

Added Sugars Working Group

Cross-cutting Topics of Dietary Guidance
and Public Health Importance



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Scope

- To inform potential recommendations for added sugars by:
 - Examining the relationship between the intake of added sugars and health
 - Evaluating the amount of added sugars that can be consumed while meeting food group and nutrient needs within the USDA Food Patterns
- To consider the evidence on low-calorie sweeteners, which have been used to replace added sugars in some foods and beverages

Added Sugars: Definition

Added Sugars: *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.*

Proposed definition from FDA in the Proposed Rule to the revision of the Nutrition and Supplement Facts Label (March 2014)

Invited Experts and Consultants

Invited Experts

Individuals invited by the SC, usually on a one time basis, to provide their expertise to inform the SC's work. Invited experts do not participate in decisions at the SC level.

Consultant SC Members

Individuals sought by the SC to participate in SC discussions and decisions on an ongoing basis but are not members of the full DGAC. Like DGAC members, consultants complete training and have been reviewed and cleared through a formal process within the Federal government.

Experts and Consultants

Invited Experts (Sept to Nov 2014)

None

Consultant SC Members

None

Questions Addressed Today

- Added sugars and:
 1. Body weight/obesity (Miriam Nelson)
 2. Type 2 diabetes (Wayne Campbell)
 3. Cardiovascular disease (Frank Hu)
 4. Dental caries (Mary Story)
 5. Food group and nutrient adequacy (Marian Neuhouser)
- Low-calorie sweeteners and:
 1. Body weight/obesity (Wayne Campbell)
 2. Type 2 diabetes (Wayne Campbell)

Added Sugars and Body Weight

Topic Lead
Miriam Nelson



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

Existing Reports

Added Sugars and Body Weight

Description of the Evidence

- WHO commissioned systematic review/meta-analysis published in 2013 supplemented with 2 systematic reviews/meta-analyses published since 2013
 - Added sugars included in reviews:
 - WHO examined “free sugars”
 - Other 2 reviews focused on sugar-sweetened beverages
 - In total, 92 articles were considered in these reviews, of which 21 were included in two or more reviews
 - Included a similar number of RCTs and prospective cohort studies
 - Included children and adults

Added Sugars and Body Weight

Key Findings

- 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.
- There is a clear benefit of weight reduction with SSB reduction in overweight children and adults.

Added Sugars and Body Weight

Draft Conclusion Statement

Strong and consistent evidence indicates that intake of added sugars from food and/or sugar-sweetened beverages are associated with unfavorable body weight in children and adults. The reduction of added sugars and sugar-sweetened beverages in the diet reduces 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% of total energy intake.

DGAC Grade: Strong

Added Sugars and Type 2 Diabetes

Topic Lead
Wayne Campbell



What is the relationship between the intake
of added sugars and type 2 diabetes?

Existing Reports

Added Sugars and Type 2 Diabetes

Description of the Evidence

- Five systematic reviews/meta-analyses published between Jan 2010 and Aug 2014
 - Added sugars included in reviews:
 - 4 reviews focused on sugar-sweetened beverages
 - 1 review examined sugar intake
 - In total, 17 articles were considered in these reviews, of which 9 were included in two or more reviews
 - All prospective cohort studies with adults

Added Sugars and Type 2 Diabetes

Key Findings

- Increased consumption of SSBs is consistently associated with increased risk of T2D.
- These positive associations between SSBs and T2D are attenuated, but still exist, after adjustment for BMI.

Added Sugars and Type 2 Diabetes

Draft Conclusion Statement

Higher consumption of added sugars, especially sugar-sweetened beverages, increase the risk for T2D among adults and this relationship is not fully explained by body weight.

