Academy of Nutrition and Dietetics

Nutrition FACT CHECK

Low- and No-Calorie Sweeteners

Low- and no-calorie sweeteners (LNCS), also known as non-nutritive sweeteners (NNS), are sugar substitutes that provide a sweet taste with little to no energy contribution. Examples include aspartame, sucralose, saccharin, and stevia. LNCS are found in a wide range of packaged foods, beverages, and non-food products, including sugar-free or low-calorie drinks, flavored dairy products, protein supplements, baked goods, medications, vitamins, chewing gum, and oral care products.[1] LNCS are commonly incorporated into dietary strategies aimed at reducing energy and added sugar intake while maintaining palatability, particularly in the context of weight management, diabetes care, and cardiometabolic health.[1]

Regulation of Low- and No-Calorie Sweeteners

In the United States, sweeteners are regulated under the Federal Food, Drug, and Cosmetic Act and must be demonstrated to be safe for their intended use. The U.S. Food and Drug Administration (FDA) evaluates scientific evidence to approve food additives and establish acceptable daily intake (ADI) levels considered safe for lifetime consumption.[1] Some sweeteners may instead be marketed as "generally recognized as safe" (GRAS) if qualified experts determine they meet the same safety standards as FDA-approved additives. Sweeteners that have been approved for use by the FDA include Acesulfame potassium (ACE-K), Aspartame, Neotame, Saccharin, Sucralose, and Advantame. Three plant- and fruit-derived sweeteners are classified as GRAS in the United States: certain stevia extracts, monk fruit (Luo han guo), and thaumatin. All of these sweeteners provide intense sweetness at levels much greater than sugar but with fewer calories.[1,2]

The safety of LNCS is reviewed not only by the FDA but also by leading international food safety organizations, including the Food and Agriculture Organization of the United Nations (FAO) and the World Health Organization (WHO). Internationally, approved sweeteners have been rigorously evaluated by food safety authorities, such as the Joint FAO/WHO Expert Committee on Food Additives (JECFA) and European Food Safety Authority (EFSA).[2] LNCS differ in their absorption, distribution, metabolism, and excretion characteristics, leading to distinct ADI levels, despite frequently being considered as one collective group.[2]

While the LNCS listed above have been recognized as safe when used within their acceptable daily intake levels by the FDA, the long-term health implications of LNCS remain an area of ongoing investigation, particularly regarding their role in weight management and the potential effects of sweet taste exposure independent of energy intake. The inconsistency or mixed evidence as reported by different study designs has led to this debate and hence, has caused public confusion.

Summary of Evidence on Low- and No-Calorie Sweeteners

In recent years, numerous umbrella reviews, systematic reviews, and meta-analyses have been conducted to evaluate the effects of LNCS on health outcomes. Randomized controlled trials have consistently linked LNCS consumption with favorable weight-related outcomes, whereas observational studies (cohorts) have consistently associated higher LNCS consumption with increased risk for obesity, all-cause mortality, cardiovascular mortality (CVD) and Type 2 diabetes (T2DM). Evidence synthesis for this report identified seven recently published umbrella reviews that based their findings on 65 systematic reviews and meta-analyses.[3-9] (Table 1)

The summarized evidence includes variation in study populations (e.g., healthy individuals, people with overweight or obesity, diabetes, or children), the comparator used (e.g., sugar-sweetened beverages, water, placebo, or no intervention), and the analytical approach. These differences can influence the interpretation of findings and should be carefully considered when reviewing the evidence.

Factors to consider when interpreting evidence:

Study Design: The evidence on LNCS is derived from both randomized controlled trials (RCTs) and observational studies, each with distinct strengths and limitations. RCTs provide the strongest evidence for causal effects because randomization minimizes confounding and directly evaluates the replacement of added sugars or sugar-sweetened beverages with LNCS. However, most RCTs are relatively short, include modest sample sizes, and primarily assess intermediate outcomes such as body weight rather than long-term outcomes, including cardiovascular disease, cancer, or mortality.

Observational studies provide important evidence on long-term consumption patterns and health outcomes but are more susceptible to bias, including residual confounding, reverse causality, and measurement error from self-reported dietary intake. Individuals with overweight, obesity, diabetes, or other cardiometabolic conditions may preferentially consume LNCS, potentially contributing to observed associations with adverse health outcomes. These methodological limitations may partly explain why observational studies often report less favorable associations than RCTs.

Interpretation of the evidence is further complicated by substantial heterogeneity across studies, including differences in study populations, types and amounts of LNCS, comparator groups, outcome definitions, and follow-up duration. Many studies also group different sweeteners together despite differences in their metabolism and physiological effects. Consequently, findings should be interpreted within the context of study design, risk of bias, and the specific dietary comparison being evaluated rather than as evidence of causal effects.

