Appendix E2.44: Evidence Portfolio

Part D. Chapter 6: Cross-Cutting Topics of Public Health Importance

What is the relationship between the intake of added sugars and body weight/obesity?

Conclusion Statement: Strong and consistent evidence shows that intake of added sugars from food and/or sugar-sweetened beverages are associated with excess body weight in children and adults. The reduction of added sugars and sugar-sweetened beverages in the diet reduces body mass index (BMI) in both children and adults. Comparison groups with the highest versus the lowest intakes of added sugars in cohort studies were compatible with a recommendation to keep added sugars intake below 10 percent of total energy intake.

DGAC Grade: Strong

Review of Evidence

These findings come from three recent reports, all using SRs and MA that examined the relationship between the intake of added sugars and measures of body weight.[1-3] Te Morenga et al.[1] considered "free sugars[i]," while Malik[2] and Kaiser et al.[3] focused on sugar-sweetened beverages. All reviews reported on body weight. The Te Morenga report also reported on body fatness. In the Te Morenga et al. study, 30 trials and 38 cohort studies were included in the analyses. In the Malik et al. study, 10 trials and 22 cohort studies were included in the analyses. Kaiser et al. provided an updated meta-analysis to a previous publication (Mattes[4]) and included a total of 18 trials. In total, 92 articles were considered in these reviews, of which 21 were included in two or more reviews. Children and adults were included in the analyses as were females and males. Diverse demographics (race/ethnicity and geographic location) also were represented by the participants in the respective research studies. All three reviews were high-quality, with ratings of 11 out of 11 using the AMSTAR tool, and they specifically addressed the Committee's question of interest.

The reviews by Malik et al. and Te Morenga et al. were very consistent. The findings from both reports provide strong evidence that among free-living people consuming ad libitum diets, the intake of added sugars or sugar-sweetened beverages is associated with unfavorable weight status in children and adults. Increased added sugars intake is associated with weight gain; decreased added sugars intake is associated with decreased body weight. Although a dose

[i] Free sugar is defined by WHO as "all monosaccharides and disaccharides added to foods by the manufacturer, cook, or consumer, plus sugars naturally present in honey, syrups, and fruit juices." It is used to distinguish between the sugars that are naturally present in fully unrefined carbohydrates such as brown rice, whole wheat pasta, and fruit and those sugars (or carbohydrates) that have been, to some extent, refined (normally by humans but sometimes by animals, such as the free sugars present in honey). They are referred to as "sugars" since they cover multiple chemical forms, including sucrose, glucose, fructose, dextrose, and others.[5]

response cannot be determined at this time, the data analyzed by Te Morenga et al. support limiting added sugars to no more than 10 percent of daily total energy intake based on lowest versus highest intakes from prospective cohort studies. Te Morenga et al. state that, "despite significant heterogeneity in one meta-analysis and potential bias in some trials, sensitivity analyses showed that the trends were consistent and associations remained after these studies were excluded." Despite these limitations the DGAC gave this evidence a grade of **Strong**, as the limitations are those inherent to the primary research on which they are based, notably inadequacy of dietary intake data and variations in the nature and quality of the dietary interventions.

The Kaiser et al. review concluded that the currently available randomized evidence for the effects of reducing sugar-sweetened beverage intake on obesity is equivocal. However, the DGAC noted methodological issues with this review, particularly the inclusion of both efficacy studies (in more controlled settings) and effectiveness studies (in real world). The outcomes from the effectiveness trials vary substantially, depending how effective the interventions are. As a result, the Committee viewed the reviews by Te Morenga et al. and Malik et al. to be stronger than the Kaiser et al. review.

Table 1. Summary of existing reports, systematic reviews, and meta-analyses examining the relationship between the intake of added sugars and body weight or risk of obesity

