



Added Sugar Intake among Pregnant Women in the United States: National Health and Nutrition Examination Survey 2003-2012



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ABSTRACT

Background Despite associations of dietary added sugar with excess weight gain and chronic disease risk, intake among most Americans exceeds the recommended limits (<10% total energy). Maternal diet plays an important role in pregnancy-related outcomes, but little is known about the extent of added sugar intake during pregnancy.

Objective To assess intake and identify the top sources of added sugars in the diets of pregnant vs nonpregnant women in the United States.

Design Cross-sectional analysis of data from the National Health and Nutrition Examination Survey (NHANES), 2003-2004 to 2011-2012.

Participants Four thousand one hundred seventy-nine pregnant and nonpregnant women (aged 20 to 39 years) who completed a dietary recall.

Statistical analyses performed Survey-weighted analyses were used to estimate means (95% CIs) in total grams and as percentage of total energy for added sugar intake by pregnancy status and by demographic subgroup and to identify leading sources of added sugar.

Results Added sugar intake trended toward being higher in pregnant compared with nonpregnant women in absolute grams, 85.1 g (95% CI: 77.4 to 92.7) vs 76.7 g (95% CI: 73.6 to 79.9), respectively ($P=0.06$), but was lower among pregnant women when total energy intake was accounted for, 14.8% (95% CI: 13.8 to 15.7) vs 15.9% (95% CI: 15.2 to 16.6) of total energy, respectively ($P=0.03$). Among pregnant women, added sugar intake was similar among demographic subgroups. However, in multivariable regression, pregnancy status significantly modified the associations of education and income with added sugar intake, whereby less educated and lower-income women who were pregnant had lower added sugar intakes compared with those who were not pregnant, but more educated or higher-income women did not exhibit this pattern. The top five sources of added sugar for all women were sugar-sweetened beverages; cakes, cookies, and pastries; sugars and sweets; juice drinks and smoothies; and milk-based desserts.

Conclusions Although pregnant women had higher energy intakes, this was not attributed to higher intakes of added sugar. Although education and income affected consumption during pregnancy, intake of added sugar among all women, regardless of pregnancy status, exceeded recommendations.

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MATERNAL OVERNUTRITION IS AN EMERGING public health issue worldwide. Women who are obese before pregnancy or who gain gestational weight above the Institute of Medicine's recommendations are at increased risk for adverse health outcomes, especially gestational diabetes and delivery complications.¹⁻⁶ In addition, offspring of these mothers are at higher risk for several adverse birth outcomes, including macrosomia, stillbirth, congenital defects, and shoulder dystocia,⁷⁻⁹ and may be predisposed to obesity and cardiometabolic diseases later in life.¹⁰⁻¹² Together, these risks make it vital that health care professionals be equipped with interventions to promote healthy weight control among

women of reproductive age both before and during pregnancy.

In the general population, high consumption of added sugar has been associated with increased risk of weight gain and obesity.¹³⁻¹⁵ The 2015-2020 Dietary Guidelines for Americans recommends that all Americans limit their intake of added sugar to less than 10% of total calories.¹⁶ No specific limits have been set for pregnant women, but a position paper from the Academy of Nutrition and Dietetics advises that pregnant women reduce intake of high-added-sugar foods as a strategy to avoid excess calories without compromising nutrient adequacy.¹⁷ The potential benefits of following this guideline have been supported by several

studies of pregnant women that revealed associations of high dietary intakes of added sugar with increased offspring fat mass and maternal gestational weight gain and increased odds of gestational diabetes.¹⁸⁻²¹ However, few studies, if any, have investigated how added sugar intakes among pregnant women compare with intakes among nonpregnant women, as well as with recommendations for the general population.

The objectives of this study were to describe patterns of added sugar intake among pregnant compared with nonpregnant women in the United States using surveillance data from the National Health and Nutrition Examination Survey (NHANES), and to determine the major food and beverage sources contributing to this intake. Based on qualitative studies of pregnant women that have identified several barriers to achieving appropriate gestational weight gain^{22,23}—in particular, limited knowledge of what a “healthy” diet is, the misunderstanding that pregnant mothers are “eating for two,” and the belief that overeating is necessary to meet the fetus’s nutritional needs—we hypothesized that pregnant women, on average, consume a higher percentage of calories from added sugar compared with nonpregnant women as a result of these misconceptions. The insights gained from this analysis will inform efforts to identify possible risk factors in pregnancy that can be modified by nutritional interventions to improve health outcomes among women of reproductive age and their offspring.

