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Meeting the *Healthy People 2030* Added Sugars Target

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Abstract

Introduction: Many Americans exceed the dietary recommendations for added sugars. *Healthy People 2030* set a population target mean of 11.5% calories from added sugars for persons aged ≥2 years. This paper describes the reductions needed in population groups with varying added sugars intake to meet this target using four different public health approaches.

Methods: Data from the 2015–2018 National Health and Nutrition Examination Survey (n=15,038) and the National Cancer Institute method were used to estimate the usual percentage calories from added sugars. Four approaches investigated lowering intake among (1) the general U.S. population, (2) people exceeding the 2020–2025 Dietary Guidelines for Americans recommendation for added sugars (≥10% calories/day), (3) high consumers of added sugars (≥15% calories/day), or (4) people exceeding the Dietary Guidelines for Americans recommendation for added sugars with two different reductions on the basis of added sugars intake. Added sugars intake was examined before and after reduction by sociodemographic characteristics.

Results: To meet the *Healthy People 2030* target using the 4 approaches, added sugars intake needs to decrease by an average of (1) 13.7 calories/day for the general population; (2) 22.0 calories/day for people exceeding the Dietary Guidelines for Americans recommendation; (3) 56.6 calories/day for high consumers; or (4) 13.9 and 32.3 calories/day for people consuming 10 to <15% and ≥15% calories from added sugars, respectively. Differences in added sugars intake were observed before and after reduction by race/ethnicity, age, and income.

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Conclusions: The *Healthy People 2030* added sugars target is achievable with modest reductions in added sugars intake, ranging from 14 to 57 calories/day depending on the approach.

INTRODUCTION

The U.S. Food and Drug Administration's definition of added sugars includes sugars that are added during the processing of foods (such as sucrose or dextrose), foods packaged as sweeteners (such as table sugar), sugars from syrups and honey, and sugars from concentrated fruit or vegetable juices; naturally occurring sugars found in milk, fruits, and vegetables are not included.[1] Sugar-sweetened beverages (SSBs), sweet bakery products, candy, other desserts, and ready-to-eat cereals are top sources of added sugars in the diets of children and adults in the U.S.[2,3] Diets high in added sugars can contribute to adverse health outcomes, including cardiovascular disease, dental caries, weight gain/obesity, and Type 2 diabetes.[4–10]

Although added sugar consumption has declined in the U.S., many Americans still consume too much.[11,12] The mean percentage calories from added sugars consumed by persons aged ≥2 years in 2013–2016 was 13.5%.[13] The 2020–2025 Dietary Guidelines for Americans (DGA) recommend that a healthy dietary pattern limits calories from added sugars to <10% of the total daily caloric intake starting at age 2 years.[14] Only about 35% of children aged 2–19 years and 47% of adults aged ≥20 years met this recommendation in 2015–2016.[2,3] People with lower incomes, non-Hispanic Black and non-Hispanic White persons, and children and younger adults are more likely to consume greater amounts of added sugars.[15–19]

Healthy People 2030, the fifth iteration of a national public health initiative led by the HHS, sets data-driven national objectives to improve health and well-being over the next decade.[20] A small subset of the *Healthy People 2030* objectives (23 of the 355 core objectives) were designated Leading Health Indicators because of their national importance and potential sizable impact on health.[21] Reducing added sugars intake is a *Healthy People 2030* Leading Health Indicator, and the objective calls for a reduction in calories from added sugars to reach a population mean of 11.5% by the year 2030 among persons aged ≥2 years.[13]

Public health efforts to achieve the *Healthy People 2030* target could focus on the general population or subpopulations on the basis of added sugar intake; the magnitude of the required reduction might affect intervention selection. This target was set on the basis of a projection method, and the authors are unaware of any previous study that has estimated the reductions needed to achieve this target if interventions focus on different populations.[13] Therefore, this paper estimated the required reduction in added sugars intake among population groups varying in added sugars consumption to achieve the *Healthy People 2030* target of 11.5% calories from added sugars consumed by persons aged ≥2 years.

