin Nutr. 1991 May;53(5)1159-64.
[20] Addington E. Aspartame- or sugar-sweetened beverages: effects on food appetites and mood in young adults (Doctoral Dissertation). Manhattan (KS): Kansas State University; 1988.
[21] King NA, Appleton K, Rogers PJ, Blundell JE. Effects of sweetness and energy ind rinks on food intake followeing exercise. Physiol Behav. 1999 Apr;66(2)375-9.
[22] DiMeglio DP, Mattes RD. Liquid versus solid carbohydrate: effects on food intake and body weight. Int J Obes Relat Metab Disord. 2000 Jun;24(6):794-800.
[23] Tordoff MG, Alleva AM. Effect of drinking soda sweetened with aspartame or high-fructose corn syrup on food intake and body weight. Am J Clin Nutr. 1990 Jun;51(6):963-9.

The Beverages Council believes that the foundation on which the premise was made to examine SSB and obesity, and on which the draft Australian Dietary Guidelines' targeted literature review found strengthened evidence for a relationship between SSB and excess weight gain, is flawed. If this issue is not addressed, the proposed guideline '*Limit intake of foods and drinks containing added sugars. In particular, limit sugar-sweetened drinks'* is potentially inaccurate and invalid and should not be supported by the NHMRC.

Important dietary factors related to obesity have been overlooked by the extreme emphasis on added sugars and sugar-sweetened beverages. The focus on one food category for increased obesity in Australia is overly-simplistic.

The Beverages Council **seeks an explanation for the exclusion of these studies** in the 2003 guidelines.

In addition we **recommend the NHMRC reassess the 2003 Level of Evidence** (including the omitted studies) assigned to the 2001 Ludwig study in order to ensure that the starting basis for the current review of sugar-sweetened beverages and obesity for the new edition is scientifically accurate and meets the NHMRC standard.

2. Dietary Guideline On Sugar-Sweetened Beverages Must Be Evidence Based

The NHMRC systematic literature review (SLR) on which the Evidence Statement '*Consumption of sugar sweetened beverages is associated with increased risk of weight gain in adults and children*' is unsound.

The Beverages Council strongly believes that the draft Australian Dietary Guidelines would fail to meet the NHMRC's own criterion in respect of:

- The best available scientific evidence is incorporated and levels of evidence are appropriately applied;
- A range of views and opposing positions are overtly discussed

2.1 Errors identified in Systematic Literature Review

2.1.1. NHMRC Evidence Statement is not consistent with critique of research papers

The Beverages Council conducted a review of each paper included in the NHMRC Evidence Based Statement (page 530-531). The full critique is included in this submission, Appendix, Item 4. A summary of the review is outlined below and highlights misinterpretation of some studies and the inconsistency of the evidence base. The Beverages Council's critique with more detail in the following sections highlights that the ratings of individual components in the evidence statement need to be revised.

Summary of Beverages Council Critique of NHMRC Evidence Based Statement:

Two Meta-analyses

- Of two meta-analyses, one showed no effect among children/adolescents (level III-2) and the other (level IV) showed an increase in risk of weight gain among children/adolescents and adults.

Three Reviews

- Of the three reviews, two showed no increase or were not conclusive due to heterogeneity in included studies (low quality study) with the exception of specific sub groups (i.e., females or high intake) and the other reported an increase in risk of weight gain among adults and children.

Five Cohorts

- Four of the five cohort studies were in children.
- The single adult study showed a positive association with a reduction in energy intake (surrogate marker of risk of weight gain) among overweight women who were following popular diet programs.
- Of the four studies in children, one study conclusively shows a relationship with increased BMI (Tam et al., 2006) (this study was the lowest quality of the cohorts);

for the remaining four studies: one looked at fruit juice and not SSB (a relationship was only observed with fruit juice consumption and BMI in individuals who are o/w or at risk of o/w); BMI association was only positive with SSB consumed between meals (no association for total daily intake of SSB), and the last study showed effectiveness for BMI for girls during the post-menarchal while no association was found for a reduction in % Body Fat.

Two Clinical Trials

- Two cluster RCT (level III-1) studies (both in children) were found and both showed no association between SSB and weight gain with the exception of specific sub-groups of the population.
- One study showed that SSB reduction was only effective at reducing BMI in children who were normal-weight (not effective for overweight) despite a significant reduction in SSB in the intervention group in comparison to the control group (a significant reduction in overweight children did not reduce BMI).
- The other CT showed an effect only for girls who were overweight.

2.1.2 Not based on totality of scientific evidence within time frame (2003 up to April 2009)

A total of nine published studies - four reviews, three cohorts and two clinical trials - were not included in the SLR (refer to Table 1 (p18) and Appendix, Item 3). Of these studies:

- **Five are either inconclusive or non-significant** –
    - Three reviews (Bachman et al., 2006[24] (IV), Drewnowski et al., 2007[25] and Pereira et al., 2006[26] (IV)) found the association between SSB and obesity inconclusive. For instance, Bachman et al states, "findings were inconsistent and better controlled studies are needed, especially in at risk groups".
    - Laurson et al., 2007[27](III-2) was a prospective cohort of 260 children followed for 18 months and found no association between SSB consumption and BMI.
    - Lim et al., 2009[28] (III-2) was a prospective cohort of low income pre-school children (3-5 years) and found no association between change in SSB consumption and change in BMI z-scores.
- **Two showed an increase in risk of weight gain in specific sub-groups** –
    - Olsen et al., 2009[29] (III-3), a review, found a positive association between intakes of SSBs and obesity. Several prospective studies included in this

[24] Bachman CM, Baranowski T, Nicklas T. Is there an association between sweetened beverages and adiposity? Nutr Rev. 2006 Apr;64(4):153-74
[25] Drewnowski A, Bellisle F. Liquid calories, sugar, and body weight. Am J Clin Nutr. 2007 Mar;85(3):651-61.
[26] Pereira MA. The possible role of sugar-sweetened beverages in obesity etiology: a review of the evidence. 2006 Int J Obes. 30:S28-S36
[27] Laurson K, Eisenmann JC, Moore S. Lack of association between television viewing, soft drinks, physical activity and body mass index in children. Acta Paediatr. 2008;97(6):795-800
[28] Lim S, Zoellner JM, Lee JM, Burt BA, Sandretto AM, Sohn W, Ismail Al, Lepkowski JM. Obesity and sugar-sweetened beverages in African-Amercian preschool children: a longitudinal study. Obesity. 2009 Jun;17(6):1262-8

review were low quality studies and results were selective: if a study was positive for a specific subgroup and there was no effect for another subgroup, it was considered a significant positive. In addition, two studies that were in this review were included in the SLR by the NHMRC as stand-alone studies (Tam et al., 2006 and Phillips et al.,2004).

- Libuda et al., 2007[30] (III-2) found an increase in SSB over the study period was associated with an increase in BMI for girls only, and no association was found in boys for baseline consumption and BMI, baseline % Body Fat or change in either variable over study period.

- **One showed a significant increase in skinfold thickness among girls only, but not BMI, and no association was found among boys for any outcome measures:**

  - Singh et al., 2009[31] (III-I) was a 20-month RCT among 1108 Dutch children undergoing a behaviour change program. No effect on the primary outcome measures (body weight and BMI) was observed in the intervention group who reduced intake of SSBs (soft drinks as well as fruit juice) in the short and long term. Among girls, skinfold thickness was reduced in the intervention group, but not body weight or BMI.

- **One showed that SSBs can be part of a successful weight loss diet** –

  - Williams et al., 2007[32] (II) demonstrated in a pilot study that with energy restriction, soft drinks can be included in an effective weight loss diet (1500 calorie controlled, including two snacks of specific types/calories).

[29] Olsen NJ, Heitmann BL. Intake of calorically sweetened beverages and obesity. Obes Rev. 2009 Jan;10(1):68-75.
[30] Libuda L, Alexi U, Sichert-Hellert W, Stehle P, Karaolis-Danckert N, Buyken AE, Kersting M. Pattern of beverage consumption and long-term association with body-weight status in German adolescents--results from the DONALD study. Br J Nutr. 2008 Jun;99(6):1370-9
[31] Singh AS, Chin A Paw MJM, Brug J, van Mechelen W. Dutch obesity intervention in teenagers: effectiveness of a school-based program on body composition and behavior. Arch Pediatr Adolesc Med. 2009 Apr;163(4):309-17.
[32] Williams CL, Strobino BA, Brotanek J. Weight control among obese adolescents: a pilot study. Int J Food Sci Nutr. 2007 May;58(3):217-30

Table 1. Studies NOT included in the NHMRC SLR

Reference	Type of Study & Target Group	Effect on risk (Increase, None, Protect)[33]
Bachman et al., 2006	Review, Children & Adults	None
Drewnowski et al., 2007	Review*, Children & Adults	None
Pereira et al., 2006	Review, Children & Adults	None
Olsen et al., 2009	Review (Jan 2009), Children & Adults	Increase
Libuda et al., 2007	Cohort, Children (9-18years)	None (Increase in BMI for girls only)
Laurson et al., 2008	Cohort, Children	None
Lim et al., 2009 (first published online February 2009)	Cohort, Low income African-American Pre-school children (3-5 years)	None
Singh et al., April, 2009	Controlled trial, Secondary school students, 12-14 years	No overall effect for BMI, (increase in skinfold thickness for girls only), decrease in skinfold in control group at 20 month follow up
Williams et al., 2007	Controlled pilot trial, Adolescent girls, 11-15 years	SSB can be part of a successful weight loss diet

*not a systematic review

In summary, the additional studies not included in the NHMRC SLR within the timeframe highlight the inconsistency of the evidence related to the consumption of SSBs and weight gain in adults and children. The majority of the level II and III studies (six out of the nine additional studies, Table 1) were focused on children and adolescents. Intervention studies provide the strongest form of evidence[22,23] with one cluster RCT showing no overall effect but in secondary analyses showed an effect on skinfold thickness in girls and another showing that soft drinks can be included as part of a balanced, low kilojoule weight loss diet. Level II, III and IV evidence in this review (Table 1) found neither a 'good' evidence base nor a 'good' consistency rating for the evidence statement in the NHMRC SLR, *Consumption of sugar sweetened beverages is associated with increased risk of weight gain in adults and children.*

[33] NHMRC 2011. A review of the evidence to address targeted questions to inform the revision of the Australian Dietary Guidelines

2.1.3 Majority of studies – children not adults

Out of the eight higher level of evidence studies (level III) presented in the NHMRC SLR, the majority (one meta-analyses, four cohort and two clinical trials) were specific to children. All of the systematic reviews and a meta-analysis are of lower level evidence (IV) with three reviews focusing on children and adults and one review (Malik et al., 2006) included 81% of the population as children.

Therefore, it is clear that the evidence base selected in the NHMRC SLR is predominantly focused on children and does not support the evidence statement for both "adults and children".

2.1.4 Major heterogeneity within and between studies used in SLR

A number of the systematic reviews included in the NHMRC SLR have articulated the problems in drawing definitive conclusions as to whether SSBs are significantly implicated in weight gain because of inconsistencies of definition, design, statistical treatment and interpretation. [34] [35] Specific examples of the inconsistency in the studies highlighted in the NHMRC SLR include:

- ***Differing definitions of SSB and terminology***. For example, Faith et al., 2006 (page 534) study assessed fruit juice intake only (and it is not clear how they defined fruit juice – did they include fruit drink?); Taylor et al., 2007 (page 536) was an intervention related to a reduction in sweetened drinks (soft drinks and fruit juice) and increased whole fruit intake (such as, was not specific to SSBs so causal statement cannot be made); Tam et al., 2006 (page 534) defined SSBs as soft drinks and cordials with fruit juice and fruit drink placed in the same category; whilst the Sichieri et al., 2009 (page 536) intervention related to reduction of sugar-sweetened carbonated beverages only, not for fruit drinks, cordials and other sugar-sweetened drinks. Giammattei et al., 2003 paper [34] is found in several systematic reviews including Malik et al., 2006 [33] and Vartanian et al., 2007 [36]. However, the Giammattei study combines results for both diet and regular soda, and diet soda drives the positive association (with weight), whereas the association with regular soda was non-significant. [37] Stookey et al., 2007 included sweetened milk, coffee, tea, and energy drinks in their definition in addition to soda (soft drinks).

- ***Insufficient long term interventions***. The two interventions included in the NHMRC SLR were of short duration – Sichieri et al., 2009 was a seven-month intervention in children and Taylor et al., 2007 although longer duration (up to two years) focused on lifestyle intervention that incorporated SSB reduction, fruit juice/drinks reduction and increased whole fruit intake. Stookey et al., 2007, another longer duration (12 months) study, was also a randomised lifestyle intervention trial, rather than a specific intervention with SSB.