DGAC Grade: Strong

Added Sugars and Cardiovascular Disease

Topic Lead
Frank Hu



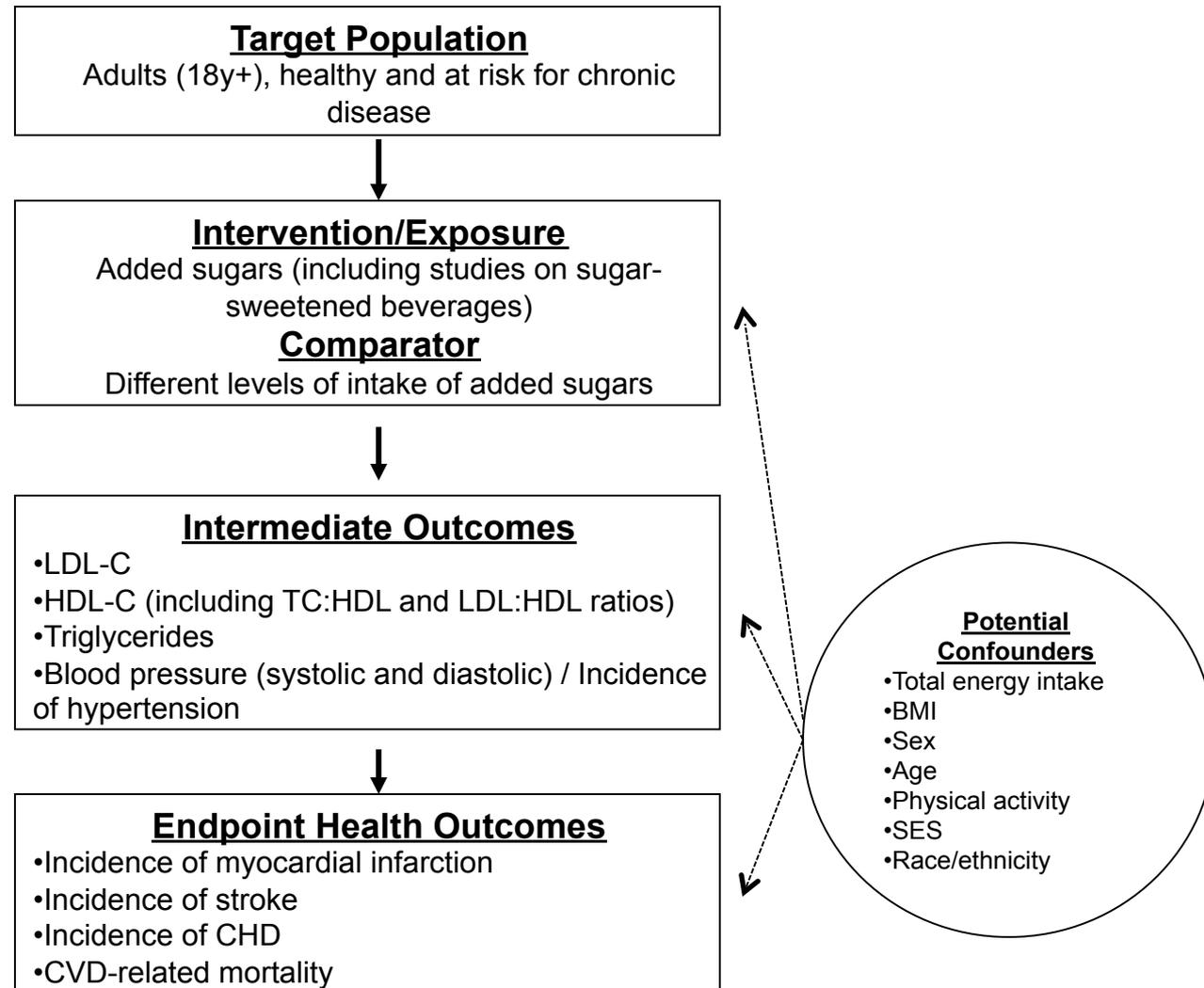
What is the relationship between the intake
of added sugars and cardiovascular
disease?

NEL Systematic Review

Analytical Framework: Added Sugars and Cardiovascular Disease

Key Definition:

•**Added Sugars:** 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.



Question:

•What is the relationship between added sugars and risk of cardiovascular disease?
(NEL Systematic Review)

Added Sugars and Cardiovascular Disease Literature Search: Inclusion/Exclusion Criteria

Date Range:

- Published between January 2000 and August 2014 (in English in a peer-reviewed journal)

Study Design:

- Randomized or non-randomized controlled trial, prospective cohort study, or nest case-control study

Study Subjects:

- Adults aged 18 years and older
- From countries with high or very high human development (per the 2012 Human Development Index)
- Healthy or at elevated chronic disease risk

Intervention/Exposure:

- Added sugars, including studies on sugar-sweetened beverages

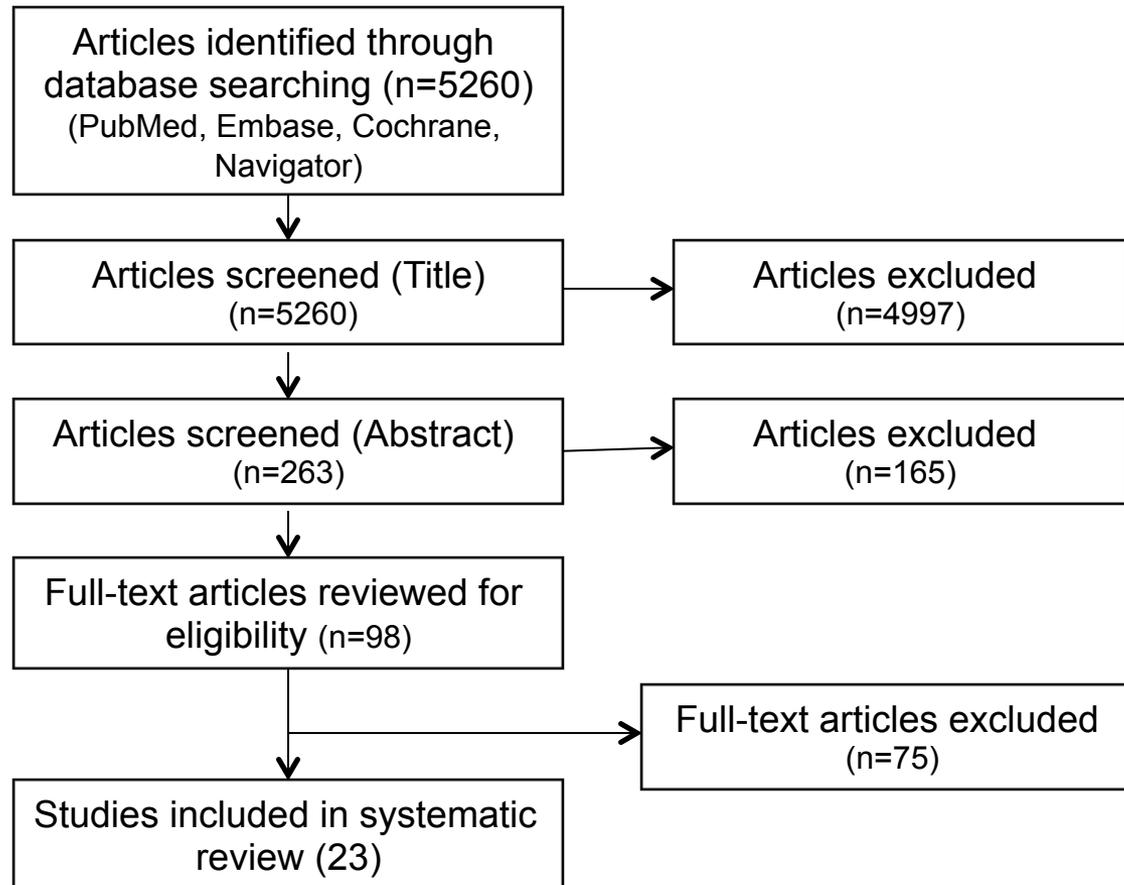
Comparator:

- Different levels of intake of added sugars

Outcome:

- Cholesterol (LDL, HDL, TC:HDL and LDL:HDL ratios), triglycerides, blood pressure/incidence of hypertension, incidence of myocardial infarction, incidence of stroke, incidence of CHD, CVD-related mortality

Added Sugars and Cardiovascular Disease Literature Search Results



Added Sugars and Cardiovascular Disease

Description of the Evidence

- 23 articles were included (11 intervention studies, 12 prospective cohort studies)
- The majority of studies provided some evidence supporting an association between higher intake of added sugars, especially in the form of sugar-sweetened beverages, and higher risk of cardiovascular disease.
 - More consistent associations were seen between added sugars and elevated serum triglycerides, blood pressure, and increased risk of hypertension, stroke or coronary heart disease (CHD)
 - Evidence for associations between added sugars and dyslipidemia (HDL, LDL, and total cholesterol) was not as consistent, especially among intervention studies.
- Limitations included:
 - Extensive heterogeneity in types/forms of sugar used (fructose, glucose, sucrose, SSB, sweetened milk), type of control and/or isocaloric condition used, duration of the intervention, and sample size.
 - Most observational studies only assessed dietary intake at baseline, and did not take assessments during follow-up.

Added Sugars and Cardiovascular Disease

Draft Conclusion Statement

Evidence from prospective cohort studies indicates that higher intake of added sugars, especially in the form of sugar-sweetened beverages, is consistently associated with increased risk of hypertension, stroke, and coronary heart disease in adults. Observational and intervention studies indicate a consistent relationship between higher added sugars intake and higher blood pressure and serum triglycerides.

DGAC Grade: Moderate

Added Sugars and Dental Caries

Topic Lead
Mary Story



What is the relationship between the intake
of added sugars and dental caries?