Four public health approaches were investigated: lowering added sugars intake among (1) the general U.S. population (population approach); (2) those exceeding the 2020–2025 DGA recommendation for added sugars, that is, consuming ≥10% calories from added sugars (DGA approach); (3) those exceeding the 2020–2025 DGA recommendation for added

sugars by at least 1.5 times, that is, consuming ≥15% calories from added sugars (high consumer approach); and (4) those exceeding the DGA recommendation for added sugars with two different reduction amounts on the basis of added sugars consumption (hybrid approach).

METHODS

Study Sample

The National Health and Nutrition Examination Survey (NHANES) is a nationally representative sample of the non-institutionalized civilian U.S. population. Details about the NHANES survey can be found elsewhere.[22,23] Data from the 2015–2016 and 2017–2018 NHANES survey cycles were combined (n=19,225). Participants were excluded from analysis if they were aged <2 years (n=1,280), lacked reliable Day 1 dietary recall data (n=2,905), or were fasting (n=2), resulting in a final analytic sample of 15,038 people.

Measures

The outcome variable was the percentage of calories from added sugars and was estimated as a person's usual intake using two 24-hour dietary recalls. Data from the 2015–2016 and 2017–2018 U.S. Department of Agriculture (USDA) Food Patterns Equivalent Database were merged with NHANES 2015–2018 data to disaggregate all foods and beverages into their components and assign nutrient values.[24,25] Added sugars were provided in teaspoons, which were converted to grams (4.2 grams/teaspoon) and calories (4 kcal/gram) to determine calories from added sugars. Calories from added sugars were divided by total caloric intake to calculate the percent calories from added sugars for Day 1 and Day 2 dietary recalls.

The National Cancer Institute (NCI) INDIVINT macro was used to estimate the usual dietary intake of percentage calories from added sugars, the usual total caloric intake for each person, and which persons likely had added sugar intake above designated cut points.[26] Because added sugars were consumed by nearly everyone in the population (98.7% consumed added sugars on Day 1 recall), a 1-part model was used, which accounted for weekend versus weekday intake. Balanced repeated replication weights were used to estimate SEs.

The NCI method accounts for intraindividual variation and provides a typical dietary intake of added sugars. In contrast, *Healthy People 2030* uses one day of dietary recall to provide intake on any given day.[13] Therefore, a sensitivity analysis was conducted using one day of dietary recall for the four approaches.

Sociodemographic variables were selected on the basis of their documented association with added sugar consumption: sex (male, female), race/ethnicity (non-Hispanic White, non-Hispanic Black, non-Hispanic Asian, non-Hispanic other race or multirace, and Hispanic), age (2–5, 6–11, 12–19, 20–30, 31–50, 51–70, ≥71 years), and annual household income (<$35,000; $35,000–$74,999; $75,000–$99,999; ≥$100,000).[15–19]

Statistical Analysis

The analytic goal was to estimate the mean reduction in added sugars intake needed to achieve the *Healthy People 2030* population target mean of 11.5% daily calories from added sugars. This was achieved in three steps. First, baseline measures of usual percentage calories from added sugars, usual calories from added sugars, usual grams from added sugars, and usual total caloric intake were calculated. Although the *Healthy People 2030* objective used 2013–2016 NHANES as the baseline, data from 2015 to 2018 were used to reflect a more current estimate of consumption. Second, the reduction in usual percentage calories from added sugars from baseline (y) needed to achieve the population target mean of 11.5% was estimated using this general equation: $y = -(11.5 \times N - a)/n$, where N is the sum of the weighted population, a is the sum of percentage calories from added sugars for the total population, and n is the sum of the weighted population for 1 of the 4 reduction approaches. Third, the needed reduction was applied to usual percentage calories from added sugars to each person in the total population or those in the relevant subgroup depending on the reduction approach. With baseline calories held constant, usual calories from added sugars and the difference between original and reduced usual added sugars calories were calculated.

The goal of the population approach was to reduce added sugar intake equally across the general population aged ≥2 years. For this approach, the general formula where n is the sum of the weighted total population was used to estimate the required reduction.

The 2020–2025 DGA recommends limiting calories from added sugars to <10% of daily calories for Americans aged ≥2 years[14]; therefore, the second approach reduced consumption for only people who were estimated to consume ≥10% of usual calories from added sugars. The general formula where n is the sum of the weighted population for only those whose usual consumption was ≥10% calories from added sugars was used to estimate the required reduction.