[34] Gibson, S. 2008, Sugar-sweetened soft drinks and obesity: a systematic review of the evidence from observational studies and interventions, Nutrition Research Rev*iews*, vol. 21, no. 2, pp. 134-147.
[35] Malik, V. S., Schulze, M. B. & Hu, F. B. 2006, Intake of sugar-sweetened beverages and weight gain: a systematic review, American Journal of Clinical Nutrition, vol. 84, no. 2, pp. 274-288.
[36] Vartanian, L. R., Schwartz, M. B. & Brownell, K. D. 2007, "Effects of soft drink consumption on nutrition and health: a systematic review and meta-analysis", American Journal of Public Health,vol. 97, no. 4, pp. 667-675.
[37] Giammattei J, et al. Television watching and soft drink consumption: associations with obesity in 11- to 13-year-old schoolchildren. *Arch Pediatr Adolesc Med.* 2003;157: 882–886.

- ***Inconsistent evidence between subgroups.*** Often studies will report at least one variable positive (e.g., % body fat) and the other variables remain non-significant (e.g., BMI or body weight). This is a critical issue as these studies should be recorded in the SLR as 'no association' for primary outcomes and the secondary analysis findings put in proper context. For example, in Sichieri et al., 2009 they found no difference between controls and intervention groups after adjusting for age and time of follow up, yet SLR reported results as "increased risk (reduced intake protect in overweight girls only)". Yet, should have been reported as: overall, no risk; increase in subgroup of overweight girls only. And, in Dubois et al., 2007 there was no effect of SSB on BMI for total daily intake of SSB; effect seen only for SSB intake between meals. Total energy intake remained the same between groups, which implies that consumption with meals may have resulted in a reduction in BMI. Taylor et al., 2007 found a significant association only in children who were not originally overweight (what's the clinical significance in reducing BMI in normal weight children and how can this study be reported as an "increase" in the SLR?). Phillips et al., 2004 found no significant difference for percent body fat despite higher BMI among participants with higher percent of energy from SSB (authors could not explain why that was the case).

- ***Inconsistency in the aims/design of the studies.*** In many of the studies included in the NHMRC SLR, the aims were inconsistent and not directly linked to the evidence statement related to "excess weight gain". For example, Stookey et al., 2007 was a secondary analysis modelling for substitution of water for SSB and its effect on Energy Intake (EI being used as a surrogate marker of weight gain). In some studies, the test/intervention was a lifestyle intervention (which included SSB reduction) or an intervention not specific to SSB alone, therefore no conclusion can be made that SSBs reduction led to lower BMI when it was the whole intervention that led to lower BMI (e.g., Taylor et al., 2007; Stookey et al., 2007). In addition, Wolff et al., 2008 have no clear methodology in their review and no inclusion/exclusion criteria, and hence several studies included by Malik et al., 2006 or Vartanian et al., 2007 were excluded in their reviews.

- ***Weight and height self-reported or not measured.*** Stookey et al., 2007 measured change in energy intake as a surrogate marker of weight gain, but did not measure change in body weight or BMI.

- ***Inadequate exploration of confounders or effect modifiers in analysis***. Dubois et al., 2007 did not control for baseline BMI – given this is a strong predictor of subsequent weight gain, failure to control for this variable may undermine the results.

- ***Incomplete reporting, no definitive conclusions can be drawn***. Tam et al., 2006 (page 534) was a small study (n=281 children) and was published as a short communication where reporting was incomplete. For instance, the paper contained baseline dietary information (e.g., intake of SSBs) however, there was no data on changes in SSB intake over the five years of the study. This is a critical issue since children who were originally SSB beverage consumers may not be consumers after five years and vice versa. In addition, those who were original consumers of SSB may have decreased their intake at five years and reported a higher BMI than original non-consumers and vice versa.

- ***Poor or no measurement of physical activity***. It is not clear from the NHMRC SLR report whether this key variable was taken into account when reviewing papers.

2.1.5 Some studies not scored appropriately

The Beverages Council's Review (Appendix Item 4) has identified inaccurate grading of a number of studies in the NHMRC SLR:

- Forshee et al., 2008 (page 533) – Level of Evidence III-1
  Fact: III-2 (page 5 of NHMRC document states that a systematic review of cohort studies is III-2 and RCTs is II. This review combines both.

- Tam et al., 2006 (page 534) – Level of Evidence III-2
  Fact: III-3 or IV – this is a short communication

- Sichieri et al,, 2009 (page 536) – Level of Evidence II
  Fact: III-1 – this is a cluster RCT

2.1.6 Studies wrongly included - not consistent with NHMRC definition for sugar sweetened beverages

The Beverages Council's Review (Appendix Item 4) has identified the wrongful inclusion of a cohort (Level III-2) study as it does not adhere to the NHMRC definition of SSBs. This study, Faith et al., 2006 (page 534) is focused on the consumption of fruit juice and BMI, not on SSBs.

2.1.7 Simple errors, typos, lack of attention to detail

The Beverages Council's Review (Appendix, Item 4) has identified a lack of attention to detail in the documentation of the SLR (pages 533-536). Specific examples include:

a. Typos in SLR critique

- Sicheri et al., 2008 (page 536) – control and intervention numbers reversed; date for reference incorrect – should be 2009, not 2008

- Fiorito is spelled incorrectly (Page 531)

b. Examples of sloppiness

- Forshee et al., 2008, Page 533 - In population/study information, the number of studies are less than quoted – SLR claims '12' studies in total and Beverages Council's Review of paper found only '10' studies in total

- Gibson, 2008, page 533 – In population/study information, the number of cross sectional studies are higher than quoted – SLR claims '23', compared to Beverages Council's Review of published paper as '26'

- Malik et al., 2006, page 533 – In population/study information, the study numbers are incorrect – SLR quotes '136,772' compared to '240,093' from the Beverages Council's Review of published paper.

2.2 Studies included post-SLR timeframe in SLR and Draft Dietary Guidelines Report do not provide strengthened evidence

2.2.1 Fiorito 2010 [573] study referenced as 'strengthening the evidence associating SSBs with weight gain" (page 88) is incorrect.

On page 88 of the Draft Report: "*A more recent longitudinal study also strengthens the evidence associating sugar-sweetened drinks with weight gain, [Fiorito 573]".* The reference included as [573], page 251 does not reach this conclusion as outlined below.

There are two studies published by the Fiorito group and we assume that the authors should have referenced the 2009 paper published in the *American Journal of Clinical Nutrition* as this paper focused on BMI outcomes. Both studies, however, cannot be used as evidence of 'strengthening the evidence' as they include both sugar-sweetened and artificially sweetened 'sodas' (soft drinks) in the sweetened beverage category. This is not consistent with the NHMRC definition of sweetened beverages. Therefore, the study results are irrelevant to the evidence statement related to sugar-sweetened drinks and excess weight gain in children and adults.

The Beverages Council review of the published paper by Fiorito[38] found:

- Relatively small longitudinal study only among 5 year old girls (n=197) followed up every two years until 15 years old
- Objectives were to describe changes in beverage intake and to assess whether beverage intake at age 5 years was associated with beverage and nutrient intake during childhood and adolescence
- "Sodas" (soft drinks included both sugar-sweetened and artificially sweetened (therefore this study is not evidence for SSBs). It is well-documented that the failure to distinguish between diet and regular versions of beverages can potentially overestimate positive effects (diet versions being more strongly associated with excess weight because overweight and obese people drink more diet beverages).
- No measurement of physical activity, which is well known to influence body weight measures
- *'No differences between soda consumption groups were noted in girl's energy intake and weight status from age 5 to 15 years.'*
- *'A limitation of this study is the relatively small sample and the inability to generalise results beyond non-Hispanic white girls'*
- '*The longitudinal data allowed to follow the same cohort of girls over time…however it could not be assessed to the extent to which the observed changes in patterns of intake are attributable to developmental changes or secular trends*.'

[38] Fiorito LM, Marini M. Francis LA, Smiciklas-Wright H and Birch LL. Beverage intake of girls at age 5 y predicts adiposity and weight status in childhood and adolescence. Am J Clin Nutr 2009;90:935-42.

2.2.2 "However, more recent studies indicate that sugar-sweetened drinks may increase the risk of developing type 2 diabetes [578]" Page 89.

The study referenced is Esposito et al., Page 252. A review of the Esposito study indicates:

- Not a longitudinal study, but a review of longitudinal studies
- Review identified studies that prospectively evaluated the association of dietary patterns (not specific to sugar-sweetened beverages) in type 2 diabetes prevention
- Excluded studies focusing on single foods or nutrients, cross-sectional and retrospective studies, and any study not specifically designed to evaluate the role of ***dietary patterns*** in diabetes prevention (therefore didn't include anything specifically related to SSB)
- Overall, adherence to a healthy dietary pattern was associated with reduced risk of developing type 2 diabetes: Combined mean difference -0.39, 95% CI -0.54 to -0.24
- In five studies, dietary patterns not associated with diabetes prevention were reported. The characteristics of these patterns were provided with the relative risk for development of type 2 diabetes in the follow up:
    - Only **one study** in this table shows 'high-sugar drinks' (not defined)
    - Sugary drinks are not mentioned anywhere else
    - No specific mention of soft drinks
- Author statement in the discussion: "*The use of dietary patterns avoids focusing on single foods or nutrients that can be correlated with, or interact with, each other and assesses combinations of food that alone may have effects too small to be identified."*

2.2.3 "A recent meta-analysis also supports an increased risk for type 2 diabetes and the metabolic syndrome from consumption of sugar-sweetened drinks [579]. Page 89"

The paper referenced is Malik et al, published in Diabetes Care, 2010. [39] The Beverages Council review of the meta-analysis indicates that the authors chose to include only prospective studies (which show an association, not cause and effect) that did not adjust for energy intake or adiposity where possible. The reasoning was that:

"Because the association between SSB consumption and risk of these disease outcomes is mediated in part by energy intake and adiposity, adjustment for these factors will tend to underestimate any effect."

Despite the authors' reasoning that energy intake is a mediator of the association between SSB and type 2 diabetes, they found that energy intake was not a mediator of the association:

"However, results from a meta-regression did not find adjustment for energy to be a significant predictor of effect (P = 0.38)."

Because energy adjustment was not a significant predictor, it would have been useful if authors also reported the analysis with BMI-adjusted RR.

[39] Malik VS et al., Sugar-sweetened beverages and risk of metabolic syndrome and type 2 diabetes: a meta-analysis. Diabetes Care 2010; 33(11):2477-83.

Palmer et al 2008, one of the studies in this meta-analysis, reported both BMI adjusted and BMI unadjusted data. [40] After adjustment for BMI, the RR was no longer significant. The following quote was obtained from Malik et al 2010[38]:

"After additional adjustment for BMI, the RR was no longer statistically significant, suggesting that in this population, the majority of the effect was mediated by BMI".

This study was included in this meta-analysis as a significant positive study despite the fact that the majority of the effect seen between SSB and type 2 Diabetes was mediated by BMI.

The Beverages Council **recommends** the statement related to increased risk of SSB and type 2 diabetes to be modified based on an objective review of the totality of the evidence in this area.

2.3 Studies included in Draft Dietary Guidelines Report do not provide strong evidence base on proposed satiety mechanism

On page 91 of the Dietary Guidelines Report, three studies are cited to support the proposed mechanism of sugar-sweetened drinks and excess weight gain - "the association between sugar-sweetened drinks and weight gain appears to be related to the reduced effect on satiety with sugars in a liquid medium". [41]

These statements are not based on a comprehensive review of the literature. The literature review to inform the revision of the Dietary Guidelines for Americans, 2010 concludes that the evidence base is "limited" - "*A limited body of evidence shows conflicting results about whether liquid and solid foods differ in their effects on energy intake and body weight, except that liquids in the form of soup may lead to decreased energy intake and body weight*". [42] In fact, this reference was included in Section 4 of the draft Dietary Guidelines Report (page 118) highlighting inconsistency in different sections of the Report.

The review's conclusion is supported by an earlier review by Drewnoski et al., 2007 which states, "*Numerous clinical studies have shown that sugar-containing liquids, when consumed in place of usual meals, can lead to a significant and sustained weight loss*" and "*The principal ingredient of liquid meal replacement shakes is sugar, often high-fructose corn syrup, which is present in amounts comparable to those in soft drinks*". [43]

Specifically, the Raben study (reference 599, page 91 Dietary Guidelines Report) cited as evidence that compensation for sugar-sweetened drinks is less complete than that for energy in solid form and therefore adds to total energy intake did not address this specific question. In fact, Mattes and colleagues (2011) points out that "this study can address only the question, 'What is the effect of required ingestion of no less than a specified amount of both solid and liquid items containing sucrose vs. required ingestion of both solid and liquid

[40] Palmer JR, Boggs DA, Krishnan S, Hu FB, Singer M, Rosenberg L. Sugar-sweetened beverages and incidence of type 2 diabetes mellitus in African American women. Arch Intern Med 2008;168:1487–1492.