Author, Year Publication Type AMSTAR Rating*	Added Sugars Definition Outcomes Considered	Date Range Searched Criteria Used	Included Studies** (Number and Design)	Recommendations, Evidence/Conclusion Statements, and/or Main Results from Existing Report/ SR/ MA
Te Morenga, 2012 Systematic Review and Meta-Analysis AMSTAR: 11/11	"Free sugars" as defined by the World Health Organization: all monosaccharides and disaccharides added to foods by the manufacturer, cook, or consumer, plus sugars naturally present in honey, syrups, and fruit juices At least one measure of body fatness	Up to Dec 2011 Examined intake of total sugars, intake of a component of total sugars, or intake of sugar containing foods and beverages; only included RCTs and PCSs in humans; adults and children free from acute illness, but those with diabetes or other non-communicable diseases whom conditions were stable were included; duration of at least 2 wks for RCTs and 1 yr for PCSs; excluded studies with interventions designed to achieve weight loss because the aim of the review was to facilitate the	30 RCTs and 38 PCSs	**Conclusion:** Among free living people involving ad libitum diets, intake of free sugars or sugar sweetened beverages is a determinant of body weight. The change in body fatness that occurs with modifying intakes seems to be mediated via changes in energy intakes, since isoenergetic exchange of sugars with other carbohydrates was not associated with weight change. **Main Results:** In trials of adults with ad libitum diets (that is, with no strict control of food intake), reduced intake of dietary sugars was associated with a decrease in body weight (-0.80 kg, 95% CI: -1.21 to -0.39; P<0.001); increased sugars intake was associated with a comparable weight increase (0.75 kg, 0.30

		development of population-based recommendations rather than recommendations for management of obesity		to 1.19; P=0.001). Isoenergetic exchange of dietary sugars with other carbohydrates showed no change in body weight (0.04 kg, 95% CI: −0.04 to 0.13). Trials in children, which involved recommendations to reduce intake of sugar sweetened foods and beverages, had low participant compliance to dietary advice; these trials showed no overall change in body weight. However, in relation to intakes of sugar sweetened beverages after one year follow-up in prospective studies, the odds ratio for being overweight or obese increased was 1.55 (95% CI: 1.32 to 1.82) among groups with the highest intake compared with those with the lowest intake.
Malik, 2013 Systematic Review and Meta-Analysis AMSTAR: 11/11	Sugar-sweetened beverages (carbonated beverages, sweetened beverages, soda, sports drink, fruit drink) Body weight	Up to March 2013 Original research; PCSs and RCTs in children and adults; reported multivariable-adjusted coefficients for the association between SSBs and BW from PCSs or the difference in changes in BW between intervention and control groups from RCTs; did not combine SSBs with other beverages, foods, or lifestyle factors; had a control group and intervened for at least 2 wks in clinical trials; English language	10 RCTs and 22 PCSs	**Conclusion:** This systematic review and meta-analysis of prospective cohort studies and RCTs provides evidence that SSB consumption promotes weight gain in children and adults. **Main Results:** In cohort studies, one daily serving increment of SSBs was associated with a 0.06 and 0.05-unit increase in BMI in children and 0.22 kg and 0.12 kg weight gain in adults over 1 y in random and fixed effects models, respectively. RCTs in children showed reductions in BMI gain when SSBs were reduced (random and fixed effects: -0.17 and -0.12 kg), whereas RCTs in adults showed increases in body weight when SSBs were added (random and fixed effects: 0.85 kg).
Kaiser, 2013; Mattes, 2011 Systematic Review and Meta-Analysis AMSTAR: 11/11	Nutritively sweetened beverage (NSB) / Sugar-sweetened Beverages (SSB): Something one drinks to which a nutritive sweetener has been added. Regular sodas, fruit punch, and chocolate milk qualified as NSBs. Does not include any studies of	Kaiser, 2013 (Jan 2010 – Oct. 2012); Mattes, 2011 (through January 2009) Note: newly published articles meeting original criteria were combined with the meta-analyzed studies from Mattes, 2011.	18 RCTs	**Conclusion:** The updated meta-analysis shows that the currently available randomized evidence for the effects of reducing SSB intake on obesity is equivocal. **Main Results:** In the three new studies in which SSBs were added to the diets of adults or children, statistically significant weight

	alcoholic beverages or beverages consumed as meal replacements (e.g., Slim-Fast) or growth promoters (e.g., Ensure)	Criteria: RCTS in humans that involved comparison of outcomes between subjects assigned to 2 or more conditions that differed only in the extent to which the subjects were required, asked, or encouraged to consume or not consume NSBs. Study duration had to be at least 3 weeks and included a body weight/composition outcome		gain was observed in both adult trials, ranging from 0.39 to 1.14 kg. No significant difference in weight gain was observed in the study in children. In one new study of adults and the two new studies of children in which participants who drank some amount of SSBs at baseline were asked to eliminate or reduce their SSB consumption, standardized mean differences in percentage weight loss or BMI reduction ranged from 0.13 to 0.33. In new studies in which all participants were overweight or obese at baseline standardized mean differences ranged from 0.13 to 0.73. In combination with earlier studies or subgroup analysis of the effects of reducing SSBs on overweight subjects, the overall standardized mean difference was 0.25 (CI: 0.13 to 0.38 standard deviations), p<0.0001)

* A measurement tool for the 'assessment of multiple systematic reviews' (AMSTAR)

**Reference overlap: Of the 92 articles included in total across the reviews, 21 were included in two or more reviews.

References Included in Review

1. Te Morenga L, Mallard S, Mann J. Dietary sugars and body weight: systematic review and meta-analyses of randomised controlled trials and cohort studies. BMJ. 2013;346:e7492. PMID: 23321486. http://www.ncbi.nlm.nih.gov/pubmed/23321486.