The third approach reduced consumption only among people whose intake was 1.5 times higher than the DGA recommendation or ≥15% calories from added sugars. The general formula where n is the sum of the weighted population for only those whose usual consumption was ≥15% usual calories from added sugars was used to estimate the required reduction.

The fourth approach reduced consumption in people exceeding the DGA recommendation for added sugars at 2 different amounts on the basis of 2 consumption levels. Among those consuming 10% to <15% calories from added sugars, intakes were reduced at the same reduction amount applied in the population approach. Then, among those consuming ≥15% calories from added sugars, the general formula where n is the sum of the weighted population for only those whose usual consumption was ≥15% usual calories from added sugars was used to estimate the reduction required.

Linear regression analysis examined whether sociodemographic characteristics (i.e., sex, race/ethnicity, age, and income) were associated with the mean usual percentage calories from added sugars. This analysis was conducted before and after each reduction approach

was applied. The SAS (Version 9.4) was used for all analyses, and SAS survey procedures were used to account for the complex NHANES design.[27] Estimates were age adjusted to the 2,000 standardized U.S. population.

RESULTS

About half the sample was female (51.3%), and the majority was non-Hispanic White (60.2%), was aged ≥20 years (76.1%), and had an annual household income of at least $35,000 (72.0%) (data not shown). Before applying any reduction approach, in 2015–2018, the U.S. population aged ≥2 years had a mean usual daily intake of 12.2% (SE=0.10) calories from added sugars (Table 1).

To achieve the population target mean of 11.5% calories from added sugars in the total population, the population approach required a reduction in added sugars consumption of 0.7 percentage points across the total sample (Table 1). The mean usual percentage calories from added sugars were reduced from 12.2% (SE=0.10) to 11.5% (SE=0.10) or a mean of 13.7 (SE=0.05) calories from added sugars/day.

The DGA approach required a reduction in added sugars consumption of 1.1 percentage points for people consuming ≥10% usual calories from added sugars (Table 1). For this group, the mean usual percentage calories from added sugars were reduced from 14.7% (SE=0.09) to 13.6% (SE=0.09) or a mean of 22.0 (SE=0.09) calories from added sugars/day.

The high-consumer approach required a reduction in added sugars consumption of 2.7 percentage points for people consuming ≥15% usual calories from added sugars (Table 1). For this group, the mean usual percentage calories from added sugars were reduced from 18.6% (SE=0.11) to 15.8% (SE=0.11) or a mean of 56.6 (SE=0.47) calories from added sugars/day.

The hybrid approach required a reduction of 0.7 percentage points for people consuming 10% to <15% calories from added sugars (mean=13.9 calories/day) and 1.6 percentage points for people consuming ≥15% usual calories from added sugars (mean=32.3 calories/day) (Table 1).

Findings at baseline indicated significant differences in mean usual percentage calories from added sugars by race/ethnicity, age, and annual household income (Table 2). Non-Hispanic Black persons (13.0%, SE=0.13), children aged 6–11 years (13.1%, SE=0.15) and aged 12–19 years (13.1%, SE=0.14), and people with an annual household income <$35,000 (13.0%, SE=0.18) had the highest mean usual percentage calories from added sugars. Non-Hispanic Asian persons (9.6%, SE=0.13), adults aged ≥71 years (11.6%, SE=0.15), and people with an annual household income ≥$100,000 (11.4%, SE=0.14) had the lowest mean usual percentage calories from added sugars. Significant differences by race/ethnicity, age, and income remained after the 4 reduction approaches were applied. Non-Hispanic Black persons, children aged 6–19 years, and those with the lowest income (<$35,000) continued to have the highest intake regardless of the reduction approach.

The sensitivity analyses using one day of dietary recall data still showed that modest reductions would be required to meet the *Healthy People 2030* added sugars target. Estimates ranged from reductions of 36–107 mean calories from added sugars—an additional 23–52 calories compared with the usual intake methodology—with the largest reduction in the high consumer approach.