[41] Page 91 Australian Dietary Guidelines NHMRC 2011

[42] *Report of the Dietary Guidelines Advisory Committee on the 2010 Dietary Guidelines for Americans (DGAC Report*) http://www.nutritionevidencelibrary.com/evidence.cfm?evidence_summary_id=250301&highlight=beverages%20and%20satiety&home=1

[43] Drewnowski A, Bellisle F. Liquid calories, sugar, and body weight. Am J Clin Nutr. 2007 Mar;85(3):651-61.

items containing non-caloric sweeteners?"' [44] And, "this was not a test of solid vs. beverage, only compensation for different sweeteners presented in both solid and beverage food forms." The study simply showed that use of non-nutritive sweeteners in place of nutritive sweeteners in food and beverages resulted in body weight changes. This is predictable, since the energy density of the diet was higher in the sucrose than in the sweetener condition—thus, diets were not isocaloric.

Interestingly, the Raben study has been included in several systematic reviews in the NHMRC SLR (Malik et al., 2006; Gibson, 2008; Vartanian et al., 2007; & Wolff et al., 2008) and thus is part of the SLR by the NHMRC. By comparison, the more recent systematic review undertaken by Mattes et al., 2011 excluded the Raben study based on issues described above.

A more recent prospective study (Chen et al., 2009) examined beverage consumption in the PREMIER study at baseline, six months and 18 months. [45] This study population was obese, pre-hypertensive/ hypertensive type 1 and were very high consumers of SSB (19% of dietary energy).

Reductions in both liquid and solid kilojoule intake had a significant effect on weight loss, and that effect was only stronger for liquid than solid at six months. Interestingly, SSB and diet soft drink intake were the only beverages that changed (decreased and increased respectively) over 18 months, thus only SSB and diet soft drinks were associated with weight loss in the models. Milk, fruit juice and alcohol consumption did not change over the trial, and did not result in weight loss. However, it is important to note that this does not mean these beverages are not associated with weight loss or weight gain.

In summary, based on the totality of evidence, the notion that liquid kilojoules fail to trigger satiety mechanisms is inconclusive and inconsistent.

The Beverages Council **recommends** the NHMRC undertake a systematic review of the evidence on the impact of liquids vs solid foods on energy intake and body weight.

2.4 Studies Excluded from Systematic Literature Review

The Beverages Council is concerned that the defined timeframe of the systematic literature review is ill defined and ambiguous. The timeframe for the systematic literature review is either 2002 to ‘mostly’ April 2009 or 2003 to ‘mostly’ April 2009.

Evidence of this is found **within** the Australian Dietary Guidelines report and also **between** the Australian Dietary Guidelines report and the Evidence Report (See Appendix Item 5).

[44] Mattes RD, Shikany JM, Kaiser KA, Allison DB. Nutritively sweetened beverage consumption and body weight: a systematic review and meta-analysis of randomized experiments. Obes Rev. 2011 May;12(5):346-65.
[45] Chen L, Appel LJ, Loria C, Lin PH, Champagne CM, Elmer PJ, Ard JD, Mitchell D, Batch BC, Svetkey LP, Caballero B. Reduction in consumption of sugar-sweetened beverages is associated with weight loss: the PREMIER trial. *Am J Clin Nutr.* 2009 May;89(5):1299-306. Epub 2009 Apr 1.

The Beverages Council is also concerned about the lack of a consistent and standardised approach to the systematic literature review and also the Committee's rationale for additional studies that were outside the end date of the timeframe (See Appendix Item 6).

The Working Committee is expected to have used the consistent, standardised approach, as described in the report. However the Beverages Council has identified a number of studies that have not been considered by the Committee and they are listed and provided for consideration:

A. Studies not included within the NHMRC SLR Timeframe (up to April 2009)

The Beverages Council's review of the evidence within the NHMRC SLR timeframe has identified an additional nine published papers that are consistent with the evidence-statement focus and levels of evidence described in the SLR (refer to Section 2.1.2 (pages 14-16) of the Submission).

B. Studies not included between May 2009 and December 2010 as additional evidence

The Beverages Council's review of the evidence that was not included as 'additional evidence' between May 2009 and December 2010 (given the SLR and Draft Dietary Guidelines Report included 2 papers as 'additional evidence' outside the SLR timeframe) is outlined in Table 2.

Table 2. Studies between April 2009 and December 2010

Reference	Type of study	Month first published	Effect on risk (Increase, None, Protect)[46]
Dennis et al., 2009[47]	Review*	DECEMBER	None
Ruxton et al., 2010[48]	Review	DECEMBER (30) (first published online) JANUARY issue	None
Summerbell et al., 2009[49]	Review	JULY	None
Malik et al., 2010[50]	Review*		Increase
Mattes et al., 2010[51]	Review (Meta-Analysis of RCT)	NOVEMBER	None (some suggestion for increase among overweight)

[46] NHMRC 2011. A review of the evidence to address targeted questions to inform the revision of the Australian Dietary Guidelines
[47] Dennis EA, Flack KD, Davy BM. Beverage consumption and adult weight management: a review. Eat Behav. 2009 Dec;10(4):237-46.
[48] Ruxton CHS, Gardner EJ, McNulty HM. Is sugar consumption detrimental to health? A review of the evidence 1995-2006. Crit Rev Food Sci Nutr 2010 Jan;50(1):1-19.
[49] Summerbell CD, Douthwait W, Whittaker V, Ells LJ, Hillier F, Smith S, Kelly S, Edmunds LD, Macdonald I. The association between diet and physical activity and subsequent excess weight gain and obesity assessed at 5 years of age or older: a systematic review of the epidemiological evidence: Results by exposure 5.3 Beverages. Int J Obesity. 2009 Jul;33:S28-S34
[50] Malik V, Popkin BM, Bray GA, Despres JP, Hu, F. Sugar-sweetened beverages, obesity, type 2 diabetes mellitus, and cardiovascular disease risk. Circulation 2010 Mar 23;12(11):1356-64
[51] Mattes RD, Shikany JM, Kaiser KA, Allison DB. Nutritively sweetened beverage consumption and body weight: a systematic review and meta-analysis of randomized experiments. Obes Rev. 2011 May;12(5):346-65.

Vanselow et al., 2009[52]	Cohort	NOVEMBER	None
Nissinen et al., 2009[53]	Cohort	MAY (28)	None (increase only among women who increase their SSB over time)
Chen et al., 2009	Cohort	MAY	Increase (reduction in SSB AND solid calories associated with weight loss. No significant difference re amount of weight loss between solid calories and SSB at 18 months (endpoint)).

*not a systematic review

Therefore, a further five review papers (one was non-systematic and only included one systematic review on SSB and weight[29]) and two cohort studies were published between May 2009 and December 2010 and could have been included in the narrative of the SLR and Draft Dietary Guidelines Report as "additional evidence". If they had been included as "additional evidence", it is clear that the statement of "*strengthened evidence associating sugar-sweetened drinks with weight gain*" could not be made since six out of the seven studies found no association. One out of five review papers found an increased risk and one cohort found no overall increased risk, except amongst a sub-group of women who increased their SSB over time.

The Beverages Council **recommends** NHMRC provide definitive advice on the search timeframe and rationale for why studies were excluded and for studies included post April 2009.

The Beverages Council **recommends** NHMRC should review the excluded studies identified in the Beverages Council's review of evidence and revise the Evidence Statement. The reason for exclusion of these studies should be provided.

The Beverages Council **recommends** NHMRC reviews the critique of the NHMRC SLR Studies and the Working Committee's recorded reason for inclusion or exclusion.

The Beverages Council understands that the Committee members have completed the NHMRC Evidence Statement Forms and **recommends** these should be made publicly available in order to assess the rationale for notable exclusion of these additional studies.

[52] Vanselow MS, Pereira MA, Neumark-Sztainer D, Raatz SK. Adolescent beverage habits and changes in weight over time: findings from Project EAT. Am J Clin Nutr. 2009 Dec;90(6):1489-95.
[53] Nissinen K, Mikkila V, Mannisto S, Lahti-Koski M, Rasanen L, Vilkari J, Raitakari OT. Sweets and sugar-sweetened soft drink intake in childhood in relation to adult BMI and overweight. The Cardiovascular Risk in Young Finns Study. Public Health Nutr. 2009 Nov;12(11)2018-26.

3. Implied Industry Bias

The fact that the NHMRC systematic review chose to include commentary on industry-funded studies is disappointing and not supported by the available evidence. This was confined to the review of sugar and beverages and obesity.

The statement that '*Evidence from one meta-analysis indicated that industry funded studies provided results of a smaller effect size.*' [54] Similarly, '*One industry funded meta-analysis was required to slightly adjust their results due to concerns raised by scientists.'* [39]

No references were provided for these statements and they appear to be attributed to a letter to the editor regarding the Forshee et al., 2008 study. [55] The only mention in the letter in relation to industry was '*The conclusion of their meta-analysis, which was supported by the beverage industry, contradicts those drawn from several other reviews*.' Forshee and colleagues revised the results and provided rationale that the error did not change the outcome. '*Although we regret the scaling error, this does not affect any of the substantive conclusions of the article*.' [56]

The Beverages Council considers that the statements above represent opinion, not science, and can be construed as bias towards industry funded research. This is an issue of considerable interest in the nutrition and obesity literature, such as to assess both the quality of research reporting in general and whether reporting quality differs between industry-funded versus non-industry funded research.

A short summary of the conclusions from relevant published evidence both within the timeframe of the SLR and more recently published is outlined below:

- "*Our findings suggest that the efforts to improve reporting quality be directed to all obesity RCTs, irrespective of funding source.*" [57]
- "*'White hat bias' is bias leading to distortion of information in the service of what may be perceived to be righteous ends and is documented through quantitative data and anecdotal evidence from the research record regarding the postulated predisposing and protective effects of nutritively sweetened beverages and breastfeeding, respectively, on obesity…readers should beware of WHB, and our field should seek methods to minimize it*". [58]

[54] NHMRC 2011. A review of the evidence to address targeted questions to inform the revision of the Australian Dietary Guidelines, Page 530
[55] Malik VS, Willett WC and Hu FB. Sugar-sweetened beverages and BMI in children and adolescents: reanalyses of a meta-analysis. Am J Clin Nutr 2009,438-9
[56] Forshee RA, Anderson PA, Storey ML. Reply to VS Malik et al. Am J Clin Nut 2009, 439-50.
[57] Thomas O et al. Industry funding and the reporting quality of large long-term weight loss trials. International Journal of Obesity (2008), 1-6.
[58] Cope MB and Allison DB. White hat bias: examples of its presence in obesity research and a call for renewed commitment to faithfulness in research reporting. International Journal of Obesity (2009), 1-5

- "*Recently published RCTs on nutrition and obesity that appear in top-tier journals seem to be equivalent in quality of reporting, regardless of funding source. This may be a result of recent reporting of quality statements and efforts of journal editors to raise all papers to a common standard*." [59]

- "*Research report quality cannot be accurately predicted from the funding source after controlling for research design. Continued vigilance to evaluate the quality of all research regardless of the funding source and to further understand other factors that affect quality ratings are warranted*". [60]

It is therefore clear from the literature that the statements included in the NHMRC document are not supported by the available evidence.

The Council **recommends** that the NHMRC removes commentary in the systematic literature regarding industry funded studies, or it systematically addresses this topic to include the totality of evidence available.

[59] Kaiser KA et al. Is funding source related to study reporting quality in obesity or nutrition randomised control trials in top-tier medical journals? International Journal of Obesity (2011), 1-5.
[60] Myers EF et al. Funding source and research report quality in nutrition practice-related research, PLoS ONE December 2011, Vol 6, Issue 12, 1-13.

4. Level of Evidence

Given the inconsistency of the evidence, the methodological limitations, the actual evidence provided by the NHMRC SLR, as well as the additional studies highlighted as not included in the SLR, in context with the small effect sizes reported, this argues strongly against a meaningful relationship between consumption of sugar sweetened beverages and weight gain in adults and children.

As the Beverages Council has outlined in Section 2, the Beverages Council believes the evidence **cannot** be graded as 'B' on the basis of NHMRC criteria.

The quality of evidence as defined by a recent review of the quality of systematic reviews and meta-analyses related specifically to SSBs and weight status (Weed et al, 2011)[61] using a validated instrument known as Assessment of Multiple Systematic Reviews (AMSTAR), concluded, *"..we showed that surprisingly few reviews (less than half) systematically collected the evidence, documented which studies were included and excluded, assessed the quality of those studies critically, and provided conclusions (and/or recommendations) on the basis of clearly described interpretative methods. A well conducted systematic review provided readers with an accurate summary and defensible synthesis of the available evidence*".