Population: Most of the available evidence has been generated in mixed adult populations, particularly among individuals with overweight, obesity, or elevated cardiometabolic risk. Comparatively fewer studies have examined the effects of LNCS in children, adolescents, pregnant individuals, and older adults, limiting the ability to draw firm conclusions for these groups. Differences in age, health status, baseline dietary habits, and reasons for consuming LNCS may influence observed outcomes and contribute to variability across studies. As a result, findings from one population may not be directly generalizable to others.

Analysis Methods (Prevalent vs Substitution): The interpretation of LNCS research is strongly influenced by the analytical approach used.

- *Prevalent* analyses typically compare individuals with higher versus lower LNCS intake measured at a single point in time and often do not account for the dietary component being replaced. These analyses may be particularly vulnerable to reverse causality because individuals with overweight or who are at increased risk of chronic disease may be more likely to choose LNCS products.
- In contrast, *substitution* analyses explicitly evaluate the effects of replacing sugar-sweetened beverages or added sugars with LNCS alternatives and may better reflect real-world dietary choices.
- Across umbrella reviews, *prevalent* analyses frequently suggest modest adverse associations, whereas *substitution* analyses generally indicate neutral or beneficial effects, particularly for body weight and some cardiovascular outcomes.

Comparator Context: The health effects of LNCS depend largely on the comparator used. When compared with water, some LNCS may show neutral or less favorable effects. However, from a public health perspective, the most relevant comparison is often sugar-sweetened beverages (SSBs) or added sugars. Evidence consistently indicates that replacing SSBs with LNCS beverages reduces added sugars and energy intake and is associated with modest improvements in body weight, body mass index (BMI), and some cardiometabolic outcomes. Similarly, substituting added sugars with LNCS can improve postprandial glycemic responses. These findings suggest that the potential benefits of LNCS are most apparent when they are used to replace caloric sweeteners rather than when they are compared with water.

Adverse Events: Evidence regarding adverse effects of LNCS remains limited and inconsistent. Regulatory agencies have determined that approved LNCS are safe when consumed within established acceptable daily intake levels, and systematic reviews have generally not identified consistent evidence of serious harms. However, uncertainty remains regarding potential long-term effects on cardiometabolic health, cancer risk, appetite regulation, and the gut microbiome. Many reported adverse associations are small in magnitude and are primarily derived from observational studies, making it difficult to determine whether these relationships are causal. Furthermore, adverse events are often not systematically assessed as primary outcomes in clinical trials.

Weight-Related Outcomes

Evidence from randomized controlled trials has consistently shown that consumption of LNCS compared to all-comparators reduced body weight and body mass index.[3-6] When LNCS consumption was compared to water intake, randomized controlled trials indicated no effect on weight outcomes. Results from prospective cohort studies have reported mixed associations between LNCS and body weight, with most relying on prevalent analyses that assess intake at a single time point and are vulnerable to reverse causation. In contrast, a recent systematic review[10] and umbrella review[3] of cohort studies using substitution analysis found that replacing sugar-sweetened beverages with LNCS beverages was associated with lower body weight.

Type 2 Diabetes and HbA1c

Evidence from systematic reviews of randomized controlled trials on hemoglobin A1c (HbA1c) levels is inconsistent.[3,4] Evidence from one systematic review of six RCTs indicated no effect on HbA1c values in prevalent analysis or substitution analysis for sugar-sweetened beverages (SSB).[3] However, when comparing LNCS substitution for water or placebo, a trivial increase on HbA1c was noticed.[3] A 2026 systematic review of 14 primary studies, and prevalent analysis of LNCS consumption compared to SSB indicated a modest reduction in HbA1c.[4]

Evidence from prevalent analysis of four umbrella reviews of cohort studies consistently indicated an association of LNCS and risk of T2DM.[3,4,8,9] However, results from substitution analysis (biased-adjusted) indicated no effect of LNCS on T2DM incidence risk.[3]

All-Cause Mortality

Prevalent analyses from five umbrella reviews of cohort studies indicate that higher LNCS intake compared to lower LNCS intake was associated with a relatively small increase in all-cause mortality risk or a risk comparable to that associated with SSB intake.[3,4,6,8,9] However, substitution analysis (LNCS for SSB) of cohort studies indicated lower all cause-mortality risk.[3]

Cardiovascular Outcomes

Across five umbrella reviews of cohort studies, findings on cardiovascular (CVD) outcomes were mixed and largely derived from prevalent analyses.[3,4,6,8,9] Higher LNCS vs. lower intake was generally associated with a small increase in CVD incidence, including coronary heart disease and stroke, and some reviews reported that the risks of CVD incidence and CVD mortality were similar to those observed with higher SSB consumption. Higher intake of NNS beverages was also associated with an increased risk of CVD.[4] In contrast, analyses that evaluated substitution of SSBs with LNCS beverages and adjusted for potential biases suggested potential benefits, including lower cardiovascular mortality risk (RR 0.94, 95% CI 0.90–0.99) and lower coronary heart disease risk (RR 0.89, 95% CI 0.81–0.98).[3] Overall, *prevalent* analyses tended to suggest modest adverse associations, whereas *substitution* analyses indicated potential cardiovascular benefits when LNCS beverages replaced SSBs.