2. Malik VS, Pan A, Willett WC, Hu FB. Sugar-sweetened beverages and weight gain in children and adults: a systematic review and meta-analysis. Am J Clin Nutr. 2013;98(4):1084-102. PMID: 23966427. http://www.ncbi.nlm.nih.gov/pubmed/23966427.

3. Kaiser KA, Shikany JM, Keating KD, Allison DB. Will reducing sugar-sweetened beverage consumption reduce obesity? Evidence supporting conjecture is strong, but evidence when testing effect is weak. Obes Rev. 2013: 14(8):620-633. PMID: 23742715. http://www.ncbi.nlm.nih.gov/pubmed/23742715

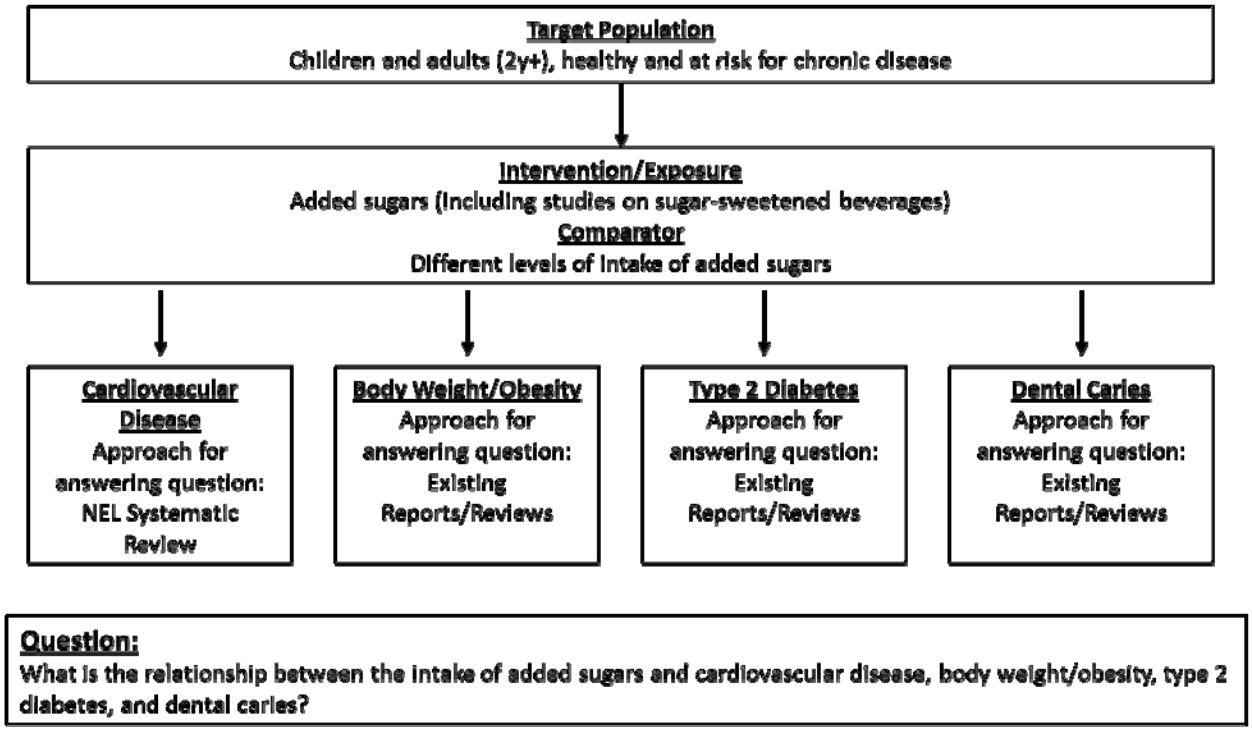
4. Mattes RD, Shikany JM, Kaiser KA, Allison DB. Nutritively Sweetened Beverage Consumption and Body Weight: A Systematic Review and Meta-Analysis of Randomized Experiments. Obes Rev. 2011:12(5):346-365. PMID:20524996 http://www.ncbi.nlm.nih.gov/pubmed/20524996

Additional Reference

5. The science behind the sweetness in our diets. Bull World Health Organ. 2014;92(11):780-1. PMID: 25378738. http://www.ncbi.nlm.nih.gov/pubmed/25378738.