In relation to the reviews included in the NHMRC review, the AMSTAR rating was as follows (≥7 rating = Good and <7 = Poor)[36]:

First Author, Year Published	**Author's conclusions about SSBs and health outcomes**	**AMSTAR Rating**
Forshee, et al., 2008	No relationship	≥7
Vartanian et al., 2007	Weakly associated on the basis of a meta-analysis; clear associations stated in abstract	<7
Gibson, 2008	Difficult to draw definitive conclusions	≥7
Malik et al., 2006	Associated	≥7
Wolff et al., 2008	Uncertain	<7

Therefore, based on the AMSTAR rating, of the one meta-analysis and two systematic reviews that received a Good Quality Rating (≥7), two concluded there was no relationship or difficult to draw definitive conclusions about SSBs and weight gain and one showed an association.

The Beverages Council also disputes the Committee's claim that the Fiorito et al, 2009 study, 'strengthened the evidence' of the B grading. The SLR described this study as, 'An additional longitudinal study published after search dates, provides additional evidence to

[61] Weed et al. Quality of reviews on sugar-sweetened beverages and health outcomes: a systematic review. Am J Clin Nutr 2011

support above recommendation (Fioritio et al. 2009)'. The Beverages Council has found no evidence that this one study that does not meet NHMRC criteria is able to support the Committee interpretation of 'additional evidence' being upgraded to 'strengthened'.

'As nutrition is a continuously evolving area and research studies are published on a regular basis, the Working Committee also considered results from ***high quality studies*** *(primarily systematic reviews) published after the literature review, and where deemed warranted, included the findings and references in the relevant evidence sections in each Chapter.'*[62]

The Beverages Council review has demonstrated that the Fiorito et al., 2009 study does not meet the above criteria – it is not high quality and is not a systematic review.

The Beverages Council **recommends** NHMRC commissions a review of the SLR and evidence statement to take into account the totality of evidence with an objective review of the quality of studies and consistency of the evidence based on issues outlined in sections 2,3,4&5.

[62] Page 160 Australian Dietary Guidelines NHMRC 2011

5. Inappropriate Focus On Sugar-Sweetened Beverages Used To Justify 'Added Sugars' Guideline

The systematic literature review found that the evidence to support advice on added sugar and obesity was limited, inconclusive or contradictory. The Evidence Statement for Sugars and Obesity is Grade D and was not used to inform the Dietary Guidelines.

The Beverages Council is disappointed that the Evidence Statement (Grade B) on SSBs was used to justify the *'limiting intake of foods and drinks containing added sugars'*. SSBs appear to have become a *de facto* rationale for the public to be advised to limit added sugars.

The dietary guidance to significantly reduce intake of added sugars is unlikely to result in any material changes in public behaviour and body weight. If the focus is on reducing added sugar intake rather than reducing total kilojoule intake, there is a risk that consumers compensate by consuming more of another macronutrient (protein or fat) or food resulting in no net change in kilojoule consumption.

Long-term compliance with weight loss programs is not increased when specific foods are forbidden. [63] Instead of being told to limit sugar-sweetened beverages individuals should be educated on the importance of regular physical activity and the consumption of a well-balanced diet that provides adequate nutrients (vitamins and minerals; dietary fibre) and an appropriate, but not excess, amount of kilojoules while not prohibiting specific foods or beverages.

The importance of multifaceted programs to prevent childhood obesity has been recently confirmed by a recent Cochrane Review regarding which forms of intervention could have maximum effect in helping children to avoid becoming obese.[64] The authors concluded that environmental approaches improving physical activity levels and dietary habits are critical. These approaches include: a. Including healthy eating, physical activity and body image in school curricula; b. Increasing the number of opportunities for physical activity and the development of fundamental movement skills during the school week and c. Creating environments and cultural practices within schools that support children eating healthier foods and being active throughout each day.

These conclusions are supported by a recent Productivity Commission review highlighting the complex, multifaceted causes of obesity and suggested that effective policy solutions are likely to involve a mix of tools acting on a range of levels. [65] Moreover, they state, "*Measures that constrain behaviour indiscriminately are rarely effective, equitable, or improve community wellbeing. Bans or taxes on particular energy-dense nutrient-poor foods, for example, face design difficulties, affect all consumers regardless of their weight status, and in the case of taxes, can have perverse budgetary and health effects particularly for the neediest groups*".

[63] ADA, Total approach to communicating food and nutrition information. Journal of the American Dietetic Association 2007; 107(7): 1224-1232

[64] Waters E, et al. Interventions for preventing obesity in children. Cochrane Database of Systematic Reviews 2011, Issue 12. Art.No:CD001871. DOI: 10.1002/14651858.CD001871.pub3

[65] Crowle, J. and Turner, E. 2010, Childhood Obesity: An Economic Perspective, Productivity Commission Staff Working Paper, Melbourne.

The Beverages Council **recommends** that dietary recommendations should focus on understanding total kilojoule needs, to underscore that all foods and beverages can fit into a sensible balanced diet that is combined with regular physical activity. Education on energy balance – kilojoules in and kilojoules out – is critical.

6. Australian Context

6.1 Beverage Consumption Data

Children

Although the Beverages Council agrees that "all initiatives and approaches which promote physical activity, healthy eating, access to nutritious food, and the healthy growth of children contribute to promoting healthy weight at the population level" [66], the focus on SSBs ignores the relatively modest contribution of SSBs to the diets of most children. Analysis of the latest Australian national children's dietary survey, **Kids Eat, Kids Play (2007)** found:

- Sugar-sweetened beverages (all beverages other than 100% fruit juice, non-nutritive sweetened drinks and unsweetened water) provided a modest contribution to all children's total energy intake of around 5% compared to 7.4% in 1995. For example, sugar-sweetened soft drinks contribution to energy intake was halved in this time: 3.3% in 1995 compared to 1.6% in 2007 [67].

- Across the total sample, the contribution to total energy intake from all non-dairy, non-alcoholic beverages, sugar-sweetened soft drinks or fruit juice was relatively small (5.4%, 1.6% and 2% respectively). [67] By comparison, the contribution to total energy intake from 'snack foods, confectionery and cereal bars' was around 7%. [68]

- The average energy contribution from sugar-sweetened beverages dropped by more than two percentage points since the last survey in 1995 [47], while there has been an increase in the rate of overweight and obesity over this time period (from 22% in 1995 to 25% in 2007) [69].

- Overweight or obese children were not consuming a significantly greater proportion or amount of sugar-sweetened beverages than children in the healthy weight range [70]

- There was a substantial decrease in the proportion of children under seven years consuming sugar-sweetened beverages over the past 12 years (1995 vs 2007) [71]. (Drop from 26% to 13% in the 2-3 year olds and from 34% to 21% in the 4-7 year olds) [72].

[66] Page 122, Australian Dietary Guidelines NHMRC 2011
[67] Clifton PM,Chan L, Moss C and Cobiac L. Beverage intake and obesity in Australian children. In press
[68] 2007 Australian National Children's Nutrition and Physical Activity Survey, Main Findings, Commonwealth of Australia 2008
[69] Australian Bureau of Statistics, http://www.abs.gov.au/AUSSTATS/abs@.nsf/Lookup/4102.0Main+Features20Sep+2009
[70] Ibid
[71] Ibid
[72] Flinders Partners. Analysis of the 2007 Australian National Children's Nutrition & Physical Activity Survey. Rpt for Australian Beverage Council Ltd 2010

- Five out of ten children (47%) drank some type of sweet beverage - fruit juice was most frequently consumed (37%), followed by sugar-sweetened soft drinks (25%) [73].
- Nine out of ten children drank water on the day of the survey [74].

The research found that a higher proportion of children with lower socioeconomic status consumed sugar-sweetened soft drinks (30.2%) compared with the highest socioeconomic group (19.4%). The mean consumption in consumers only of sugar-sweetened soft drinks was greater in the two lower SES quartiles (440-467g/d) while the estimated mean intake was lowest in those children in the top SES quartile (407g/d). However, the absolute differences in total consumption between higher and lower SES is relatively small equating to around 30 – 60g/d. Similar trends were seen for all SSBs. [58] This highlights a key issue in nutrition stated in the Dietary Guidelines Report, "*Socioeconomic factors have a large impact on food and nutrient intakes and food purchasing decisions and patterns… Yet evidence for a social gradient related to specific foods – rather than overall dietary patterns – is less clear*". [75]

This issue needs further exploration and the upcoming National Health Survey data will hopefully provide valuable information on current associations between SES status, dietary patterns and food groups. Specific targeted nutrition and physical activity education programs may be necessary for these groups based on an understanding of key barriers and drivers.

It is clear that sugar-sweetened beverages were not predominant 'extra foods' in the diets of Australian children. Therefore, the question of whether there is much to be gained by focusing public health policy on the removal of SSB remains. [4] Guidelines that specifically target SSB, rather than total kilojoule consumption of all sources of food kilojoules do not seem to be justified.

Adults

The most recent national dietary intake data cited in the Dietary Guidelines Report is over sixteen years old (National Nutrition Survey, 1995) and is unlikely to be representative of current consumption patterns of beverages given the growth in non-nutritive sweetened beverages over this time period. For example:

- Decrease in sugar contribution from nutritively sweetened soft drinks in Australian food supply of 12,402 tonnes from 2002 to 2006. [76]
- Significant changes in the purchasing patterns of non-alcoholic water-based beverages in the period 1997-2006, documenting the shift away from regular energy beverages to those with reduced or no energy content since 2002 - "*Total volume sales of Water Based Beverages increased by 13% from 1997 to 2006, largely accounted for by increases in sales of plain still water and non-sugar carbonated soft drink (CSD). Sales in the CSD category saw a shift away from sugar-sweetened to non-sugar. Sugar*

[73] Ibid
[74] Ibid
[75] Page 180 Australian Dietary Guidelines NHMRC 2011
[76] Page 11

supply from beverages has declined, mostly because of decreasing sales of sugar-sweetened CSDs since 2002." [77]

Given these significant changes in the beverage category, it is imperative that the Dietary Guidelines are based on current beverage consumption patterns to provide relevant and meaningful recommendations.

The Beverages Council **recommends** waiting until current data on dietary intake, weight status and physical activity levels is released from the Australian Health Survey (2011-2012), to ensure the Dietary Guidelines are relevant and meaningful to the Australian population.

6.2 Australian Paradox

The draft report found that '*The prevalence of overweight and obesity has increased dramatically in Australia over the past 30 years and is now 62% in adults and around 25% in children and adolescents.* [78]

Interestingly, sugar intake has decreased in Australia over the past 40 years – but as a nation, we continue to put on weight. This has been described as the 'Australian Paradox'. This recent review paper in Australia found the per capita consumption of refined sugar decreased by 23% from 1980 to 2003. [79] The paper stated that a similar inverse relationship between sugar sweetened beverages and the threefold increase in prevalence of obesity has been observed. The consumption of low or zero kilojoule beverages doubled over a 12 year period (1994-2006), while sales of sweetened beverages decreased by around 10%. [80]

Therefore, it appears that efforts to reduce sugar intake has reduced consumption but obesity levels have continued to climb.

The Beverages Council agrees with the report statement, '*In relation to obesity, actual dietary recommendations and measures of compliance and weight outcomes vary greatly in published studies. Overall energy intake is the key dietary factor affecting weight status.'* [81]

6.3 Consumer Behaviour

Advising consumers to limit or avoid specific foods or nutrients has historically proven to be an ineffective and even counterproductive approach for weight management. The American Dietetic Association ('ADA'; now the Academy of Nutrition and Dietetics) has recognised that

[77] G Levy and L Tapsell. —Shifts in purchasing patterns of non-alcoholic, water-based beverages in Australia, 1997-2006. *Nutrition and Dietetics* 2007; 64: 268-279.
[78] Page 7 Australian Dietary Guidelines NHMRC 2011
[79] Barclay AW, Brand Miller J, The Australian Paradox: A Substantial Decline in Sugars Intake over the Same Timeframe that Overweight and Obesity has increased, Nutrients 2011, 3, 491 - 504
[80] Ibid
[81] Page 8 Australian Dietary Guidelines NHMRC 2011

all foods and nutrients, if consumed in moderation with appropriate portion size and combined with regular physical activity, can fit within the total diet of American consumers. [82]

One of the intervention studies included in the NHMRC SLR, Sichieri et al., 2008 [83] highlights this issue. The intervention was an educational program to reduce SSB and measure changes in weight gain. Despite a significant reduction in SSB intake, no overall reduction in BMI was observed. The intervention objective was to replace SSB with water. The authors highlighted the limitations of this recommendation:

"*We anticipated that this scenario would be adequate to test the hypothesis that the discouragement of intake of carbonated beverages would prevent excessive weight gain, but this single message was not effective in reducing excessive weight gain".*

"The changes in consumption indicate that future interventions should allow exchanges to low sugar products, instead of a too big switch such as, in this case, to plain water".