Existing Reports

Added Sugars and Dental Caries

Description of the Evidence

- WHO commissioned systematic review
 - Examined total sugars, free sugars, added sugars, sucrose, non-milk extrinsic (NME) sugars
 - 65 papers (55 studies) included in the review
 - Majority in children, only 4 in adults
 - 3 intervention, 8 prospective cohort studies, 20 population, and 24 cross-sectional

Added Sugars and Dental Caries

Key Findings

- Largely consistent evidence supports a relationship between the amount of sugars intake and the development of dental caries across age groups.
- 42 out of 50 studies in children and 5 out of 5 in adults reported at least one positive association between sugars and caries.

Added Sugars and Dental Caries

Draft Conclusion Statement

The DGAC concurs with the World Health Organization's commissioned systematic review that there is moderate consistent evidence supporting a relationship between the amount of sugars intake and the development of dental caries among children and adults. There is also evidence of moderate quality showing that caries are lower when free-sugars intake is less than 10% of energy intake.

DGAC Grade: Moderate

Added Sugars and Food Group and Nutrient Adequacy

Topic Lead
Marian Neuhouser



How many calories are available in the
USDA food intake patterns after meeting
food group and nutrient
recommendations that could be
consumed as added sugars?

Food Pattern Modeling from SC1

Added Sugars and Food Group and Nutrient Adequacy

In the healthy eating patterns modeled for the 2015 DGAC (Healthy US-Style Pattern, Healthy Mediterranean-Style Pattern, and Healthy Vegetarian Pattern), a limited number of calories are available to be consumed as added sugars.

CALORIE LEVEL	1000	1200	1400	1600	1800	2000	2200	2400	2600	2800	3000	3200
Empty calorie limits available for added sugars (assuming 55% empty calories from solid fats, 45% from added sugars)												
Healthy US-Style Patterns	68	50	50	54	77	122	126	158	171	180	212	275
Healthy Med-Style Patterns	63	50	50	81	72	117	126	135	149	158	194	257
Healthy Vegetarian patterns	77	77	81	81	81	131	131	158	158	158	185	234
Average	69	59	60	72	77	123	128	150	159	165	197	255
Healthy US-Style Patterns	7%	4%	4%	3%	4%	6%	6%	7%	7%	6%	7%	9%
Healthy Med-Style Patterns	6%	4%	4%	5%	4%	6%	6%	6%	6%	6%	6%	8%
Healthy Vegetarian patterns	8%	6%	6%	5%	5%	7%	6%	7%	6%	6%	6%	7%
Average	7%	5%	4%	5%	4%	6%	6%	6%	6%	6%	7%	8%

Low-Calorie Sweeteners and Body Weight

Topic Lead
Wayne Campbell



What is the relationship between the intake
of low-calorie sweeteners and body
weight?

Existing Reports

Low-Calorie Sweeteners and Body Weight Description of the Evidence

- Three systematic reviews/meta-analyses published between Jan 2010 and Aug 2014
 - All considered a variety of LCSs
 - In total, 39 articles were considered in these reviews, of which 6 were included in two or more reviews
 - Included RCTs and prospective cohort studies

Low-Calorie Sweeteners and Body Weight

Key Findings

- Evidence from RCTs consistently indicates that LCSs (vs. sugar-containing foods and beverages) modestly reduces body weight in adults.
- When evidence from adults and children are combined, LCSs modestly reduce BMI, fat mass, and waist circumference.

Low-Calorie Sweeteners and Body Weight

Draft Conclusion Statement

Moderate and generally consistent evidence from short-term RCTs conducted in adults and children supports that replacing sugar-containing sweeteners with LCSs reduces calorie intake, body weight, and adiposity.

DGAC Grade: Moderate

Long-term observational studies conducted in children and adults provide inconsistent evidence of an association between LCS and body weight as compared to sugar-containing sweeteners.

DGAC Grade: Limited

Low-Calorie Sweeteners and Type 2 Diabetes

Topic Lead
Wayne Campbell



What is the relationship between the intake of low-calorie sweeteners and type 2 diabetes?

Existing Reports

Low-Calorie Sweeteners and Type 2 Diabetes

Description of the Evidence

- Two systematic reviews/meta-analyses published between Jan 2010 and Aug 2014 (the data from one of the reviews is also represented in the second review)
- Examined artificially sweetened soft drinks

Low-Calorie Sweeteners and Type 2 Diabetes

Key Findings

- Both studies report a positive association between artificially sweetened soft drinks and T2D risk that was confounded by weight status (BMI).
- The experimental designs of the studies included in these reviews precludes the assessment of cause and effect relationships, and the disparate findings when BMI is vs. is not included in the statistical models adds complexity to the issue.