Supplementary Information:

Analytical Framework



Question:
What is the relationship between the intake of added sugars and cardiovascular disease, body weight/obesity, type 2 diabetes, and dental caries?

Methodology

To answer this question, the DGAC relied on a systematic review commissioned by the World Health Organization (WHO).[1] Additionally, to capture new research, the Committee searched for SRs and MA published since January 2012, the completion of the WHO review.

Search Strategy for Existing Systematic Reviews/Meta-Analyses

PubMed:

Added Sugar* OR brown sugar*[tiab] OR white sugar*[tiab] OR raw sugar* OR syrup*[tiab] OR dextrose OR fructose OR fruit juice concentrate* OR glucose OR honey[mh] OR honey[tiab] OR jam[tiab] OR invert sugar* OR malt sugar* OR maltose[tiab] OR maltodextrin OR molasses OR turbinado sugar* OR cane sugar*[tiab] OR cane juice*[tiab] OR “sugar cane”[tiab] OR sugar beet*[tiab] OR trehalose[tiab] OR sucrose[tiab] OR sweetene* OR table sugar*[tiab] OR "Monosaccharides"[Mesh] OR Monosaccharide*[tiab] OR disaccharide*[tiab] OR "Disaccharides"[Mesh] OR "Sweetening Agents"[Mesh:noexp] OR "Nutritive Sweeteners"[Mesh] OR "Dietary Sucrose"[tiab] OR sugar based* OR sugar-based* OR HFCS OR candy[tiab] OR "Candy"[Mesh] OR “Carbonated beverages”[mh] OR Soft drink* OR Liquid sugar* OR Soda pop* OR soda[tiab] OR Carbonated drink*[tiab] OR dessert*[tiab] OR pastries[tiab] OR ice cream*[tiab] OR cookies[tiab] OR cake*[tiab] OR pie[tiab] OR pies[tiab] OR gelatin*[tiab] OR

jello[tiab] OR fruit punch*[tiab] OR fruitade*[tiab] OR sugary[tiab] OR sweets[tiab] OR sugar-sweetene*[tiab] OR caramel OR "malt barley" OR "barley malt" OR "Sweetening Agents" [Pharmacological Action] (done; w/ food/diet terms 30; none selected; 8/7/2014) OR sugar-coated[tiab] OR sugar coated*[tiab] OR sugar*[ti] OR sugar sweeten*[tiab] OR dietary sugar*[tiab] OR confectioner*[tiab] OR fizzy drink*[tiab] OR chewing gum*[tiab]
AND

"body size"[tiab] OR body size[mh] OR obesity[tiab] OR obese[tiab] OR overweight[mh] OR obesity[mh] OR overweight [tiab] OR overnutrition[tiab] OR overnutrition[mh]OR adipos*[tiab] OR adiposity[mh] OR body composition[mh] OR body fat distribution[mh] OR “body fat”[tiab] OR "body weight"[tiab] OR body weight[mh] OR weight gain[mh] OR weight loss[mh] OR “body-weight related”[tiab] OR "weight gain"[tiab] OR weight-gain[tiab] OR weight loss[tiab] OR weight-loss[tiab] OR Body Weights and Measures[mh] OR weight[ti] OR "Anthropometry"[Mesh:noexp] OR body mass index[mh] OR “body mass index”[tiab] OR BMI[tiab] OR “weight status”[tiab] OR adipose tissue [mh] OR "healthy weight"[tiab] OR waist circumference[mh] OR “body mass”[ti] OR “body fat mass”[tiab] OR body weight changes[mh] OR “waist circumference”[tiab] OR ideal body weight[mh] OR waist-hip ratio[mh] OR waist-hip ratio[tiab] OR waist hip ratio[tiab] OR “body height”[tiab] OR "body fat"[tiab] OR waist[ti]

Embase:

(added NEXT/1 sugar*):ti,ab OR (raw NEXT/1 sugar*):ti,ab OR (white NEXT/1 sugar*):ti,ab OR (brown NEXT/1 sugar*):ti,ab OR 'sugar intake'/exp OR 'sucrose'/exp OR 'sweetening agent'/de OR 'fructose'/exp OR 'monosaccharide'/exp OR 'sugarcane'/exp OR 'lactose'/exp OR (milk NEXT/2 sugar*):ti,ab OR 'sugar beet'/exp OR 'sugar'/exp/mj OR (sugar NEXT/1 beet*):ti,ab OR sugarcane:ti,ab OR (sugar NEXT/1 cane):ti,ab OR dextrose:ti,ab OR 'glucose'/exp OR (corn NEXT/1 syrup*):ti,ab OR (maple NEXT/1 syrup*):ti,ab OR 'honey'/exp OR 'invert sugar'/exp OR (invert NEXT/1 sugar*):ti,ab OR 'maltose'/exp OR (malt NEXT/1 sugar*):ti,ab OR 'maltodextrin'/exp OR 'molasses'/exp OR (turbinado NEXT/1 sugar*):ti,ab OR 'disaccharide'/exp OR disaccharide*:ti,ab OR trehalose*:ti,ab OR (sugar NEXT/1 based*):ti,ab OR HFCS*:ti,ab OR candy:ti,ab OR candies:ti,ab OR 'carbonated beverage'/exp OR (carbonated NEXT/1 beverage*):ti,ab OR (Soft NEXT/1 drink*):ti,ab OR (Liquid NEXT/1 sugar*):ti,ab OR (Soda NEXT/1 pop*):ti,ab OR popsicle*:ti,ab OR (soda NEAR/10 (drink* OR beverage*)) OR (Carbonated NEXT/1 drink*):ti,ab OR 'soft drink'/exp OR dessert*:ti,ab OR pastries:ti,ab OR (ice NEXT/1 cream*):ti,ab OR 'ice cream'/exp OR cookies:ti,ab OR cake*:ti OR pie:ti,ab OR pies:ti,ab OR gelatin*:ti,ab OR jello:ti,ab OR (fruit NEXT/1 punch*):ti,ab OR fruitade*:ti,ab OR (('fruit juice'/exp OR (fruit NEXT/1 juice*)) AND concentrate) OR sweets:ti,ab OR caramel:ti,ab OR (malt* NEAR/1 barley) OR ('syrup'/exp OR syrup*:ti,ab) OR sugary:ti,ab OR sugar*:ti OR (sugar NEAR/3 sweet*):ti,ab OR (sugar NEAR/3 coat*):ti,ab OR (dietary NEXT/1 sugar*):ti,ab OR confectioner*:ti,ab OR (fizzy NEXT/1 drink*):ti,ab OR chewing gum*:ti,ab OR 'chewing gum'/exp
('food'/exp OR 'beverage'/exp OR diet/exp OR 'dietetics'/exp OR nutrition/exp OR cane OR rice OR sorghum OR malt OR golden OR 'food additive'/exp)
AND

'body size'/de OR (body NEXT/1 size*):ti,ab OR 'obesity'/exp OR obesity:ti,ab OR obese:ti,ab OR overweight:ab,ti OR adipos*:ab,ti OR 'body weight'/exp OR (body NEXT/1 weight*):ti,ab OR 'weight gain'/de OR (weight NEXT/1 gain):ti,ab OR 'weight reduction'/exp OR 'weight reduction':ab,ti OR (weight NEXT/1 loss):ti,ab OR 'body composition'/exp OR 'body fat':ab,ti OR 'anthropometry'/de OR 'body mass'/de OR bmi:ab,ti OR (body NEXT/1 mass):ti,ab OR weight:ti OR 'waist circumference'/de OR 'waist circumference':ab,ti OR 'waist hip ratio'/de OR (waist NEXT/1 hip):ti,ab OR 'body fat'/de OR 'adipose tissue'/exp OR 'skinfold thickness'/exp OR 'body fat distribution'/exp OR 'overnutrition'/exp OR 'overnutrition':ti,ab OR weight:ti OR “weight status”:ti,ab OR waist:ti

Cochrane:

(Added NEXT Sugar*) OR (brown NEXT sugar*) OR (white NEXT sugar*) OR (raw NEXT sugar*) OR syrup*:ti,kw OR dextrose:ti OR fructose:ti OR (fruit NEXT juice NEXT concentrate*) OR glucose:ti OR honey:ti OR jam:ti OR (invert NEXT sugar*) OR (malt NEXT sugar*) OR maltose:ti OR maltodextrin:ti OR molasses OR (turbinado NEXT sugar*) OR (cane NEXT sugar*) OR (cane NEXT juice*) OR “sugar cane”:ti,ab OR (sugar NEXT beet*):ti,ab OR trehalose:ti OR sucrose:ti OR sweetene* OR (table NEXT sugar*) OR Monosaccharide*:ti OR disaccharide*:ti OR "Dietary Sucrose":ti,ab OR (sugar NEXT based*) OR sugar-based* OR HFCS OR candy:ti,ab OR candies:ti,ab OR (Carbonated NEAR beverage*) OR (Carbonated NEAR drink*) OR (Soft NEXT drink*) OR (Liquid NEXT sugar*) OR (Soda NEXT pop*) OR popsicle* OR soda:ti OR dessert*:ti,ab OR pastries:ti,ab OR (ice NEAR/1 cream*) OR cookies:ti,ab OR cake*:ti OR pie:ti OR pies:ti OR gelatin*:ti OR jello:ti OR “fruit punch”:ti,ab OR fruitade*:ti,ab OR sugar*:ti OR sweets:ti OR (sugar-sweetene*:ti,kw,ab) OR caramel:ti,ab OR (malt* NEAR/1 barley) OR 'syrup':ti,ab,kw OR (dietary NEXT sugar*):ti,ab OR sugary:ti,ab OR sugar*:ti OR (sugar NEAR/3 sweet*):ti,ab OR (sugar NEAR/3 coat*):ti,ab OR (dietary NEXT/1 sugar*):ti,ab OR confectioner*:ti,ab OR (fizzy NEXT/1 drink*):ti,ab OR chewing gum*:ti,ab (“body weight” OR obesity:ti,kw,ab OR overweight:ti,kw,ab OR “body fat”:ti,kw,ab OR adipos*:ti,kw,ab OR weight:ti,kw,ab OR waist:ti,kw,ab OR “body mass”:ti,kw,ab OR bmi:ti,kw,ab OR “Metabolic syndrome”:ti,kw,ab)

Navigator:

((Added NEXT Sugar*) OR (brown NEAR/1 sugar*) OR (white NEAR/1 sugar*) OR (raw NEAR/1 sugar*) OR title:syrup* OR title:dextrose OR title:fructose OR (fruit NEAR/1 juice NEAR/1 concentrate*) OR title:glucose OR title:honey OR title:jam OR (invert NEAR/1 sugar*) OR (malt NEAR/1 sugar*) OR title:maltose OR title:maltodextrin OR title:molasses OR (turbinado NEAR/1 sugar*) OR (cane NEAR/1 sugar*) OR (cane NEAR/1 juice*) OR “sugar cane” OR (sugar NEAR/1 beet*) OR title:trehalose OR title:sucrose OR title:sweetene* OR (table NEAR/1 sugar*) OR title:Monosaccharide* OR title:disaccharide* OR "Dietary Sucrose" OR (sugar NEAR/1 based*) OR sugar-based* OR HFCS OR title:candy OR title:candie* OR (Carbonated NEAR beverage*) OR (Carbonated NEAR drink*) OR (Soft NEAR/1 drink*) OR (Liquid NEAR/1 sugar*) OR (Soda NEAR/1 pop*) OR popsicle* OR title:soda OR title:dessert* OR title:pastries OR (ice NEAR/1 cream*) OR title:cookies OR title:cake* OR title:pie OR pies:ti

OR title:gelatin* OR title:jello OR "fruit punch" OR title:fruitade* OR title:sweets OR (sugar-sweetene*) OR title:caramel OR (malt* NEAR/1 barley) OR (dietary NEAR/1 sugar*) OR title:sugar* OR (sugar NEAR/3 sweet*) OR (sugar NEAR/3 coat*) OR (dietary NEAR/1/1 sugar*) OR title:confectioner* OR (fizzy NEAR/1 drink*) OR chewing NEAR/1 gum*)

Inclusion Criteria

Date Range:

- Published between December 2011 and August 2014 (in English in a peer-reviewed journal)

Study Design:

- Systematic review and/or meta-analysis that included randomized controlled trials and/or prospective cohort studies

Study Subjects:

- Reviews that included studies from high or very high human development (2012 Human Development Index)
- Healthy or at elevated chronic disease risk

Intervention/Exposure:

- Added sugars, including sugar-sweetened beverages
- Added sugars are sugars that are either added during the processing of foods, or are packaged as such, and include sugars (free, mono- and disaccharides), syrups, naturally occurring sugars that are isolated from a whole food and concentrated so that sugar is the primary component (e.g., fruit juice concentrates), and other caloric sweeteners.