"In addition, the reduction in drinking sugar-sweetened carbonated beverages as reported by students was combined with an increase in juice intake, which suggests that juices may have blurred the effects of soda reduction".

Therefore, the efficacy of singling out sugar-sweetened beverages in dietary guidelines is unclear and may be counterproductive as the impact on beverage and food behaviour is unclear e.g. would there be a shift to kilojoule-containing fruit juices and/or snack foods? For instance, an unintended consequence could be a shift to snack foods containing high amounts of salt, saturated fat and high GI starch e.g. potato crisps and fries.

The Beverages Council **recommends** the emphasis needs to be on total kilojoules from all sources rather than solely those from any specific food or beverage.

[82] ADA, Total approach to communicating food and nutrition information. Journal of the American Dietetic Association 2007; 107(7): 1224-1232.
[83] Sichieri, R., Paula Trotte, A., de Souza, R. A. & Veiga, G. V. 2009, "School randomised trial on prevention of excessive weight gain by discouraging students from drinking sodas", *Public Health Nutrition*, vol. 12, no. 2, pp. 197-202.

Summary

The Beverages Council recognises that sugar-sweetened beverages (SSBs) are consumed primarily for their thirst-quenching, refreshing and pleasurable aspects. However we consider that the draft Australian Dietary Guidelines overstate the significance of the role of added sugars in the increase of obesity in Australia.

The Evidence Statement for Sugars and Obesity clearly shows that added sugars are **not** uniquely responsible for excess weight gain in the Australian public.

The Beverages Council believes that on the evidence presented in this submission that SSB are **not** uniquely responsible for the rising rates of obesity:

- The recommendation in Guideline 2 that '*In particular, limit sugar-sweetened drinks'* in order to prevent weight gain or obesity is not supported by a preponderance of the scientific evidence.
- The statement is inaccurate, misstates the level of evidence and does not meet the NHMRC level of evidence Grade B.
- The targeted review itself recognises that additional research is needed in order to fully assess the link between SSB and obesity.

  '*More quality RCTs of adequate duration are needed to improve the evidence base. Many of the associations were found in sub groups of cohort studies and RCTs so may be more significant for some populations. Effect seen is small but significant.'* [84]

Public health recommendations should **not** be based on incomplete and inconsistent science, but on a reliable systematic process to assemble and review the relevant research.

The Beverages Council **recommends** that it is imperative that the Dietary Guidelines be based on a careful review of the science found in published and currently available scientific literature and we urge the NHMRC to take great care not to be influenced by mere opinion, conjecture or speculation.

[84] Page 531 Targeted evidence report

Appendix

Item 1 Beverages Council's 'Commitment to Addressing Obesity and Other Health and Wellness Issues'

Item 2 Australian Beverages Council Membership

Item 3 Beverages Council's Review – Studies not included in: i. NHMRC SLR Timeframe and ii. Additional evidence base to support evidence statement

Item 4 Beverages Council's Review of the NHMRC SLR 2011, Sugar-Sweetened Beverages

Item 5 Timeframe Discrepancies

Item 6 Rationale

Item1: Beverages Council's 'Commitment to Addressing Obesity and Other Health and Wellness Issues'

The Beverages Council's members are committed to making a positive contribution and constructively helping in Australia's fight against diet-related chronic diseases and believe they have an important role to play. As part of the beverage industry's approach to addressing obesity and other health and wellness issues, members introduced a raft of voluntary initiatives in 2006, detailed in the Beverages Council's *'Commitment Addressing Obesity and Other Health and Wellness Issues'*. The commitments relate to issues such as education, research, consumer information, marketing to children, promotions, product development and distribution to schools. These commitments include the following:

- Continue to increase the number of new beverages with low or no kilojoule content and light versions of existing beverages, where technologically possible, safe and acceptable to consumers;
- Voluntarily provide additional nutrition information both on the front and back of packaging;
- Not to direct product advertising or marketing to children under 12 years;
- Where directly responsible, voluntarily not engage in any direct commercial activity in primary schools, unless otherwise requested by school authorities or where the product meets the relevant government criteria;
- Abide by voluntary primary and secondary school distribution guidelines;
- Increase involvement in educational programs which provide consumers with relevant information on healthy eating and active lifestyles;
- Ensure that promotional activities avoid requiring consumers to drink excessive quantities of products;
- Ongoing contribution where appropriate to research into encouraging healthy eating and healthy lifestyles;
- Where relevant, share consumer research insights as they relate to health and wellness with government and health stakeholders.

The Beverages Council has established Key Performance Indicators (KPIs) for its proposed actions and commitments. These are explicit commitments to the Australian public, and they are transparent about some often contentious matters of marketing and advertising, particularly to children in their vulnerable years. The Beverages Council's progress towards specific KPIs has been audited by the independent nutrition consultancy *Food and Nutrition Australia* (FNA).

The most recent audit report (November 2008), undertaken by FNA concluded that appropriate actions had been made by Beverages Council and many of its member companies in the majority of Key Performance Indicator areas (these will be specifically outlined under relevant actions below). Most importantly, there was a significant increase in the number of public education, healthy lifestyle and physical activity programs run by the four major companies (representing over 85% of the Australian non-alcoholic beverages market) from 2006 to 2008 and there was widespread adoption of front and back of pack % Daily Intake information.

These Key Performance Indicator areas are in line with relevant recommendations for diet, physical activity and health in the 'WHO Global Strategy on prevention and control of noncommunicable diseases'. In particular:
(c) support the healthier composition of food by:

- reducing salt levels
- eliminating industrially produced *trans*-fatty acids
- decreasing saturated fats
- limiting free sugars

(d) provide accurate and balanced information for consumers in order to enable them to make well-informed, healthy choices; and
(e) prepare and put in place, as appropriate, and with all relevant stakeholders, a framework and/or mechanisms for promoting the responsible marketing of foods and non-alcoholic beverages to children, in order to reduce the impact of foods high in saturated fats, *trans*-fatty acids, free sugars, or salt.

1. Product innovation to guide consumer choice

Through innovative product development, the beverage industry has implemented a range of strategies to provide consumers with healthier beverage choices. These strategies also support other health strategies, such as the Australian Dietary Guidelines.

1a. Sugar

The beverage industry has been introducing reduced, low or no sugar products for many years to increase the range of diet and 'lite' versions of existing sugar-sweetened beverages available to consumers.

There is a wide selection of non-nutritive sweeteners (low kilojoule), permitted by FSANZ and which are currently used in food and beverage products demonstrating industry innovation in this area.

Beverages Council members continue to invest heavily in new product development and innovation to provide 'no sugar' beverages that meet consumer demand and lifestyles. For instance, the use of steviol glycosides (stevia) as a natural sweetener has been approved by FSANZ (November 2008). This will result in an even greater choice of low kilojoule beverages in the marketplace, and importantly provide beverage alternatives to consumers who desire 'natural' low kilojoule sweetener ingredients.

The growth in the low or 'no sugar' beverage category is demonstrated by two research reports' key findings:

1. Significant changes in the purchasing patterns of non-alcoholic water-based beverages in the period 1997-2006, documenting the shift away from sugar-sweetened to non-sugar beverages since 2002[85].

2. Market Statistics (Nielsen Company, 2008):

    a. **Sugar soft drinks have decreased in volume share of total non-alcoholic beverage market from 47% in 2004 to 41% in 2008;**
    b. Non-sugar soft drinks have increased volume share of total beverage market from 16% in 2004 to 18% in 2008;
    c. **Now in Australia, 1 in 3 soft drinks are sugar-free;**
    d. **Internationally, fewer than 1 in 10 soft drinks are sugar-free - Australia is significantly ahead of most countries in this respect, second only to the UK;**
    e. Bottled water consumption has increased, with bottled water now 1 in 8 of beverages sold, compared with 1 in 10 in 2004.

In addition, key findings from the independent audit report from FNA demonstrate the significant innovation in low or no kilojoule beverages in the Australian market:

"...*Seven companies manufactured new low or no calorie beverages between August 2006 and August 2008, six companies launched new pack sizes and four decreased pack sizes of existing products, indicating a good level of compliance to this commitment*"

1b. Pack Sizes

[85] G Levy and L Tapsell. "Shifts in purchasing patterns of non-alcoholic, water-based beverages in Australia, 1997-2006. *Nutrition and Dietetics* 2007; 64: 268-279.

To help people manage their energy intake, the Beverages Council and its members are committed to increasing the choice and availability of individual packaging sizes, portion control sizes and pursue where appropriate cup downsizing, to help reduce individual over-consumption.

The independent audit by FNA confirmed significant changes had been made with six companies launching new pack sizes and four decreasing pack sizes of existing products, indicating a good compliance to this commitment.

Item 2: Australian Beverages Council Membership

Bottlers and Distributors

100% Bottling Company P/L
Alpine Beverages Pty Ltd
Aquasplash P/L
Bayer Australia Limited
Beloka Water Pty Ltd
Bertshell Pty Ltd
Bevco Pty Ltd
Bickfords Australia Pty Ltd
Big Springs Riverina
Big Wet Natural Spring Water
Blue Mountains Natural Spring Water
Bundaberg Brewed Drinks Pty Ltd
Cantarella Bros Pty Ltd
Cascade Brewery Co Pty Ltd
CB Juice
Central Burnett Fruit
Coastal Springs Pty Ltd
Coca-Cola Amatil Ltd
Coca-Cola South Pacific
Cooks Soft Drinks
Cool Aqua Springs
Don Kyatt Pty Ltd
Eastcoast Beverages
Emma & Tom Foods Pty Ltd
Fosters Australia
Frezco Beverages
Frucor Beverages Ltd
Grove Fruit Juice P/L
HJ Heinz Australia Pty Ltd

Hopes Goulburn Cordials
IQ Beverages
Jolt Corporation Australia Pty Ltd
Juicy Isle Pty Ltd
Just Squeezed Fruit Juices
Just Water
Lillyman Bros
Lion
Lithgow Valley Springs
Mildura Fruit Juices
Mountain Fresh Fruit Juices
Mountain H2O
Nippy's Fruit Juices P/L
Nudie Foods Australia Pty Ltd
NZ Quality Waters Ltd

PET Technologies Ltd
Pleass Beverages
Red Bull Australia Pty Ltd

Saxby's Soft Drinks Pty Ltd
Schweppes (Aust) Pty Ltd
Springwater Beverages Pty Ltd
The Cape Grim Water Company
The Spring Water Man
TruBlu Beverages
Vitality Brands
Waterfarms Australia Pty Ltd
Wet Fix Pty Ltd
Wimmer Marketing Pty Ltd

Suppliers

Amcor Australasia
Amec Plastics Ltd
Aquatek Products Pty Ltd
Bev-Cap Pty Ltd
Beverage Holdings Pty Ltd
Black Mount Spring Water
Brooke-Taylor & Co
Bundaberg Sugar Ltd
Capitol Ingredients
CHEP
CHR Hansen
Cormack Packaging Pty Ltd
Correct Food Systems
Cuno Pacific Pty Ltd
Directus Australia Pty Ltd
Eaton Filtration
Ecolab Pty Ltd
Ed Ten Water
Elkay Pacific Rim (M) Sdn Bhd
Idexx Laboratories
Firmenich Ltd
Fruitmark
Interaust Foods Pty Ltd
International Flavours and Fragrances Inc
Invita Australia
Johnson Diversey
JNI Pallet Systems
Kerry Group / Mastertaste
KHS Pacific Pty Ltd
Lloyd’s Register Quality Assuarnce
Manildra Harwood Sugars
Matthews Australasia Pty Ltd
MeadWestvaco
Millipore Australia Pty Ltd
National Measurement Institute
NCSI
Neverfail Springwater Ltd
Norco Foods
Nugan Quality Foods
O-I Asia Pacific
Pall Corporation

Peacock Bros Pty Ltd
PureCircle Australia Pty Ltd
Quality Assurance International (QUASI)
Roxset Australia
Scholle Industries Pty Ltd
Sensient Technologies Aust Pty Ltd
Sopura Australia Pty Ltd
Splatt Engineering Group
Sugar Australia Pty Ltd
Tate & Lyle ANZ Pty Ltd
The Product Makers (Aust) Pt Ltd
Tradex NZ & Australia
Visy Beverage Packaging
Vitality Brands
Waterworks Australia Pty Ltd
Woodbine Park (Operations) Pty Ltd
Zymus International Ltd

Item 3: Beverages Council Review- Studies not included in: i. NHMRC SLR Timeframe and ii. Additional evidence base to support evidence statement

NHMRC Evidence Statement: "Consumption of sugar-sweetened beverages is associated with **increased risk of weight gain** in adults and children"

Table 1. Studies NOT included in NHMRC SLR (2003 – April 2009)

Reference	Type of study	Effect on risk (Increase, None, Protect)
Bachman et al., 2006	Review	None
Drewnowski et al., 2007	Review	None
Pereira et al., 2006	Review	None
Olsen et al., 2009	Review (Jan 2009)	Increase
Libuda et al., 2007	Cohort	Increase (in BMI for girls only)*
Laurson et al., 2008	Cohort	None
Lim et al., 2009	Cohort (first published online February 2009, in June issue)	None
Singh et al., 2009	Controlled trial (published April 2009)	Increase (in body fat but not BMI; SSBs included 100% fruit juice so not exclusive to SSBs as defined by NHMRC)
Williams et al., 2007	Controlled trial	Protect

Table 2.Studies that should be considered in the re-assessment of this guideline (between April 2009 and December 2010)

Reference	Type of study	Month first published	Overall outcome
Dennis et al., 2009	Review*	DECEMBER	None
Ruxton et al., 2010	Review	DECEMBER (30) (first published online) JANUARY issue	None
Summerbell et al., 2009	Review	JULY	None
Malik et al., 2010	Review*		Increase
Mattes et al., 2010	Review (Meta-Analysis of RCT)		None (some suggestion for increase among o/w)
Vanselow et al., 2009	Cohort	NOVEMBER (AJCN issue number 6 & AJCN is published every two months so I'm assuming it is the Nov issue.)	None
Nissinen et al., 2009	Cohort	MAY (28)	None (increase among women who increase their SSB over time)

*not a systematic review.