Cancer

Across three umbrella reviews of cohort studies, evidence linking higher LNCS intake compared to lower LNCS intake and cancer outcomes was generally limited and inconsistent.[4,8,9] Most associations were null or very small, with cancer mortality estimates close to no effect[4] and no significant associations observed for several site-specific cancers.[8] Some findings suggested that higher LNCS intake compared to lower was associated with a small increase in leukemia risk, while higher LNCS consumption was associated with a lower risk of colorectal cancer.[8] One umbrella review reported weak evidence that high LNCS intake compared to lower was associated with an increased risk of overall cancer based on prevalent analyses.[9]

A 2025 umbrella review found no consistent evidence that LNCS consumption is associated with overall cancer incidence or mortality.[7] Most site-specific cancer analyses were also null, although associations varied by cancer type, with limited evidence suggesting a lower risk of gynecological cancers. Overall, the findings do not support a consistent relationship between LNCS intake and cancer outcomes.

Energy Intake
A study published in 2026 synthesized evidence from both randomized controlled trials and observational studies examining various types of LNCS intake.[6] Observational evidence indicated that, compared with water or placebo, consumption of LNCS was associated with a small increase in energy intake (SMD 0.24; 95% CI 0.08–0.40), while also being associated with a small reduction in daily sugar intake (SMD –0.09; 95% CI –0.17 to –0.01). The certainty of evidence was rated as very low.

Gastrointestinal Outcomes
Research examining gastrointestinal effects of LNCS has focused on changes in the gut microbiome and gastrointestinal symptoms. The impact of LNCS on gut microbiota is inconsistent, with some intervention studies reporting a dysbiotic effect and others finding no effects, even at high doses.[11,12] Differences in study design, LNCS dose and duration, and participant characteristics may contribute to variability in findings, while individualized microbiome responses may further limit the generalizability of results.

Cognition
A 2025 systematic review of prospective cohort studies found an association between higher artificially sweetened beverage intake and an increased risk of Alzheimer's disease, based on two studies representing 208,090 participants.[13] In both studies, the association between Alzheimer's disease and LNCS consumption existed at the highest level of consumption (>/= 1 beverage/day or >2 beverages/day, respectively) and was slightly attenuated when controlling for diabetes status among other cardiometabolic confounders (e.g., lipoproteins, blood pressure).[14,15] A multicohort study of U.S. adults (n=10,974) aged 65 and older did not find an association between LNCS beverage consumption and dementia risk.[16]

Evidence Synthesis for Children and Adolescents
A 2024 systematic review and meta-analysis evaluated the association between nonnutritive sweetener consumption and body mass index (BMI) among children and adolescents, incorporating evidence from four randomized controlled trials (n=1,372) and eight prospective cohort studies (n=35,340).[17] Evidence from randomized controlled trials suggested that replacing SSBs with beverages containing LNCS was associated with modest reductions in BMI among children and adolescents. However, evidence from prospective cohorts was less consistent and generally showed no clear association between habitual LNCS intake and long-term BMI changes. The overall certainty of evidence ranged from low to moderate for most outcomes, reflecting the limited number of trials and variability across studies.[17]

A 2022 systematic review found limited evidence on LNCS use in children, with no consistent effects on health outcomes.[18] One randomized controlled trial included in this systematic review reported reductions in body weight, waist circumference, and body fat mass when SSB were replaced with LNCS-beverages, whereas, prospective cohort studies generally found no significant associations with adiposity.[18] Two trials also reported improvements in dental caries with stevia, but most other studies found no significant associations between LNCS consumption and the health outcomes evaluated.[18]

Evidence Synthesis for Pregnant Individuals
Evidence on LNCS use during pregnancy was limited and generally of low certainty.[18] Meta-analysis of prospective cohort studies found that higher LNCS intake compared to lower intake was associated with a modest increase in the risk of preterm birth, particularly late preterm delivery. Findings related to birth weight and offspring adiposity were inconsistent, with some studies reporting higher body fatness in childhood and others finding no association. Limited evidence also suggested possible links between prenatal LNCS exposure and childhood asthma, allergies, or cognitive outcomes, while no association was observed with gestational diabetes. Overall, the certainty of the evidence was rated as very low, highlighting the need for further research.