METHODS

Study Population

The NHANES is conducted in 2-year cycles by the National Center for Health Statistics of the Centers for Disease Control and Prevention to assess the health status of a cross-section of noninstitutionalized US residents. It utilizes a complex, multistage, probability sampling design to obtain a nationally representative sample, the details of which are described elsewhere.²⁴ For this analysis, we merged five survey cycles (2003–2004, 2005–2006, 2007–2008, 2009–2010, and 2011–2012) to achieve greater sample size within subgroups and to ensure statistically reliable estimates. The National Center for Health Statistics Ethics Review Board approved all study protocols for each NHANES cycle included in this report.

The sample for this analysis was limited to women aged 20 to 39 years with valid data for the urine pregnancy test at the mobile examination center (MEC) exam. Females 19 years or younger were excluded for continuity between cycles because starting in 2007–2008, pregnancy exam results were only released for females aged 20 to 44 years. Females 40 years or older were also excluded because of the small number of pregnant women in this age range ($n=11$). Subjects were also excluded if they had incomplete or unreliable day 1 dietary recall data or if they were missing values for family poverty-income ratio (PIR), education level, or marital status (Figure 1). This resulted in a final sample of 4,179 pregnant ($n=650$) and nonpregnant women ($n=3,529$).

Dietary Intakes

What We Eat in America is the dietary assessment component of NHANES and includes two 24-hour recalls performed by trained interviewers using the automated multiple-pass method. For this analysis, we used the day 1 dietary recall because a single recall for a large population is adequate to

RESEARCH SNAPSHOT

Research Question: How much added sugar do pregnant women in the United States consume and how does their consumption compare to that of nonpregnant women?

Key Finding Using cross-sectional data from 4,179 women participants in the National Health and Nutrition Examination Survey (NHANES), we found a trend toward pregnant women consuming more added sugar in grams per day compared with nonpregnant women. However, this equated to a lower percentage of total calories when offset by the higher total energy intakes among pregnant women ($P<0.05$). By subgroup, the contribution of added sugars to total energy intake was less among less educated and lower income pregnant women compared with their nonpregnant counterparts. Nonetheless, mean intakes of added sugar for both pregnant and nonpregnant women exceeded recommended levels of less than 10% of total energy intake.

yield unbiased estimates for mean dietary intakes.²⁵ For each subject, total energy intake (kcal/d) was calculated using the United States Department of Agriculture’s (USDA’s) Food and Nutrient Database for Dietary Studies. Teaspoon equivalents of added sugar consumed per subject per day and per food/beverage item were calculated using the USDA’s Food Patterns Equivalence Database corresponding to each cycle. In this database, “added sugar” was defined as all sugars added to foods during preparation, processing, or at the table but not naturally occurring sugars present in milk and fruit. Teaspoon equivalents were converted to grams of sugar using the conversion factor of 4.2 g of sugar per teaspoon, as suggested by the National Center for Health Statistics. Added sugar intakes were also expressed as a percentage of calories consumed per day by converting grams of sugar to kilocalories using the conversion factor 4 kcal/g of sugar and then dividing by total energy intake to yield a percentage.

Assessment of Other Covariates

Sociodemographic information—including age, race/ethnicity, education, and family PIR—was collected during in-person interviews. Body measurements, including weight (kg) and height (cm), were measured by trained NHANES staff during the MEC exam and used to calculate current body mass index (BMI; calculated as kg/m^2). For pregnant women, pre-pregnancy BMI was estimated by using self-reported weight 1 year before the NHANES examinations, which was collected in the weight history questionnaire, and the height measured during the MEC exam. To estimate the trimester of pregnancy, month of pregnancy was collected from the reproductive health questionnaire administered during the MEC exam.

Statistical Methods

All analyses were performed using SAS version 9.4.²⁶ NHANES sampling weights and complex survey procedures were used to obtain nationally representative estimates and to account for different sampling probabilities, lack of response, and lack of coverage. Descriptive statistics of the sample are reported as counts and weighted frequencies by

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