Table 4. Summary of studies prior to April 2009 (that should have been included): Reviews.

Reference [1]	**Bachman et al. 2006**	**Drewnowski et al. 2007**
Type of study [2]	Systematic review	(Systematic?) review
Level of evidence [3]	IV	IV
Intervention/ comparator [4]	Association between sweetened beverages and adiposity (BMI, wt, EI)	A critical re-examination of the role of liquid sugar energy in weight control
N [5]		
Population/study information [6]	Children & adults	Children & adults
Results [8]	Inconsistent. Strongest for EI, but findings not conclusive.	Longitudinal dada is limited among adults and children (even more limited in adults). Data on dietary intervention is sparse. "At this time, the epidemiologic evidence linking beverage consumption to the global obesity epidemic is still weak".
Effect on risk Increase/None/Protect	None.	None.
Comments	Findings were inconsistent and better controlled studies are needed (especially in at –risk groups).	*No methodology of how review was selected. *Good discussion on evidence comparing short-term satiating power of different types of liquids and solids—Drewnowski mentions that it is inconclusive. *Mentions that weight loss shakes are predominantly sugar (SSB definition) and they result in weight loss.

Table 4. Continued

Reference [1]	**Pereira et al. 2006**	**Olsen et al. 2009**
Type of study [2]	Systematic review	Systematic review
Level of evidence [3]	IV	III-3 OR III-2 (review of prospective and controlled studies)
Intervention/ comparator [4]	Evidence of association between SSB and body weight or obesity risk from observational and randomised trials	The associations between intake of calorically sweetened beverages and obesity, relating to adjustment for EI.
N [5]		
Population/study information [6]	Children & adults	Children & adults
Results [8]	Some support for hypothesis, but inconsistent due o methodological difficulties. No definite conclusion. The impact of recommendations to reduce intake of SSB and its effect on obesity rates are difficult to predict.	Majority of prospective studies found a positive association. 3/5 experimental studies found positive effects on changes in body fat.
Effect on risk Increase/None/Protect	None.	Increase.
Comments		*Many of the prospective studies included are flawed and low-quality studies. *The issue with reviews is that they are selective and no description is given in terms of inclusion of studies based on quality. *Several results are misinterpreted or selective (i.e. if a study is positive for a subgroup, it is considered a +ve effect, despite that another subgroup showed no effect).

Table 5. Summary of studies prior to April 2009 (that should have been included): Cohorts and Controlled Trials.

All children

Reference [1]	**Libuda et al. 2007**	**Laurson et al. 2008**	**Lim et al. 2009**
Type of study [2]	Cohort	Cohort	Cohort
Level of evidence [3]	III-2	III-2	III-2
Intervention/ comparator [4]	Bvg consumption (soft drink, diet soft drink, 100% fruit juice) & body wt status (BMI, %BF). Over 5 years.	The longitudinal association b/w phys. Activity, screen time, diet and BMI at follow up. Over 18 months.	Association b/w SSB (soda, fruit drinks and both combined (and o/w &obesity. Over 2 years.
N [5]	244	268 (122 girls, 146 boys)	365
Population/study information [6]	German adolescents 9-18y.	Rural American children aged 10y at entry.	Low-income African American pre-school children (3-5y).
Results [8]	No association in boys for baseline consumption and BMI, baseline %BF, or change in either variable over study period. For girls, higher BMI (BMI standard deviation score) associated with regular soft drink (+0.055 SDS/MJ, P=0.08) and 100% fruit juice consumption.	No association found between SSB consumption and BMI.	No association b/w change in SSB and change in BMI z-scores.
Effect on risk Increase/None/ Protect	None for boys. Increase in BMI for girls.	None.	None.
Comments	* 4 days of diet records. *BMI increased in whole population.		*FFQ data, measure ht & wt, age-specific BMI * Data is not shown for longitudinal association, despite article title includes longitudinal— misleading article since all results reported in tables are cross-sectional.

Table 5. Continued

Reference [1]	**Williams et al. 2007**	**Singh et al. 2009**
Type of study [2]	RCT	Cluster RCT
Level of evidence [3]	II	III-1
Intervention/ comparator [4]	Pilot program - Effect of snacks and dieting on weight loss and diet compliance. Over 12 weeks. *Diet of 1500kcal/d + free-snack program (allowing SSB as one of two 150kcal snack) or Diet of 1,500kcal/d + restricted snack program (1 of 2 snacks were from a healthy snack list) & no SSB allowed).	The effect of a multicomponent health promotion intervention on body composition (body wt, ht, waist circumference, skinfold thickness), dietary and physical activity behaviour. Over 20 months.
N [5]	32	1108
Population/study information [6]	O/w adolescent girls aged 11-15y.	Dutch secondary school students aged 12-14y. Follow up at 8, 10, 20 months).
Results [8]	Both diets were effective in achieving wt loss.	Intervention included SSB reduction (soft drinks and fruit juices). Intervention reduced SSB in boys and girls. Only in girls was skinfold measures reduced with intervention. **No differences in BMI were observed**.
Effect on risk Increase/None/Protect	Protect as part of a low calorie balanced weight loss dietary program.	N/A to SSB only. If Increase, for girls only for body fatness (skinfold) and no effect for BMI.
Comments	With calorie restriction, sodas can be part of a weight loss diet.	* Doesn't look specifically at SSB and weight; cannot be sure the relationship is with SSB alone. *20 month RCT among 1108 Dutch children undergoing a behaviour change program was effective in reducing intake of SSB in the short and long term, however no effect on body weight or BMI were observed. Among girls, skin fold thickness was reduced in the intervention group.

Table 6. Studies between April 2009 and December 2010 (may have been included): Reviews.

Reference [1]	**Dennis et al. 2009***	**Ruxton et al. 2010**
Type of study [2]	Review (non-systematic)	Systematic review
Level of evidence [3]	IV	IV
Intervention/ comparator [4]	The effect of beverage (soft drinks, coffee, tea, juice, juice drinks, milk and soy) consumption on energy intake and body wt.	To consider whether intake of sugar (including SSB) are harmful to health.
N [5]		
Population/study information [6]		Children & adults
Results [8]	Energy-containing beverages acutely increase EI, however long-term effects on body wt. are uncertain	8 studies (only 3 high quality 'primary' studies) found positive association between SSB and obesity risk No real 'conclusion/summary' of SSB and weight gain— narrative.
Effect on risk Increase/None/Protect	None.	None. "Balancing the lack of controlled trials in this area with the fairly consistent findings of short-term experimental studies, the possibility that considerable intakes of SSB contribute to obesity risk cannot be discounted.
Comments	*Not a systematic review, despite clear table (no description of inclusion/exclusion criteria and methodology).	*1 RCT study (James) cannot separate impact of lower SSB from healthy eating program → this study is often quoted as "positive" in reviews, despite the fact that the positive association is not directly related to SSB. *Ludwig and several other studies used in meta-analysis are classified as 'tertiary' or low quality studies. *Critique on Malik's review (highlights several flaws where 3 null studies were classified as positive) *Raben 2002 reported that sugar-supplemented diets) resulted in weight gain in adults. However, the diets weren't isocaloric.

Table 6. Continued

Reference [1]	Summerbell et al. 2009	Malik et al. 2010*	Mattes et al. 2010
Type of study [2]	Systematic review	Review (not systematic)	Meta-analysis of RCTs
Level of evidence [3]	III-I (excluded cross-sectional studies)	IV	I
Intervention/ comparator [4]	Prospective cohort studies with an accurate measure of diet (including beverages) and physical activity exposures at baseline, and outcomes in terms of body fatness at subsequent points in time (>1y). *Beverages included alcohol.	Temporal patterns in SSB consumption and clinically relevante effects on obesity, T2DM and cardiovascular disease risk.	RCTs looking at consumption of nutritively sweetened beverage on changes in body wt and adiposity.
N [5]			
Population/study information [6]	Humans >5y.	Adults and children	
Results [8]	"The epidemiological data show that the consumption of beverages of any type is not associated with higher levels of subsequent excess weight gain and obesity."	SSB leads to long-term weight gain, T2DM and cardiovascular risk.	Meta-analysis of 12 studies. *6 studies tested the addition of SSB to the diet and resulted in weight gain (significant in only 2 studies). *Meta-analysis to decrease SSB showed no effect on BMI.
Effect on risk Increase/None/Protect	None.	Increase.	None overall. Increase (protective effect) for overweight persons only.
Comments	*Refer to journal's supplemental section for the methodology and conclusion. *Review originally conducted for the World Cancer Research Fund in 20005 & updated the literature up to 31 Dec 2008. *The only diet exposures found to be associated with subsequent excess weight gain and obesity were fast foods, breastfeeding and intake of non-caloric sweeteners.	*This is not a systematic review	*Studies were min. 3 weeks, randomised and adiposity indicator as an outcome (EI is not an adiposity indicator) *Rationale for including/excluding studies is clearly stated. *Authors disagree with previous meta-analysis where RCTs with very different research questions are combined.

Table 7. Studies between April 2009 and December 2010 (may have been included): Cohorts.

All children

Reference [1]	**Vanselow et al. 2009**	**Nissinen et al. 2009**	**Lim et al. 2009**
Type of study [2]	Cohort	Cohort	Cohort
Level of evidence [3]	III-2	III-2	III-2
Intervention/ comparator [4]	Association b/w bvg and change in BMI. Over 5y.	Aim 1. Association b/w BMI and o/w in adulthood with consumption of sweets and SSB in childhood; & Aim 2. The *change* in consumption between childhood and adulthood and BMI and o/w in adulthood. Over 21 years.	Association between SSB (soda, fruit drinks & both combined) and o/w & obesity. Over 2y.
N [5]	2294	967 boys, 1172 girls at baseline.	365
Population/study information [6]	American adolescents	Cardiovascular Risk in Young Finns Study	Low-income African American pre-school children (3-5y).
Results [8]	No association found between sugar-sweetened beverage (soft drink, punch and other noncarbonated fruit drink) consumption or juice consumption and BMI over 5 years.	Increase in consumption of SSB from childhood to adulthood associated with increase in BMI among women only (*b*=0.45, P=0.0001; 0.45kg/m^2 increase for every 10-unit increase/month)	
Effect on risk Increase/None/ Protect	None.	None (for Aim 2) None (for Aim 1 among men) Increase (for Aim 2 among women).	
Comments	Positive association found for low-calorie soft drink after adjusting for phys. activity, socioeconomic, age, race, coffee, tea and sedentary behaviour; no association found when adjusting for dieting behaviour as well.	Aim 1 assessed the association between consumption of sweets in childhood and BMI in adulthood—no effect seen. Aim 2 assessed the association between the change in consumption (i.e. increase or decrease) and BMI in adulthood. They found a significant association among women only when they increased their intake of SSB.	*FFQ data, measure ht, wt ? relevance to Australian population as at-risk group is specific to USA

Item 4: Beverages Council Review of NHMRC SLR 2011, Sugar-Sweetened Beverages

Summary

2 Meta-analyses

- Of two meta-analyses, one showed no effect among children/adolescents (level III-2) and the other (level IV) showed an increase in risk of weight gain among children/adolescents and adults

3 Reviews

- Of the three reviews, two showed no increase or were not conclusive due to heterogeneity in included studies (low quality study) with the exception of specific sub groups (i.e., females or high intake) and the other reported an increase in risk of weight gain among adults and children

5 Cohorts

- Four of the five cohort studies were in children
- The single adult study showed a positive association with a reduction in energy intake (surrogate marker of risk of weight gain) among overweight women who were following popular diet programs
- Of the four studies in children, one study conclusively shows a relationship with increased BMI (Tam 2006) (this study was the lowest quality of the cohorts); for the remaining four studies: one looked at fruit juice and not SSB (a relationship was only observed with fruit juice consumption and BMI in individuals who are o/w or at risk of o/w); BMI association was only positive with SSB consumed between meals (no association for total daily intake of SSB), and the last study showed effectiveness for BMI for girls during the post-menarchal while no association was found for a reduction in % BF.