A 2025 systematic review and meta-analysis examined whether maternal consumption of LNCS before conception, during pregnancy, or while breastfeeding affects child health outcomes, including birth weight, growth, overweight/obesity risk, cognition, and behavior.[19] Most studies were observational cohort studies. Evidence from included studies does not support a clear association between maternal LNCS consumption during pregnancy and adverse child health outcomes. While frequent intake may be associated with modest increases in birth weight and childhood overweight risk, the evidence is inconsistent and of low certainty.

Evidence Synthesis for Individuals with Diabetes

Among individuals with diabetes, systematic reviews indicate that the health effects of LNCS remain uncertain due to limited and heterogeneous evidence. A 2026 systematic review which included 22 studies across multiple study designs, found inconsistent associations between sweetener intake and metabolic outcomes, with meta-analyses suggesting possible increases in insulin and HbA1c levels, although results were not robust across statistical models and showed substantial heterogeneity.[20] Similarly, a 2020 systematic review of nine randomized controlled trials involving 979 individuals with Type 1 or Type 2 diabetes found no consistent differences between LNCS and sugar, placebo, or other low-calorie sweeteners for HbA1c, body weight, or adverse events, and rated the overall certainty of evidence as very low because of small sample sizes and methodological limitations.[21] While a 2024 meta-analysis reported that replacing sugar with LNCS was associated with lower energy and carbohydrate intake in adults, including some individuals with diabetes, these findings were not observed when LNCS were compared with water, and the certainty of evidence was low to moderate.[22] Overall, current evidence suggests that LNCS may reduce energy and carbohydrate intake, particularly relative to sugar-sweetened products, but current evidence does not support clear metabolic benefits or harms, highlighting the need for higher-quality long-term studies in people with diabetes.

Translating Evidence into Public Health

The divergence between findings from randomized controlled trials and observational studies is also reflected in clinical guidelines and public health recommendations. While short-term randomized trials generally demonstrate that replacing SSBs with LNCS can reduce intake of added sugars and lead to modest improvements in body weight and adiposity, long-term observational studies frequently report associations between higher LNCS consumption and increased risks of obesity, Type 2 diabetes, cardiovascular disease, and mortality. As a result, most contemporary guidelines acknowledge that LNCS may have a role as a temporary or transitional strategy for reducing added sugar intake, particularly among individuals at elevated metabolic risk, but stop short of recommending their routine long-term use.

Several organizations and guidelines, including the World Health Organization (WHO), the Korean Society of Obesity, the British Dietetic Association, and the Dietary Guidelines for Americans emphasize that water and unsweetened beverages should be the preferred alternatives to sugar-sweetened beverages.[4,23-25] These groups generally recommend focusing on improving overall diet quality and reducing intake of added sugars rather than relying on LNCS as a primary strategy for weight management or chronic disease prevention. Similarly, diabetes-focused organizations, including the American Diabetes Association, Diabetes Canada,[25] Diabetes Australia, and Diabetes UK, recognize that LNCS can be used in moderation as a substitute for sugar-sweetened products when they help reduce overall calorie and carbohydrate intake.[24, 26-28] However, these recommendations consistently emphasize that LNCS should be considered one tool within a broader dietary approach rather than a stand-alone solution. For pediatric populations, both the Healthy Eating Research (HER)[29] Healthy Beverage Consensus Statement (0-5 years of age) and the American Academy of Pediatrics (AAP)[30] (0-2 years of age) do not recommend beverages containing LNCS because evidence regarding their long-term health and developmental effects during early childhood remains insufficient. (Table 2)

Conclusion

Evidence suggests that LNCS may be useful tools for reducing added sugar intake and supporting short-term weight management when they replace caloric sweeteners, particularly SSBs. However, interpretation of findings should consider study design, population characteristics, and analytical approaches, as outcomes appear more favorable when LNCS replace SSBs rather than water or no consumption. Consequently, current guidelines generally support cautious, context-specific use of LNCS while emphasizing dietary patterns centered on water, minimally processed foods, and reduced added sugar intake. Additional long-term research using substitution-based approaches, particularly in understudied populations, is needed to clarify their role in chronic disease prevention and overall health.

Note from the Academy of Nutrition and Dietetics:

This summary reflects findings from evidence-based research and is a high-level overview of low- and no-calorie sweeteners; this summary is not a comprehensive deep-dive on the topic. The information shared in this summary is up to date as of August 2026.