Low-Calorie Sweeteners and Type 2 Diabetes

Draft Conclusion Statement

Long-term observational studies conducted in adults provide inconsistent evidence of an association between LCS and risk of type 2 diabetes.

DGAC Grade: Limited

Added Sugars

Draft Implications Statement

Miriam Nelson



- Obesity, type 2 diabetes, cardiovascular disease, and dental caries are major public health concerns. Added sugar intake has a negative health impact on all of these conditions, and strong evidence supports reducing added sugar intake to reduce health risks.
- Added sugars are frequently used in food/ beverage processing and provide energy but no other nutrients.

Added Sugars

Draft Implications Statement

Added Sugars

- In order to ensure a high quality, nutrient dense dietary pattern that is balanced in calories, the U.S. population should minimize their intake of added sugars.
- This recommendation is supported by the food pattern modeling analysis conducted by the 2015 DGAC. This analysis based on the Healthy U.S.-Style Pattern, the Healthy Vegetarian Pattern, and the Healthy Mediterranean-Style Pattern demonstrates that 3% to 9% of total calories, depending upon calorie level, from added sugars in foods and beverages can be included in a healthy dietary pattern.

Added Sugars

Draft Implications Statement

- The Committee recommends limiting added sugars to no more than 10% of total daily calorie intake. The scientific evidence on added sugars and chronic disease risk coupled with the food pattern modeling supports this limit. Given that the average current intake of the U.S. population is 13.4%, this 10% upper limit is a reasonable goal.

Added Sugars

Draft Implications Statement

Low-Calorie Sweeteners

- When LCSs are used to replace sugar, the resulting reduction in calories can help to achieve short-term weight loss.
- There is insufficient evidence to recommend the use of LCSs as a strategy for long-term weight loss and weight maintenance.

Added Sugars

Draft Implications Statement

- The recommendation to limit added sugars, especially sugar-sweetened beverages, is in line with recommendations from national and international organizations including AAP, WHO, CDC, AHA, and ADA.
- Policies and programs at local, state, and national level in both the private sector and public sector are necessary to support efforts to lower added sugars in foods and beverages and to limit availability of sugar sweetened beverages.
- The Nutrition Facts Panel should include added sugars (in grams and teaspoons) and include a percent daily value in order to assist consumers in identifying the amount of added sugars in foods and beverages to help them in making informed decisions.

Added Sugars Working Group

Cross-cutting Topics of Dietary Guidance
and Public Health Importance

Reminder: DGAC members, please state your name before speaking.

NEL Grading Rubric

Elements	Grade I: Strong	Grade II: Moderate	Grade III: Limited	Grade IV: Grade Not Assignable
Quality (as determined using the NEL BAT) <ul style="list-style-type: none"> Scientific rigor and validity Consider study design and execution 	Studies of strong design Free from design flaws, bias, and execution problems	Studies of strong design with minor methodological concerns OR only studies of weaker study design for question	Studies of weak design for answering the question OR inconclusive findings due to design flaws, bias, or execution problems	Serious design flaws, bias, or execution problems across the body of evidence
Quantity <ul style="list-style-type: none"> Number of studies Number of subjects in studies 	Several good quality studies Large number of subjects studied Studies have sufficiently large sample size for adequate statistical power	Several studies by independent investigators Doubts about adequacy of sample size to avoid Type I and Type II error	Limited number of studies Low number of subjects studied and/or inadequate sample size within studies	Available studies do not directly answer the question OR no studies available
Consistency of findings across studies	Findings generally consistent in direction and size of effect or degree of association, and statistical significance with very minor exceptions	Some inconsistency in results across studies in direction and size of effect, degree of association, or statistical significance	Unexplained inconsistency among results from different studies	Independent variables and/or outcomes are too disparate to synthesize OR single small study unconfirmed by other studies
Impact <ul style="list-style-type: none"> Directness of studied outcomes Magnitude of effect 	Studied outcome relates directly to the question Size of effect is clinically meaningful	Some study outcomes relate to the question indirectly Some doubt about the clinical significance of the effect	Most studied outcomes relate to the question indirectly Size of effect is small or lacks clinical significance	Studied outcomes relate to the question indirectly Size of effect cannot be determined
Generalizability to the U.S. population of interest	Studied population, intervention and outcomes are free from serious doubts about generalizability	Minor doubts about generalizability	Serious doubts about generalizability due to narrow or different study population, intervention or outcomes studied	Highly unlikely that the studied population, intervention AND/OR outcomes are generalizable to the population of interest