2 Clinical Trials

- Two cluster RCT (level III-1) studies (both in children) were found and both showed no association between SSB and weight gain with the exception of specific sub-groups of the population
- One study showed that SSB reduction was only effective at reducing BMI in children who were normal-weight (not effective for o/w) despite a significant reduction in SSB in the intervention group in comparison to the control group (a significant reduction in overweight children did not reduce BMI)
- The other CT showed an effect only for girls who were overweight

	NHMRC Evidence Statements 2011	ABCL Critique
Reference [1]	**Forshee et al. 2008 [1332], Page 533**	**Forshee et al, 2008**
Type of study [2]	**Meta-analysis**	
Level of evidence [3]	III-1	III-2 p. 5 of document states that a systematic review of cohort studies is III-2 and RCTs is II This review combines both—not sure if you give it III-2 or III-1 Not graded IV because there were no cross-sectional studies
Intervention/ comparator [4]	BMI, intake of sugar sweetened beverages	
N [5]	14,609	
Population/study information [6]	12 studies; 10 longitudinal, 2 RCT children and adolescents age range 6-10yrs.	10 studies: 8 longitudinal and 2 RCT
Quality [7]	O	
Results [8]	SSB and BMI association near zero	SSB and BMI association near zero and non-significant, and remained near zero after re-analysis
Effect on risk Increase/None/Protect	None	None
Clinical Importance [9]	2	1
Clinical Relevance [10]	1	1
Generalisability	y	Applies to children and adolescents
Applicability	Y	
Notes/Questions		Re-analysis by Malik et al 2010 showed significant increase in BMI by 0.08, however studies were excluded from the analysis based on adjustment of energy intake. After Malik's re-analysis, clinical relevance is low as change in BMI is very low. This was an author's reply that was used to support the Dietary Guidelines Report as further evidence.

Reference [1]	**Vartanian et al. 2007** **Page 533 [3345]**	**ABCL Critique**
Type of study [2]	**Meta-analysis**	**Meta-analysis & systematic review** Did not specify cut-off date
Level of evidence [3]	IV	IV Systematic review that includes cross-sectional data
Intervention/ comparator [4]	SSB consumption, energy intake and BMI	Soft drink and energy intake Soft drink and body weight (measures of adiposity including BMI, % body fat and so on)
N [5]	No population data.	
Population/study information [6]	Soft drink & energy intake: 21 studies: 12 cross-sectional, 5 prospective, 16 CTs. SD and BMI: 27 studies, 11 cross sectional, 11 prospective, 5 CTs M and F children and adults	
Quality [7]	O	O 6 /10 'no' needed for quality to be negative and it scored 4/10
Results [8]	Soft drink & energy intake: Longitudinal studies: r=0.24 p<0.001; clinical trials (short): r=0.21 P<.001. (significant heterogeneity) clinical trials (long): r-0.30 P<0.001, no significant heterogeneity SD and BMI: cross sectional; :r=0.05 p<0.001 Longitudinal: r=0.009 p<0.001 CT: r=0.24 p<0.001 (all +ve)	Also reported on the relationship between SSB & body weight in addition to BMI and energy intake (EI) <u>Soft drink & EI:</u> *The majority (7/12) short-term clinical trials showed no effect on EI, however P-value is significant in their meta-analysis despite high heterogeneity reported in these studies. *The majority of longitudinal (5/5) showed positive relationship <u>Soft drink & Body weight:</u> 5/11 reported + effect for longitudinal (mainly children) and 5/7 positive effect for CT (mainly in adults) <u>OVERALL:</u> Increase (for energy intake) and increase in BMI for adults. Authors quote that there is 'some evidence' for longitudinal studies.
Effect on risk Increase/None/Protect	Increase	Increase for EI only based on longitudinal studies conducted mainly in children and RCTs conducted mainly in adults
Clinical Importance [9]	1	1 The overall effect size for SSB and BMI was 0.08 for children (very low and not clinically significant) Significant shown for adults in RCT were clinically important (0.24)
Clinical Relevance	1	1 Energy Intake is a surrogate marker of weight gain – the effect was much smaller for body weight than EI with the exception of clinical trials and body weight
Generalisability	y	Applies to children, adolescents and adults
Applicability	y	Low- risk increase, even if significant is very low

Reference [1]	Gibson 2008 [1426], Page 533	ABCL Critique
Type of study [2]	Systematic review	Up to July 2008
Level of evidence [3]	IV	IV
Intervention/ comparator [4]	SSB intake and BMI, adiposity, weight change	
N [5]	115,988	
Population/study information [6]	44 studies: 23 cross-sectional, 17 prospective, 4 CT, adults and children. M and F aged 2-65 years	26 cross-sectional
Quality [7]	O	O
Results [8]	Small effect on BMI/wt/wt gain/adiposity in susceptible individuals or with high intakes of SSB Cross-sectional=23 (12 +ve, 11 NS or null) Longitudinal studies=17 (8 +ve, 9 non significant); clinical trials=4 (all +ve for at least some sub-groups).	8/17 longitudinal studies were positive, and of the 8, the majority (5) were in children. All 4 clinical trials were positive for at least one subgroup and all were in children. Increase only in women who increase SSB consumption, adults who are already gaining weight (>3kg) and middle aged men, overweight children
Effect on risk Increase/None/Protect	Increase	None (only in specific subgroups of the population or with high intake)
Clinical Importance [9]	2	2
Clinical Relevance [10]	1	1
Generalisability	y	y
Applicability	y	Y
Notes/Questions		Of the 6 reviews in this review, half (3) weren't included in the SLR by the NHMRC Systematic review that includes cross-sectional data Most studies suggest that the effect of SSB is small except in susceptible individuals or at high levels of intake. "Inconsistencies in definition, design, statistical treatment make it difficult to draw definitive conclusions as to whether SSB are significantly implicated in weight gain".

Reference [1]	Malik et al. 2006 [2202] Page 533	ABCL Critique
Type of study [2]	Systematic Review	Systematic Review Review up to May 2005
Level of evidence [3]	IV	IV
Intervention/comparator [4]	SSB intakes, BMI, BMI z score, weight, adiposity, weight gain	
N [5]	136,772	240,093
Population/study information [6]	30 studies (15 cross-sectional, 10 prospective and 5 CTs) M and F aged 2-99 years	81% of population were children
Quality [7]	0	0 3 “no” in quality assessment
Results [8]	Increased intake of SSB is associated with increased BMI. Cross-sectional studies = 15 (9 +, 5NS, 1 –ve); Prospective studies = 10 (6+ve, 4NS); clinical trials = 5 (all +ve)	High heterogeneity in studies, could not do meta-analysis 10 longitudinal 6/10 +ve 10 longitudinal (6/10 +ve, 3/4 in adults no effect, 1 significant only in women who increased SSB intake) 5 CTs (3 in adults- all +ve, one of those was only +ve in females; 2 in children showed +ve association (only 1 was RCT, 1 cluster RCT)- missing Raben et al 2002 NOTE THAT A FEW OF THESE STUDIES WERE MIS-CLASSIFIED AS POSITIVE (see Quality)
Effect on risk Increase/None/Protect	Increase	Increase (longitudinal studies seem to show effect in children and RCTs show effect in adults)
Clinical importance[9]	1	1
Clinical relevance [10]	1	1
Generalisability	Y	Y for children (longitudinal data), adults (CT)
Applicability	Y	Y
Notes/Questions	NHMRC SLR misclassified 3 studies: 1. Ranks the study by Giammattei et al 2003 as significant positive. This study, quoted by Gibson et al. 2008 “failed to reach significance”, and “ results for diet and regular soda combined” and “diet soda drives the positive association, whereas the association with regular soda was non-significant” 2. Forshee et al 2003 (which was only positive for diet sodas) 3. Forshee et al. 2004 (Malik interpreted the results from the single 24h recall, slightly positive but P>0.36 and not that of the FFQ, where results were negative. * Authors conclude that there were 2 longitudinal adult trials that showed +ve association, but one was NS (French) and in the 1 trial that was significant (Schulze), was significant among females only: therefore only 1 trial was significant, with an increase in risk in females only. * Majority of the population studied were children, may not apply to adults, as longitudinal data does not support association among adults.	

Reference [1]	**Wolff et al. 2008[14] Page 533**	**ABCL Critique**
Type of study [2]	Systematic review	Systematic review
Level of evidence [3]	IV	IV
Intervention/ comparator [4]	SSB intakes, BMI, BMI z score, weight, adiposity, weight gain,	
N [5]	116,699	
Population/study information [6]	30 studies (15 cross-sectional, 10 prospective, and 5 CTs) M and F adults and children aged 2-44 yrs	
Quality [7]	O	N (scores 6/10 'no' in quality assessment checklist)
Results [8]	6/15 cross-sectional studies showed +ve association, 6/10 cohorts +ve, 5/5 CTs +ve association with SSB and BMI in at least variable/group.	10 prospective cohort→ (6 in children- 4 +ve, 4 in adults- 2 +ve), 5 CTs +ve →(2 in children-, 3 in adults, very different study designs) -positive in women only,
Effect on risk Increase/None/Protect	Increase	Not conclusive Increase for adults in very short-term trials, but authors conclude not enough evidence from observational studies to support overall association (positive for short term CT only)
Clinical importance[9]	2	2
Clinical relevance [10]	1	1
Generalisability	Y	y
Applicability	Y	y
Notes/Questions	*AMSTAR Rating <7 (poor quality review), Weed et al, 2011 *Not clear as to the methodology and inclusion/exclusion criteria. * Several studies were left out (including CT that show no association) * No table to easily compare studies and determine their quality and outcomes.	

Reference [1]	**Stookey et al. 2007 Page 534, [3112]**	**ABCL Critique**
Type of study [2]	Cohort	Cohort
Level of evidence [3]	III-2	III-2
Intervention/ comparator [4]	Replacement of SSB with H2O and Energy Intake	4 popular diets (Atkins, Zone, LEARN, Ornish), Secondary analysis modeling for substitution of water for SSB (definition includes sweetened milk, coffee, tea, energy drinks) and its effect on EI (no intervention of actual replacement of SSB)
N [5]	118	118 (96 followed up to 12 months)
Population/study information [6]	Overweight dieting females aged 25-50 yrs	who regularly consume SSB participating in a weight loss trial (not free-living dieting)
Quality [7]	P	P quality rating doesn't relate to the fact that the definition of SSB was different to the NHMRC one
Results [8]	Controlling total beverage vol, food composition, and energy expenditure, each 1 unit of soft drinks replaced by water associated with 9 (2) kcal/d lower energy intake P<0.04, If all SSBs were replaced by water would result in predicted reduction of 200kcal/day	Included sweetened milk, coffee and tea as "sugar-sweetened beverages"
Effect on risk Increase/None/Protect	Increase (reduce intake-protect)	Increase
Clinical importance[9]	1	1
Clinical relevance [10]	2	2 or 3 EI is a surrogate marker of weight gain, and the intervention was DIFFERENT since it wasn't exclusive to SSB
Generalisability	Y	Overweight women on diets—was not specific to SSB or general population
Applicability	Y	
Notes	*Note that it should state III not 111 under Level of evidence *Change in EI <10kcal/day, significant—is this clinically significant? Resulted in a significant reduction of 200kcal over 12 months. *Randomized into diets, not into SSB replacement * One of diets had no water recommendation (Ornish Diet) * 18% loss in participants (<20% recommended) * Definition of SSB was not specific to NHMRC definition of SSB * Intake of non-caloric beverages did not differ (was it because these women had similar intakes since they were on a diet?)	