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Table 1. Evidence from Umbrella Reviews Evaluating Effect of Low- and No-Calorie Sweetener (LNCS) Consumption on Health Outcomes

Umbrella Reviews	Population	Evidence Included	Intervention	Comparator	Main Findings
			Body weight (BW)		
Ayoub-Charette et al 2025	Adults, all health backgrounds	RCTs (n=6 SRs) Cohorts (n=5 SRs)	Any type of LNCS	Vs. SSB Vs. lower /higher LNCS dose	RCTs: small reduction in BW (-1.02 [-1.57, -0.46]) Cohorts: no effect in prevalent analysis; Bias -adjusted analysis (LNCS substitution for sugar) indicated trivial effect (-0.12 [-0.12, -0.10])
			Any type of LNCS	Vs. Water Vs. placebo	RCTs: No effect Cohort: No effect
Choi et al 2026	Adults/adolescents/children	RCTS (n=14 primary studies) Cohorts (n=20 SRs)	Any type of artificial LNCS	Vs. SSB	RCTs: modest reduction in BW (-0.73 kg)
Higgins et al 2024	Healthy and clinical populations (obesity, hypertension, hyperlipidemia, T2D, metabolic syndrome); no age restrictions.	RCTs (n=7 Srs) Cohorts (n=3 SRs) NRS (n=10 SRs)	Any type of LCS used alone or in combination with other foods	Multiple comparators	RCTS: replacing sugar with LNCS consistently showed modest reduction in body weight. Cohorts: Prevalent analysis: Mixed cohort evidence on LNCS intake and body weight (lower weight, unfavorable outcomes, or no association). Substitution analysis of 1 cohort study: Replacing SSBs with LNCS was associated with significantly lower BW.

Jeong et al 2026	Mixed population (adults, children, adolescents, pregnant)	RCTs (6 SRs) Observational (s4 SRs)	Any type of LNCS intake	Multiple comparators (highest vs. lowest)	RCTs: NSS consumption significantly decreased body weight in populations with overweight or obesity (SMD, −0.50; 95% CI, −0.70 to −0.30; GRADE, high) Cohorts: LNCS increased the risk of weight gain metabolic syndrome (eOR, 1.31; 95% CI, 1.21 to 1.42; CE, I), type 2 diabetes (eOR, 1.14; 95% CI, 1.02 to 1.29; CE, IV), and hypertension (eOR, 1.13; 95% CI, 1.07 to 1.19; CE, II).
Body Mass Index (BMI)					
Ayoub-Charette et al 2025	Adults, all health backgrounds	RCTs (n=6 SRs) Cohorts (n=5 SRs)	Any type of LNCS	Vs. SSB Vs. lower /higher LNCS dose	RCTs: small reduction in BMI, LNCS substitution for sugar analys indicated trivial effect (-0.21 [-0.36,-0.06]) Cohorts: Prevalent analysis indicated association between LNCS intake and obesity incidence (HR:1.76 [1.25,2.49]). However, substitution analysis indicated lower obesity risk (RR:0.88 [0.88, 0.89]).
				Vs. water	RCTs: No effect
Choi et al 2026	Adults/adolescents/children	RCTS (n=14 primary studies) Cohorts (n=20 SRs)	Any type of artificial LNCS	Vs. SSB	RCTs: modest reduction in BMI (-0.31) Cohorts: higher intake of SSBs or LNCS increased risks for T2DM, CVD, and mortality (prevalent analysis).

Higgins et al 2024	Healthy and clinical populations (obesity, hypertension, hyperlipidemia, T2D, metabolic syndrome); no age restrictions.	RCTs (n=7 Srs) Cohorts (n=3 SRs) NRS (n=10 SRs)	Any type of LNCS used alone or in combination with other foods	Multiple comparators	
Jeong et al 2026	Mixed population (adults, children, adolescents, pregnant)	RCTs (6 SRs) Observation al (s4 SRs)	Any type of LNCS intake	Multiple comparators (highest vs. lowest)	Cohort: NSSs was associated with increased risk of being overweight (OR, 1.84; 95% CI, 1.30 to 2.61). Highest intake of NSS was associated with increased risks of overweight (OR, 1.84; CI, 1.30 to 2.61;). Children: NSS intake slightly reduced BMI z-score changes in children (SMD, −0.08; 95% CI, −0.14 to −0.03; GRADE, moderate). Pregnant: Maternal intake of LNCS was associated with increased BMI z-scores of offsprings in early childhood.
Waist Circumference (WC)					
Ayoub-Charette et al 2025	Adults, all health backgrounds	RCTs (n=6 SRs) Cohorts (n=5 SRs)	Any type of LNCS	Vs. SSB Vs. lower /higher LNCS dose	RCTs: no effect on WC Cohorts: no effect in prevalent analysis and LNCS substitution for sugars. However, modeling LNCS exposure overtime analysis indicates small important change in WC (-1.15 [-2.34, -0.05])
				Vs. water	RCTs: No effect