DISCUSSION

This study investigated the needed reduction in added sugars intake to achieve the *Healthy People 2030* population target mean of 11.5% daily calories from added sugars for people aged ≥2 years using 4 different public health approaches. Findings indicate that the target is achievable with modest reductions in added sugar intake. For example, added sugars intake would require a mean reduction of 13.7 calories/day if the general U.S. population reduced consumption, 22.0 calories/day if only people who consumed ≥10% of calories from added sugars reduced consumption, 56.6 calories/day if only people who consumed ≥15% of calories from added sugars reduced consumption, and 13.9 calories/day if people consuming 10 to <15% and 32.3 calories/day if people consuming ≥15% of calories from added sugars reduced consumption. To put the caloric reduction in perspective in terms of food intake, the reduction is equivalent to about the amount of sugar in 1 oz of a soft drink or a quarter cup of sugary cereal for the population approach, 2 oz of a soft drink or half a cup of sugary cereal for the DGA approach, and 5 oz of a soft drink or one and one quarter cups of sugary cereal for the high-consumer approach.[28]

The small dietary changes in added sugars intake required to meet the *Healthy People 2030* target have practical implications at the individual and population levels. For people who want to reduce added sugars and total caloric intake, reducing the portion size or the frequency of foods or beverages with added sugars consumed, particularly those containing few other nutrients, could help achieve both goals. For those who want to reduce added sugars intake without changing their calorie consumption, replacing foods containing added sugars with more healthful food options such as fresh fruits and vegetables may help them to meet the added sugars target as well as other dietary recommendations.[14] For example, not consuming a miniature candy bar reduces calorie consumption by 40–50 calories. In contrast, replacing the miniature candy bar with an orange would reduce added sugars; keep calories similar; and add fiber and vitamin C, among other nutrients, to the diet.[28]

At the population level, all the four approaches could be feasible. The population approach would require small reductions among those in the general population aged ≥2 years. In contrast, the other three approaches would require larger reductions in added sugars intake for select subpopulations and additional effort to identify people not meeting the DGA added sugars recommendation. Because needed changes are relatively small in all approaches, the practical implication is that the choice of intervention to achieve the *Healthy People 2030* added sugars target does not need to be limited to those that produce large population effects. Thus, a variety of intervention options could be used.

A number of population-level interventions that support individual efforts to reduce added sugars intake are being used or are recommended by expert government or clinical bodies.

The Food and Drug Administration required added sugars information to be declared on the updated Nutrition Facts label to help consumers make informed food choices.[1] In addition, the USDA's Smart Snacks in Schools regulations restrict access to SSBs and limit foods sold to only foods with ≤35% of total sugars (including added sugars) by weight, which has shown to be effective for reducing added sugar intake among students.[29,30] Furthermore, the HHS Food Service Guidelines for Federal Facilities also recommends that packaged snacks sold in federal facilities contain ≤35% of total sugars by weight.[29]

A systematic review of the literature identified environmental interventions that may be effective in reducing consumption of SSBs, a leading source of added sugars, including those that used simple front-of-package labeling such as a traffic light symbol to identify healthier foods; interventions that increased the relative price of SSBs; multicomponent community campaigns; and interventions that limited access to SSBs in government benefit programs.[31] Product reformulation to reduce added sugars in foods and beverages could be another option to reduce added sugar intake.[32] For example, product reformulation efforts have been shown to be effective in reducing the intake of sodium and trans fats.[33,34]

Consistent with previous research, this paper documented differences in added sugars consumption by race/ethnicity, income, and age, which remained after reduction regardless of the approach used.[15–19] Use of approaches that prioritize reducing added sugar intake among people not meeting recommendations could help those most at risk for chronic diseases related to added sugar consumption and therefore could have the greatest public health impact. However, those who consume more added sugars may face barriers that make improvements in diet quality difficult. For example, the cost and availability of healthful foods and the intentional marketing of unhealthful foods to children and adolescents, particularly racial and ethnic minority youth, present challenges to groups at greater risk for consuming too many added sugars.[35–38] Without addressing systemic barriers and social determinants of health, sustainable improvements to more healthful eating may prove difficult.