Reference [1]	**Phillips et al. 2004 [2648], Page 534**	**ABCL Critique**
Type of study [2]	**Cohort**	**Cohort**
Level of evidence [3]	III-2	III-2
Intervention/ comparator [4]	Energy dense snack food and soft drink intake and BMI z score	
N [5]	196	
Population/study information [6]	Non obese girls aged 9-10 years	From the Michigan Institute of Technology Growth and Development Study
Quality [7]	P	P
Results [8]	Only soft drink intake associated with BMI z score. Q3 and Q4 of % kJ from soft drink had BMI z scores 0.17 higher than Q1 p<0.001	Association between BMI z score, but not % body fat. Negative BMI z-score at baseline reflected an underweight population and though the BMI z-score increased over the study period, at the end it was 0.02, indicating normal weight. No significant difference observed for %body fat despite the higher BMI among participants with higher en% from SSB (authors cannot explain why this is)
Effect on risk Increase/None/Protect	Increase	Increase for BMI (underweight to normal weight) but not for % BF and only during post-menarchal period
Clinical importance[9]	1	
Clinical relevance [10]	1	
Generalisability	Y	Predominantly white population (75%)
Applicability	y	
Notes		

Reference [1]	Dubois et al. 2007 [1230]	Critique
Type of study [2]	Cohort	Cohort
Level of evidence [3]	III-2	III-2
Intervention/ comparator [4]	Consumption of SSB and risk of overweight	SSB consumption differences between non-consumers, regular consumers and daily consumers BETWEEN MEALS and risk of overweight
N [5]	1944	
Population/study information [6]	Longitudinal Study of Child Development in Quebec Canadian children aged 4.5 yrs	
Quality [7]	P	P
Results [8]	Regular SSB consumption between meals OR of o/wt in consumers vs non consumer OR 2.4 (CI 1.105-5.054, p<=0.05)	No association with total daily intake of SSB—so if there is no difference in total intake, and higher between meals, it may mean that with meals, it lowers risk of overweight (needs further investigation)
Effect on risk Increase/None/Protect	Increase	(Increase when consumed between meals) No effect for total daily intake of SSB
Clinical importance[9]	1	1
Clinical relevance [10]	1	1
Generalisability	y	y
Applicability	y	y
Notes	* Did not control for baseline BMI- given this is often a strong predictor of subsequent weight gain, failure to control for this variable can seriously undermine the results. * Only showed that SSB intake between meals is associated with risk of overweight, but total daily intake was not associated with risk.	

Reference [1]	**Faith et al. 2006 [1279]** **Page 534**	**ABCL Critique**
Type of study [2]	Cohort	Cohort
Level of evidence [3]	III-2	III-2
Intervention/ **comparator [4]**	Consumption of fruit juice (not specified) and BMI	Fruit juice (not SSB) and risk of overweight
N [5]	1797	
Population/study **information [6]**	Women, Infants, Children Supplemental Nutrition Program. US Children 1-5 yrs monitored over 4 yrs	
Quality [7]	P	
Results [8]	In children at risk of o/wt or o/wt, increased FJ associated with increased adiposity gain. 1 serve FJ/day associated with B=-0.009 p<0.01	
Effect on risk **Increase/None/Protect**	Increase for fruit juice (Type not specified)	Fruit juice does not imply fruit drink in the US
Clinical **importance[9]**	1	
Clinical relevance **[10]**	1	
Generalisability	Y	
Applicability	Y	Applies children who are o/w or at risk of o/w.
Notes	*******This study didn't look at SSB and shouldn't be part of the evidence base** * Ht, wt measure, children attending a program	

Reference [1]	Tam et al. 2006[3180] Page 534	ABCL Critique
Type of study [2]	**cohort**	Cohort (short communication)
Level of evidence [3]	III-2	IV? Or III-3 This is a short communication
Intervention/ comparator [4]	Consumption of cordials and soft drinks and BMI over 5 yrs	
N [5]	268	281
Population/study information [6]	Australian school children aged 7.7 yrs over 5 yrs	
Quality [7]	P	O
Results [8]	Median CHO intake from soft drink/cordial 10g/d higher (P=0.002) in children who were overweight/obese at follow-up vs acceptable BMI at both baseline and follow-up, and 23g/d higher (P=0.019) vs those overweight/obese at baseline but with acceptable BMI at follow-up. No associations with fruit juice/drink or milk	*SSB intake of children those who were overweight and obese and those whose BMI increased was the same *BMI gainers had nearly half the intake of fruit juice/fruit drink than those who had normal BMI
Effect on risk Increase/None/Protect	Increase for soft drink/cordial None-fruit juice	Increase for soft drink/cordial and None for fruit juice OR fruit drink or milk
Clinical importance[9]	1	
Clinical relevance [10]	1	
Generalisability	y	
Applicability	Y	Applies only to children
Notes	*Small study, incomplete reporting, hard to make definitive judgement; did not adjust for confounders *Fruit juice and fruit drink were in the same category *Does not assess changes in SSB intake over the 5 years (measures baseline diet only)	

Reference [1]	Taylor et al. 2007 [3213], Page 536	ABCL Critique
Type of study [2]	Cluster CT	Cluster CT
Level of evidence [3]	III-1	III-1
Intervention/ comparator [4]	Height, weight, wasit circumference, blood pressure, diet (validated food questionnaire), physical activity at baseline, 1 and 2 yrs	Reduction in sweetened drinks and increased fruit and vegetable intake and activity coordinators who managed an activity program that focused on non-curricular lifestyle-based activities (i.e. community walks)
N [5]	730	
Population/study information [6]	APPLE Project NZ Children, 4 intervention and 3 control schools. Intervention n=250 M 138, age 7.7 (1.8) Control n= 219 M 108, age 7.7 (1.6)	Community-based intervention
Quality [7]	P	*measurements for diet, height, weight, waist circumference, diet , physical activity *BMI z-scores *low drop-out rate (n=3)
Results [8]	Intervention vs control: lower BMI z score mean 0.09 (0.01-0.18) after 1 yr, 0.26 (0.21-0.32) at 2 yrs. Decrease in waist circumference-1.0 (-2.0-0.0) and systolic blood pressure -2.9 (-5.2—0.6). Intervention used less soft drinks (67% of control P=0.04) and fruit juice/drinks (70%; P=-.003) and more fruit P=0.01)	* No difference in prevalence of overweight between control and intervention * BMI z score was reduced in normal-weight, but not overweight intervention children relative to control * no differences in physical activity or television viewing (therefore did not adjust data for it)
Effect on risk Increase/None/Protect	Increase (reduced intake-protect)	None (overall) * Prevents weight gain only in those not originally overweight *Results are not specific to SSB only (combination of diet, and physical activity)
Clinical importance[9]	1	1 Clinical difference relatively high (0.26 difference in BMI z-score)
Clinical relevance [10]	1	3 There is no need to lower BMI in already normal-weight children and the intervention is not specific to lowering SSB, but it is a lifestyle intervention that incorporates SSB reduction, fruit juice/drinks reduction and increased whole fruit intake.
Generalisability	y	
Applicability	y	Applies to children only
Notes	* This intervention was only effective in children who were not already overweight, it shows that it is not always an effective strategy to reduce obesity	

Reference [1]	**Sichieri et al. 2008 [2648], Page 536**	**ABCL Critique** Note that year is incorrect, should be 2009
Type of study [2]	RCT	Cluster RCT
Level of evidence [3]	II	III-1
Intervention/ comparator [4]	Reduced intake of Sugar sweetened carbonated beverages	* educational programme to reduce sugar-sweetened carbonated beverages (no cordials/fruit drinks) and measure change in weight gain * 7 month intervention
N [5]	435 controls 608 intervention	
Population/study information [6]	Intervention group: BMI=18.3 (3.6); Male: 46.9%; Overweight 15.8%; Age: 10.9 (0.81) years. Comparator group: BMI=18.2 (3.2) (P=0.69); Male: 47.4% (P=0.90); Overweight: 14.3% (P=0.70); Age=10.9 (0.75) years (P=0.30)	
Quality [7]	P	
Results [8]	significant increase in daily intake of carbonated drinks in the intervention vs. control (mean difference -56ml (95% CI – 119- -7ml) and NS overall reduction in BMI, P=0.33. However, in students overweight at baseline, the intervention group showed greater BMI reduction (-0.4kg/m2 vs. -0.2kg/m2 control group but NS (P=0.11)), but was significant in girls (regression co-efficient -0.01, P=0.009)	* BMI and weight increased in both intervention and control at the end of the study despite a reduction in soda intake in both groups * No difference in BMI between two groups after adjusting for age and time of follow-up
Effect on risk Increase/None/Protect	Increased (reduced intake protect in overweight girls only)	* Increase only in overweight girls (overall None)
Clinical importance[9]	1	
Clinical relevance [10]	1	
Generalisability	Y	
Applicability	Y	Applies to 9-12 year olds only
Notes	* Most children were from families of low socioeconomic status	

Item 5: Timeframe Discrepancies

Examples from the draft reports are outlined below:

Australian Dietary Guidelines NHMRC 2011

'This is a systematic literature review relevant to targeted questions published in the peer-reviewed nutrition literature from 2003-2009.' [86]

'NHMRC commissioned a literature review (A review of the evidence to address targeted questions to inform the revision of the Australian dietary guidelines—the Evidence Report) on food, diet and disease/health relationships, covering the period 2003–2009. This addressed specific questions developed by the expert Dietary Guidelines Working Committee (the Working Committee) on food, diet and disease/health relationships where evidence might have changed since the previous dietary guidelines were developed.' [87]

'The evidence statements and gradings (A- convincing association, B- probable association, C- suggestive association) related to 'eat a wide variety' from the Evidence Report (literature from years 2002 – 2009) are presented in the table below.' [88]

'As the Evidence Report only included studies investigating food, diet and health relationships, the results of other high quality studies published since 2002 were used to update the sections in the Guidelines which provided other information ('Setting the scene', 'How eating a particular food may improve health outcomes', and 'Practical considerations for health professionals' sections) if they met the following criteria:

- *the study was a high quality randomised controlled trial, intervention, cohort, or observational study, but not an editorial or opinion piece (meta-analyses were considered)*
- *the outcome of the study related to some aspect of health or chronic disease*
- *the study results were generalisable to the Australian population*
- *the study was related to foods or the total diet rather than nutrients.'* [89]

'Evidence, which outlines the scientific evidence base since 2002 from studies of associations between human consumption patterns and health outcomes, and the effects of dietary interventions on health outcomes relating to foods, food groups and whole dietary patterns.' [90]

[86] Page 11 Australian Dietary Guidelines NHMRC 2011
[87] Page 14 Australian Dietary Guidelines NHMRC 2011
[88] Page 27 Australian Dietary Guidelines NHMRC 2011
[89] Page 16 Australian Dietary Guidelines NHMRC 2011
[90] Page 21 Australian Dietary Guidelines NHMRC 2011

Evidence Report NHMRC 2011

'In 2008, the NHMRC tendered for systematic literature reviews to be undertaken to support the revision of the Dietary Guidelines for Australians. The details of the requested work and the methods employed are set out in the Process Report. The primary aim was to undertake a series of systematic reviews of the national and international literature from the year 2002 on the food-diet-health-disease inter-relationship for different population subgroups.' [91]

'Most of the reviews considered only evidence published from 2002, to provide an update on literature published since the last edition of the Dietary Guidelines for Australians. The searches were mostly carried out to April 2009, so more recent publications are generally not included unless specifically requested by the NHMRC. It is important therefore to realise that these are only update reviews, to be considered along with the evidence reviews summarised in the last Dietary Guidelines. In many cases, some of the most important literature was published before 2002 and is not considered in these reviews. Therefore evidence grades for these may be lower than would be anticipated with a time unlimited literature review (e.g. for sugar and dental caries, where the diet disease relationship was well established prior to 2002)'.[92]

[91] Page 8, Introduction. A Review of the Evidence to Address Targeted Questions to Inform the Revision of the Australian Dietary Guidelines NHMRC 2011

[92] Page 8, Limitations of the Review. A Review of the Evidence to Address Targeted Questions to Inform the Revision of the Australian Dietary Guidelines NHMRC 2011

Item 6: Rationale

The report outlines the approach the Working Committee used to conduct the evidence based systematic reviews of published scientific literature to support its work.

'NHMRC followed critical appraisal processes to ensure rigorous application of the review methodology [34, 38]. Data were extracted from included studies and assessed for strength of evidence, size of effect and relevance of evidence according to standardised NHMRC processes [34, 39-41]. The components of the body of evidence—evidence base (quantity, level and quality of evidence); consistency of the study results; clinical impact; generalisability; and applicability to the Australian context—were rated as excellent, good, satisfactory or poor according to standard NHMRC protocols [41].'

The reviewers then summarised the evidence into draft body of evidence statements. The Working Committee advised that a minimum of five high quality studies was required before a graded draft evidence statement could be made. The individual studies in meta-analyses were considered as separate studies. The draft Evidence Statements were graded A to D according to standard NHMRC protocols [41].' [93]

In brief, three types of reviews were commissioned, depending on the question being addressed:

• Systematic reviews, considering primary evidence from epidemiological and experimental studies, as well as reviews and meta analyses (but excluding editorial and other grey literature);

• Umbrella reviews, which only included reviews and meta analyses; and

• Narrative reviews, which may have also included information from secondary sources such as government reports. [94]

[93] Page 14 Australian Dietary Guidelines NHMRC 2011
[94] Page 1 A Review of the Evidence to Address Targeted Questions to Inform the Revision of the Australian Dietary Guidelines NHMRC 2011