HbA1c (%)					
Ayoub-Charette et al 2025	Adults, all health backgrounds	RCTs (n=6 SRs) Cohorts (n=5 SRs)	Any type of LNCS	Vs. SSB Vs. lower /higher LNCS dose	RCTs: No effect in prevalent and LNCS substitution for sugar analysis.
				Vs. water Vs. Placebo	RCTs: Trivial effect was noticed for LNCS vs water/placebo 0.21 [0.02,0.40])
Choi et al 2026	Adults/adolescents/children	RCTS (n=14 primary studies) Cohorts (n=20 SRs)	Any type of Artificial LNCS	Vs. SSB Cohort: highest vs. lowest	RCTs: modest reduction in HbA1c (-0.20 % [-0.39 , -0.01])
Type 2 Diabetes					
Ayoub-Charette et al 2025	Adults, all health backgrounds	RCTs (n=6 SRs) Cohorts (n=5 SRs)	Any type of LNCS	Vs. SSB Vs. lower /higher LNCS dose	Cohorts: Prevalent analysis indicates an association of LNCS intake and T2DM incidence. However, substitution analysis (biased-adjusted) indicated lower T2DM incidence risk.
Beigrezaei et al 2024	Adults, all health backgrounds	Cohort studies (n= 6 SRs)	Any type of LNCS	Lower vs higher LNCS dose	Cohorts: Higher LNCS intake associated with relatively small risks of type 2 diabetes and metabolic syndrome.
Choi et al 2026	Adults/adolescents/children	RCTS (n=14 primary studies) Cohorts (n=20 SRs)	Any type of Artificial LNCS	Vs. SSB	Cohorts: higher intake of SSBs or LNCS increased risks for T2DM (prevalent analysis).
Diaz et al 2023	Healthy adults	Cohorts (n=7 SRs)	Any type of Artificial LNCS	Lower vs Higher LNCS dose	Cohorts: High artificial LNCS intake was associated with increased risk for T2DM (prevalent analysis).

All- cause mortality					
Ayoub-Charette et al 2025	Adults, all health backgrounds	RCTs (n=6 SRs) Cohorts (n=5 SRs)	Any type of LNCS	Vs. SSB Vs. lower /higher LNCS dose	Cohorts: Prevalent analysis indicates an association of LNCS intake and all-cause mortality incidence. However, substitution analysis (biased-adjusted) indicated lower all-cause mortality risk.
Beigrezaei et al 2024	Adults, all health backgrounds	Cohort studies (n= 6 SRs)	Any type of LNCS	Lower vs higher LNCS dose	Cohorts: Higher LNCS intake associated with relatively small risks of all-cause mortality (n= 7), stroke (n=5), coronary heart disease (n=4), hypertension (n=3), type 2 diabetes (n=11), metabolic syndrome (n=6), and leukemia (n=3). Higher LNCS consumption was associated with a lower risk of colorectal cancer (n=3). No significant associations for cardiovascular mortality (n=5), cancer mortality (n=4), chronic kidney disease (n=2), or several site-specific cancers.
Choi et al 2026	Adults/adolescents/children	RCTS (n=14 primary studies) Cohorts (n=20 SRs)	Any type of Artificial LNCS	Vs. SSB	Cohorts: higher intake of SSBs or LNCS increased risks for mortality similarly (prevalent analysis).
Diaz et al 2023	Healthy adults	Cohorts (n=7 SRs)	Any type of Artificial LNCS	Lower vs Higher LNCS dose	Cohorts: High artificial LNCS intake was associated with increased risk of all-cause mortality.
Jeong et al 2026	Mixed population (adults, children, adolescents, pregnant)	RCTs (6 SRs) Observational (s4 SRs)	Any type of LNCS intake	Multiple comparators (highest vs. lowest)	Cohort: ASB consumption was associated with increased risks of all-cause mortality (eOR, 1.06; 95% CI, 1.02 to 1.09; CE, III), c