Limitations

This study has two key strengths. First, four public health approaches designed to achieve the *Healthy People 2030* added sugars target were investigated by examining how each approach could reduce added sugar intake across a different prioritized group. Second, the NCI method was used to calculate usual percentage of calories from added sugars, which accounts for intraindividual variances.[26]

This study also has limitations. First, there are errors inherent in assessing dietary quality, such as underreporting energy intake.[26,39] Second, although the NCI method can generate individual predicted intakes that account for day-to-day diet variability, these intakes still have errors, and individuals may be misclassified when assigned into consumption groups. The alternative was to use one day of dietary recall, but these data also have limitations related to misclassification because of day-to-day variation in intake. A sensitivity analysis showed still achievable reduction amounts with one day of dietary recall. Finally, this analysis assumed that total calorie consumption would remain constant and that a reduction in added sugar calories would be compensated with calories from a different, ideally more

healthful food or beverage. However, with high obesity prevalence, an approach that reduces both added sugars and total calories might be more appropriate.[40]

CONCLUSIONS

For many Americans, added sugars intake is high and exceeds the DGA recommendation for added sugars, with disparities observed by age, race/ethnicity, and income. Regardless of the approach used, meeting the *Healthy People 2030* added sugars target is achievable with modest reductions in added sugars intake, ranging from an average of about 14 to 57 calories/day depending on the approach.

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Table 1.

Usual Daily Added Sugar Intake at Baseline and After Reduction Among Americans Aged ≥2 Years, U.S.

			Baseline added sugars intake				Postreduction added sugars intake[b,c]				
Approach[a]	*n* [d]	Mean usual total daily calories (SE)	Mean usual % calories (SE)	Mean usual calories (SE)	Mean usual grams (SE)	Reduction amount (percentage points)	Mean usual % calories (SE)	Mean usual calories (SE)	Mean usual calories reduced (SE)	Mean usual grams (SE)	Mean usual grams reduced (SE)
Population											
Total	15,038	1,959.0 (7.01)	12.2 (0.10)	242.3 (2.20)	60.57 (0.55)	0.7	11.5 (0.10)	228.6 (2.19)	13.7 (0.05)	57.1 (0.55)	3.4 (0.01)
DGA											
≥10.0%	9,858	2,001.5 (8.14)	14.7 (0.09)	295.4 (2.19)	73.9 (0.55)	1.1	13.6 (0.09)	273.5 (2.15)	22.0 (0.09)	68.4 (0.54)	5.5 (0.02)
<10.0%	5,180	1,879.3 (11.93)	7.5 (0.04)	142.7 (1.25)	35.7 (0.31)	—	7.5 (0.04)	142.7 (1.25)	—	35.7 (0.31)	—
High consumer											
≥15.0%	3,676	2,018.5 (16.05)	18.6 (0.11)	376.6 (3.28)	94.2 (0.82)	2.7	15.8 (0.11)	320.0 (2.92)	56.6 (0.47)	80.0 (0.73)	14.2 (0.12)
<15.0%	11,362	1,939.5 (8.0)	10.1 (0.06)	198.2 (1.38)	49.5 (0.35)	—	10.1 (0.06)	198.2 (1.38)	—	49.5 (0.35)	—
Hybrid											
≥15.0%	3,676	2,018.5 (16.05)	18.6 (0.11)	376.6 (3.28)	94.2 (0.82)	1.6	17.0 (0.11)	344.3 (3.07)	32.3 (0.27)	86.1 (0.77)	8.1 (0.07)
10% to <15%	6,182	1,991.2 (8.36)	12.3 (0.03)	246.0 (1.18)	61.5 0.29	0.7	11.6 (0.03)	232.0 (1.13)	13.9 (0.07)	58.0 (0.28)	3.5 (0.02)
<10%	5,180	1,879.3 (11.93)	7.5 (0.04)	142.7 (1.25)	35.7 (0.31)	—	7.5 (0.04)	142.7 (1.25)	—	35.7 (0.31)	—

[a] Values beneath the DGA, high consumer, and hybrid approaches indicate groups on the basis of usual percentage daily calories from added sugars.

[b] Postreduction shows the approach-specific amount that usual added sugar intake was reduced.

[c] All approaches achieved the *Healthy People 2030* population target mean of 11.5% calories from added sugars for persons aged ≥2 years.

[d] Unweighted sample size.