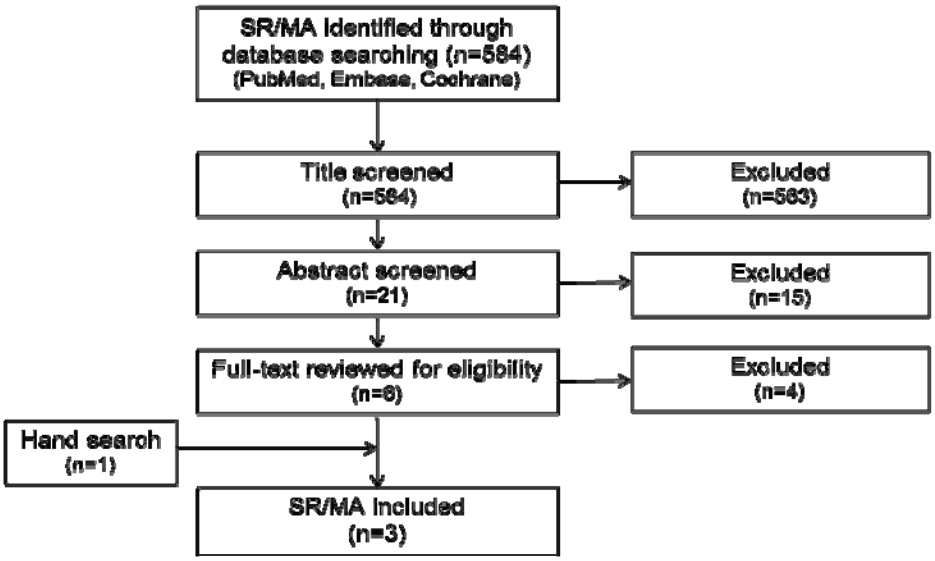
Outcome:

- Body weight: Body mass index, body weight, percent body fat, waist circumference, incidence of overweight or obesity

Quality:

- Reviews rated 8-11 on AMSTAR (A measurement tool for the 'assessment of multiple systematic reviews')

Search Results



Excluded Articles with Reason for Exclusion

6. Dolan LC, Potter SM, Burdock GA. Evidence-based review on the effect of normal dietary consumption of fructose on development of hyperlipidemia and obesity in healthy, normal weight individuals. Crit Rev Food Sci Nutr. 2010;50(1):53-84. PMID: 20047139. http://www.ncbi.nlm.nih.gov/pubmed/20047139. EXCLUDE: Focused on fructose, not added sugars

7. Greenwood DC, Threapleton DE, Evans CE, Cleghorn CL, Nykjaer C, Woodhead C, et al. Association between sugar-sweetened and artificially sweetened soft drinks and type 2 diabetes: systematic review and dose-response meta-analysis of prospective studies. Br J Nutr. 2014:1-10. PMID: 24932880. http://www.ncbi.nlm.nih.gov/pubmed/24932880. EXCLUDE: Focused on type 2 diabetes (to be considered for T2D question)

8. Ha V, Jayalath VH, Cozma AI, Mirrahimi A, de Souza RJ, Sievenpiper JL. Fructose-containing sugars, blood pressure, and cardiometabolic risk: a critical review. Curr Hypertens Rep. 2013;15(4):281-97. PMID: 23793849. http://www.ncbi.nlm.nih.gov/pubmed/23793849. EXCLUDE: Narrative review

9. Kelishadi R, Mansourian M, Heidari-Beni M. Association of fructose consumption and components of metabolic syndrome in human studies: a systematic review and meta-analysis. Nutrition. 2014;30(5):503-10. PMID: 24698343. http://www.ncbi.nlm.nih.gov/pubmed/24698343. EXCLUDE: Focused on components of metabolic syndrome; did not consider body weight as an outcome

10. Malik VS, Popkin BM, Bray GA, Despres JP, Willett WC, Hu FB. Sugar-sweetened beverages and risk of metabolic syndrome and type 2 diabetes: a meta-analysis. Diabetes Care. 2010;33(11):2477-83. PMID: 20693348. http://www.ncbi.nlm.nih.gov/pubmed/20693348. EXCLUDE: Focused on type 2 diabetes (to be considered for T2D question)

11. Massougbodji J, Le Bodo Y, Fratu R, De Wals P. Reviews examining sugar-sweetened beverages and body weight: correlates of their quality and conclusions. Am J Clin Nutr. 2014;99(5):1096-104. PMID: 24572563. http://www.ncbi.nlm.nih.gov/pubmed/24572563. EXLCUDE: Examines quality of existing systematic reviews

12. Miller PE, Perez V. Low-calorie sweeteners and body weight and composition: a meta-analysis of randomized controlled trials and prospective cohort studies. Am J Clin Nutr. 2014. PMID: 24944060. http://www.ncbi.nlm.nih.gov/pubmed/24944060. EXCLUDE: Focuses on low-calorie sweeteners, not added sugars