Cardiovascular Disease					
Ayoub-Charette et al 2025	Adults, all health backgrounds	RCTs (n=6 SRs) Cohorts (n=5 SRs)	Any type of LNCS	Vs. SSB Vs. lower /higher LNCS dose	Cohorts: Prevalent analysis indicates an association of LNCS intake and all-cause mortality incidence. However, substitution analysis (biased-adjusted) was associated with lower cardiovascular mortality risk (RR 0.94 [95% CI 0.90, 0.99]). Substitution analysis (biased-adjusted) was associated with lower CHD lower CHD risk (RR 0.89 [95% CI 0.81, 0.98]).
Beigrezaei et al 2024	Adults, all health backgrounds	Cohort studies (n= 6 SRs)	Any type of LNCS	Lower vs higher LNCS dose	Cohorts: Higher LNCS intake is associated with relatively small risks of stroke and coronary heart disease.
Choi et al 2026	Adults/adolescents/children	RCTS (n=14 primary studies) Cohorts (n=20 SRs)	Any type of Artificial LNCS	Vs. SSB	Cohorts: higher intake of SSBs or LNCS increased risks for incidence of CVD and CVD mortality similarly (prevalent analysis).
Diaz et al 2023	Healthy adults	Cohorts (n=7 SRs)	Any type of Artificial LNCS	Lower vs Higher LNCS dose	Cohorts: High artificial LNCS intake was associated with increased risk of CVD incidence (prevalent analysis).
Jeong et al 2026	Mixed population (adults, children, adolescents, pregnant)	RCTs (6 SRs) Observational (s4 SRs)	Any type of LNCS intake	Multiple comparators (highest vs. lowest)	ASB consumption was associated with increased risks of CVDs (OR, 1.17; 95% CI, 1.04 to 1.31; CE, IV)

Cancer					
Abu-Zaid et al 2025	Adults, all health backgrounds	Cohort studies (n=10 SRs)	Any type of LNCS	Lower vs higher LNCS dose	Cohort: No significant association between overall artificial sweetener intake and overall cancer risk (RR: 0.99; 95% CI: 0.96–1.01). Higher LNCS consumption was associated with reduced risk only for gynecological cancers (RR: 0.87; 95% CI: 0.79–0.96).
Beigrezaei et al 2024	Adults, all health backgrounds	Cohort studies (n= 6 SRs)	Any type of LNCS	Lower vs higher LNCS dose	Cohorts: Higher LNCS intake was associated with relatively small risks of leukemia. Higher LNCS consumption was associated with a lower risk of colorectal cancer. No significant associations for cancer mortality (n=4) or several site-specific cancers.
Choi et al 2026	Adults/adolescents/children	RCTS (n=14 primary studies) Cohorts (n=20 SRs)	Any type of Artificial LNCS	Vs. SSB	Cohorts: Cancer mortality estimates generally close to null (RR, 1.01 to 1.04)
Diaz et al 2023	Healthy adults	Cohorts (n=7 SRs)	Any type of Artificial LNCS	Lower vs Higher LNCS dose	Cohorts: Weak evidence indicated that high artificial LNCS intake was associated with higher risk for all-cause cancer (prevalent analysis).
Total energy intake					
Jeong et al 2026	Mixed population (adults, children, adolescents, pregnant)	RCTs (6 SRs) Observational (s4 SRs)	Any type of LNCS intake	Multiple comparators (highest vs. lowest)	Observational studies: Compared with water or placebo, LCS slightly increased energy intake (SMD, 0.24; 95% CI, 0.08 to 0.40; CE, IV)

Sugar intake					
Jeong et al 2026	Mixed population (adults, children, adolescents, pregnant)	RCTs (6 SRs) Observational (s4 SRs)	Any type of LNCS intake	Multiple comparators (highest vs. lowest)	increased the risk of weight gain (eOR, 1.21; 95% CI, 1.14 to 1.30; CE, IV) and Type 2 diabetes (eOR, 1.03; 95% CI, 1.02 to 1.04; CE, IV), while slightly reducing daily sugar intake (SMD, −0.09; 95% CI, −0.17 to −0.01; CE, IV).

Table 2. Guidelines or Consensus Statements on use of Low- and No-calorie Sweeteners

Korean Guidelines Choi et al 2026[1]	• ASBs may be used as a short-term substitution strategy for individuals with high SSBs consumption, particularly those at elevated cardiometabolic risk, as RCTs have demonstrated modest benefits in weight reduction and glycemic outcomes. (Strong Recommendation, Level of Evidence: Moderate) • ASBs are not recommended for initiating regular use in individuals with little or no prior SSBs or ASBs intake, nor for long-term reliance among those with high SSBs consumption, as evidence from prospective cohort studies indicates that high ASBs intake may be associated with increased risks of mortality, CVD, and T2DM, generally similar to those observed with SSBs. (Strong Recommendation, Level of Evidence: Moderate)
Joint position statement by British Dietetic Association, British Nutrition Foundation, and Diabetes UK.2025[2]	• LNCS should not be used as the primary dietary modification to support weight management. Instead, dietary interventions should focus on improving overall dietary quality by: • Reducing intakes of foods high in free sugars (e.g. cakes, pastries, sweet spreads, confectionery) and replacing them with alternatives such as fruits, vegetables, unsweetened dairy products e.g. plain yogurt, and unsalted nuts. • Encouraging the consumption of water or other unsweetened beverages, including tea and coffee, replacing sugar-sweetened beverages (SSBs). For regular SSB consumers, LNCBs may be a useful alternative, particularly for people at higher risk of type 2 diabetes. • HCPs should encourage individuals to limit free sugar intake to less than 5% of total dietary energy and provide practical advice on how this should be achieved, whilst acknowledging the challenges posed by the current food environment, including the availability, accessibility and marketing of sugary foods and drinks. • Infants and young children, especially those under 3 years old, should not be encouraged to consume products with LNCS. • For children aged 5 years and older, LNCS may be an option to help reduce excess sugar and calorie intake based on individual dietary needs. Recommended drinks for children are water and milk (or unsweetened fortified milk alternatives). Unsweetened fruit/vegetable juices and smoothies should be limited to a maximum of one small glass (150ml) a day. • HCPs should consider the diet quality of individuals choosing LNCS-containing products, to ensure no compensatory eating behaviors emerge (for example, consuming larger portions or choosing less healthy foods elsewhere in the diet under the assumption that LNCS “save calories”).