DGA, Dietary Guidelines for Americans.

Table 2.

Usual Daily Added Sugar Intake by Sociodemographic Characteristics Among Americans Aged ≥2 Years, U.S.

		Baseline			Population approach			DGA approach			High consumer approach			Hybrid approach		
Characteristics	***n*** [a]	**Mean usual % calories from added sugars (SE)**		***p*-value**	**Reduced mean usual % calories from added sugars (SE)**		***p*-value**	**Reduced mean usual % calories from added sugars (SE)**		***p*-value**	**Reduced mean usual % calories from added sugars (SE)**		***p*-value**	**Reduced mean usual % calories from added sugars (SE)**		***p*-value**
Sex																
Male	7358	12.1	(0.11)	0.30	11.4	(0.11)	0.30	11.4	(0.10)	0.36	11.5	(0.08)	0.19	11.5	(0.10)	0.30
Female	7680	12.3	(0.14)		11.6	(0.14)		11.6	(0.13)		11.6	(0.11)		11.6	(0.12)	
Race/ethnicity																
Non-Hispanic White	5033	12.4	(0.14)	**<0.0001**	11.7	(0.14)	**<0.0001**	11.7	(0.13)	**<0.0001**	11.7	(0.11)	**<0.0001**	11.7	(0.12)	**<0.0001**
Non-Hispanic Black	3373	13.0	(0.13)		12.3	(0.13)		12.2	(0.12)		12.1	(0.11)		12.2	(0.12)	
Non-Hispanic Asian	1610	9.6	(0.13)		8.9	(0.13)		9.1	(0.12)		9.4	(0.12)		9.2	(0.11)	
Non-Hispanic other	857	12.7	(0.23)		12.0	(0.23)		12.0	(0.21)		11.9	(0.19)		12.0	(0.20)	
Hispanic	4165	11.7	(0.12)		11.0	(0.12)		11.0	(0.11)		11.2	(0.11)		11.1	(0.11)	
Age																
2–5 years	1205	11.7	(0.18)	**<0.0001**	11.0	(0.18)	**<0.0001**	11.0	(0.15)	**<0.0001**	11.3	(0.15)	**<0.0001**	11.1	(0.15)	**<0.0001**
6–11 years	1835	13.1	(0.15)		12.4	(0.15)		12.2	(0.14)		12.3	(0.11)		12.3	(0.13)	
12–19 years	2240	13.1	(0.14)		12.4	(0.14)		12.3	(0.13)		12.2	(0.11)		12.3	(0.13)	
20–30 years	1686	11.8	(0.23)		11.1	(0.23)		11.2	(0.21)		11.2	(0.18)		11.2	(0.20)	
31–50 years	3115	12.2	(0.15)		11.5	(0.15)		11.6	(0.14)		11.5	(0.13)		11.6	(0.14)	
51–70 years	3445	12.0	(0.20)		11.3	(0.20)		11.3	(0.19)		11.3	(0.16)		11.3	(0.18)	
≥71 years	1512	11.6	(0.15)		10.9	(0.15)		10.9	(0.13)		11.0	(0.13)		11.0	(0.13)	
Annual household income[b]																
<$35,000	5214	13.0	(0.18)	**<0.0001**	12.3	(0.18)	**<0.0001**	12.2	(0.17)	**<0.0001**	12.1	(0.15)	**<0.0001**	12.2	(0.16)	**<0.0001**
$35,000–$74,999	4344	12.6	(0.13)		11.9	(0.13)		11.8	(0.12)		11.8	(0.11)		11.8	(0.12)	
$75,000–$99,999	1424	12.0	(0.26)		11.3	(0.26)		11.2	(0.24)		11.3	(0.20)		11.3	(0.23)	
≥$100,000	2610	11.4	(0.14)		10.7	(.14)		10.7	(0.13)		10.9	(0.11)		10.8	(0.12)	

Note: Boldface indicates statistical significance ($p<0.05$).

[a] Unweighted sample size

[b] Participants without income information (n=1,446) were excluded from this analysis but included in all other analyses Data source: The National Health and Nutrition Examination Survey 2015–2016 and 2017–2018.

DGA, Dietary Guidelines for Americans.