13. Morgan RE. Does consumption of high-fructose corn syrup beverages cause obesity in children? Pediatr Obes. 2013;8(4):249-54. PMID: 23630060. http://www.ncbi.nlm.nih.gov/pubmed/23630060. EXCLUDE: Examines quality of existing systematic reviews

14. Pereira MA. Diet beverages and the risk of obesity, diabetes, and cardiovascular disease: a review of the evidence. Nutr Rev. 2013;71(7):433-40. PMID: 23815142. http://www.ncbi.nlm.nih.gov/pubmed/23815142. EXCLUDE: Focused on artificial sweeteners, not added sugars

15. Perez-Morales E, Bacardi-Gascon M, Jimenez-Cruz A. Sugar-sweetened beverage intake before 6 years of age and weight or BMI status among older children; systematic review of prospective studies. Nutr Hosp. 2013;28(1):47-51. PMID: 23808429. http://www.ncbi.nlm.nih.gov/pubmed/23808429. EXCLUDE: Scored 7 out of 11 on AMSTAR

16. Ruxton CH, Gardner EJ, McNulty HM. Is sugar consumption detrimental to health? A review of the evidence 1995-2006. Crit Rev Food Sci Nutr. 2010;50(1):1-19. PMID: 20047137. http://www.ncbi.nlm.nih.gov/pubmed/20047137. EXCLUDE: Publication date

17. Rippe JM, Saltzman E. Sweetened beverages and health: current state of scientific understandings. Adv Nutr. 2013;4(5):527-9. PMID: 24038246. http://www.ncbi.nlm.nih.gov/pubmed/24038246. EXCLUDE: Symposium proceedings

18. Sievenpiper JL, de Souza RJ, Mirrahimi A, Yu ME, Carleton AJ, Beyene J, et al. Effect of fructose on body weight in controlled feeding trials: a systematic review and meta-analysis. Ann Intern Med. 2012;156(4):291-304. PMID: 22351714. http://www.ncbi.nlm.nih.gov/pubmed/22351714. EXCLUDE: Focused on fructose, not added sugars

19. Sonestedt E, Overby NC, Laaksonen DE, Birgisdottir BE. Does high sugar consumption exacerbate cardiometabolic risk factors and increase the risk of type 2 diabetes and cardiovascular disease? Food Nutr Res. 2012;56. PMID: 22855643. http://www.ncbi.nlm.nih.gov/pubmed/22855643. EXCLUDE: Focused on type 2 diabetes (to be considered for T2D question)

20. Te Morenga LA, Howatson AJ, Jones RM, Mann J. Dietary sugars and cardiometabolic risk: systematic review and meta-analyses of randomized controlled trials of the effects on blood pressure and lipids. Am J Clin Nutr. 2014;100(1):65-79. PMID: 24808490. http://www.ncbi.nlm.nih.gov/pubmed/24808490. EXCLUDE: Focused on blood pressure and lipids; did not consider body weight as an outcome

21. Trumbo PR, Rivers CR. Systematic review of the evidence for an association between sugar-sweetened beverage consumption and risk of obesity. Nutr Rev. 2014. PMID: 25091794. http://www.ncbi.nlm.nih.gov/pubmed/25091794. EXCLUDE: Only reviewed studies where energy balance was controlled for (isocaloric); didn't address question of interest

22. Weed DL, Althuis MD, Mink PJ. Quality of reviews on sugar-sweetened beverages and health outcomes: a systematic review. Am J Clin Nutr. 2011;94(5):1340-7. PMID: 21918218. http://www.ncbi.nlm.nih.gov/pubmed/21918218. EXCLUDE: Reviewed quality of existing reviews

23. Wiebe N, Padwal R, Field C, Marks S, Jacobs R, Tonelli M. A systematic review on the effect of sweeteners on glycemic response and clinically relevant outcomes. BMC Med. 2011;9:123. PMID: 22093544. http://www.ncbi.nlm.nih.gov/pubmed/22093544. EXCLUDE: Focused on non-caloric sweeteners, not added sugars

24. Zhang YH, An T, Zhang RC, Zhou Q, Huang Y, Zhang J. Very high fructose intake increases serum LDL-cholesterol and total cholesterol: a meta-analysis of controlled feeding trials. J Nutr. 2013;143(9):1391-8. PMID: 23825185. http://www.ncbi.nlm.nih.gov/pubmed/23825185. EXCLUDE: Focused on total cholesterol and LDL-cholesterol; did not consider body weight as an outcome