	For diabetes management: • Regular SSB consumers should be encouraged to replace these with water or other unsweetened drinks. LNCBs may be useful as part of a gradual approach to reducing free sugar intake. • Replacing free sugars, including those found in SSBs, with LNCS and LNCBs can be an effective strategy for reducing carbohydrate intake and managing post-prandial blood glucose levels.
	Healthcare professionals should: • Encourage people living with diabetes to monitor how replacing free sugars with LNCS affects their diabetes management and body weight. • Support individuals in understanding food and drink labels, to increase awareness of how product reformulation may impact their blood glucose levels and overall diabetes management. • Help to show people living with diabetes how to improve their diets by following a dietary pattern rich in whole grains, fruits, vegetables, fish, pulses, nuts, seeds, and unsweetened dairy or fortified unsweetened dairy alternatives, while limiting red and processed meats, salt, refined carbohydrates, and sugar-sweetened foods and drinks. • Refer individuals to a dietitian for personalized dietary advice and support when needed and appropriate.
WHO 2023[3]	• WHO suggests that non-sugar sweeteners not be used as a means of achieving weight control or reducing the risk of noncommunicable diseases (conditional recommendation)
American Diabetes Association 2024[4]	• Counsel people with prediabetes and diabetes that water is recommended over nutritive and nonnutritive sweetened beverages. However, the use of nonnutritive sweeteners as a replacement of sugar-sweetened products in moderation is acceptable if it reduces overall calorie and carbohydrate intake
Diabetes Canada 2024[5,6]	• Limit intake of free sugars to less than 10% of total daily calorie (energy) intake. This is approximately 50 g (12 teaspoons) of free sugars consumption per day based on a 2000-calorie diet. • Limit intake of sugar sweetened beverages (SSB) and drink water in their place. • Promote the intake of whole foods and reduce the intake of free sugars throughout life for overall health. • Low calorie sweeteners are one tool available for sugar intake reduction efforts.
Diabetes Australia 2024[7]	• The use of alternative sweeteners could assist in maintaining the palatability of foods and beverages with the absence of sugar and with less energy (kJ). • Non-nutritive sweeteners include aspartame, sucralose and stevia. These do not influence blood glucose levels and may be a useful alternative for replacing added sugar.

Dietary Guidelines for Americans[8]	• Limit foods and beverages that include artificial flavors, petroleum-based dyes, artificial preservatives, and low-calorie non-nutritive sweeteners • While no amount of added sugars or non-nutritive sweeteners is recommended or considered part of a healthy or nutritious diet, one meal should contain no more than10 grams of added sugars.
American Heart Association Science Advisory[9]	• it is prudent to advise against prolonged consumption of LCS beverages by children • Although water is the optimal beverage choice, children with diabetes mellitus who consume a balanced diet and closely monitor their blood glucose may be able to prevent excessive glucose excursions by substituting LCS beverages for sugar-sweetened beverages [SSBs] when needed • For adults who are habitually high consumers of SSBs, LCS beverages may be a useful replacement strategy to reduce intake of SSBs. This approach may be particularly helpful for persons who are habituated to a sweet tasting beverage and for whom water, at least initially, is an undesirable option.
American Academy of Pediatrics[10]	A number of findings, recommendations and guidance for pediatricians are reported in this paper. A snapshot of couple of statements: • No advice can be provided on the use of NNS in children younger than 2 years old given the absence of data on this age group. • Higher-quality data suggest that NNS use is associated with weight stabilization and/or weight loss in the short-term. Currently, there is a paucity of long-term data. • High-quality evidence, including meta-analysis and data from RCTs, suggests that there is no association between hyperactivity and NNS use in children. • There are limited data regarding the effect of NNS use on appetite change and taste preference.

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