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Beverage Consumption in Relation to Discretionary Food Intake and Diet Quality among US Adults, 2003 to 2012

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ABSTRACT

Background A majority of Americans consume beverages and discretionary foods—foods that are typically low in nutrient value but high in sugar, sodium, fats, and cholesterol—as part of their daily diet, which profoundly impacts their energy balance and nutritional status.

Objective This study examined consumption of different types of beverages in relation to discretionary food intake and diet quality among US adults.

Methods Nationally representative sample of 22,513 adults from the National Health and Nutrition Examination Survey 2003 to 2012 waves were analyzed. The discretionary food category identifies energy-dense, nutrient-poor food products that do not necessarily provide essential nutrients that the human body needs, but can add variety. First-difference estimator addressed confounding bias from time-invariant unobservables (eg, eating habits, taste preferences) by using within-individual variations in diet and beverage consumption between 2 nonconsecutive 24-hour dietary recalls.

Results Approximately 21.7%, 42.9%, 52.8%, 26.3%, and 22.2% of study participants consumed diet beverage, sugar-sweetened beverage (SSB), coffee, tea, and alcohol, respectively, and 90.1% consumed discretionary foods on any given day. Across beverage types, alcohol (384.8 kcal) and SSB (226.2 kcal) consumption was associated with the largest increase in daily total calorie intake; coffee (60.7 kcal) and diet-beverage (48.8 kcal) consumption was associated with the largest increase in daily calorie intake from discretionary foods, and SSB consumption was associated with the largest reduction in daily overall diet quality measured by the Healthy Eating Index 2010. The impact of beverage consumption on daily calorie intake (overall and from discretionary foods) and diet quality differed across individual sociodemographics and body-weight status. The incremental daily calorie intake from discretionary foods associated with diet-beverage consumption was highest in obese adults, and that associated with SSB was highest in normal-weight adults.

Conclusions Interventions to promote healthy eating should assess beverage consumption in the context of overall dietary behavior.
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DISCRETIONARY FOODS REFER TO ENERGY-DENSE, nutrient-poor food products that do not necessarily provide essential nutrients that the human body needs, but can add variety.[1] These foods are typically high in saturated fat, added sugar, added salt, and cholesterol that dietary guidelines recommend substantial reductions in consumption, but low in certain vitamins, minerals, and fiber that contribute to a healthy diet.[1,2] More than 90% of the US population 2 years of age and older consumes discretionary foods, nearly 50% drinks sugar-sweetened beverages (SSBs), and approximately 20% drinks diet beverages on any given day.[3-6] Existing literature predominately focuses on calorie intake and health consequences of SSB consumption.[7-12] It was not until recently that the role of diet beverages and discretionary foods on diet quality and weight management began to receive attention, but yielding largely inconsistent results.[13-21] Beverages are often consumed together with other foods, which jointly impact daily total calorie intake and overall diet quality—an important dietary pattern uninformed by studying beverage or discretionary food consumption in isolation. Various genetic and sociobehavioral factors, such as metabolism, diet habits, health attitudes, nutrition knowledge, and affordability, can contribute to the differential relationship between beverage and discretionary food consumption. Understanding these population heterogeneities is essential in designing targeted policy interventions.

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This study examined consumption of different types of beverages (ie, diet beverage, SSB, coffee, tea, and alcohol) in relation to daily total calorie intake, calorie intake from discretionary foods, and overall diet quality among US adults using a decade of data from a large nationally representative survey. We utilized within-individual variations in diet and beverage consumption based on 2 nonconsecutive 24-hour dietary recalls, which addressed the confounding issue due to unobservable individual characteristics, such as eating habits or taste preferences. Daily total calorie intake, calorie intake from discretionary foods, and overall diet quality were examined for the overall adult population and by sex, race/ethnicity, age, education, income, and body-weight status.

METHODS

Survey Setting and Participants

Individual-level data came from the National Health and Nutrition Examination Survey (NHANES) 2003-2004, 2005-2006, 2007-2008, 2009-2010, and 2011-2012 waves. NHANES is a program of studies conducted by the National Center for Health Statistics to assess the health and nutritional status of children and adults. The program began in the early 1960s and periodically conducted separate surveys focusing on different population groups or health topics. Since 1999, NHANES has been conducted continuously in 2-year cycles and has a changing focus on a variety of health and nutrition measurements. A multistage probability sampling design is used to select participants who are representative of the civilian, noninstitutionalized US population. Certain population subgroups are oversampled to increase the reliability and precision of health status indicator estimates for these groups.

Dietary Interview

Except for the NHANES 1999-2000 wave, for which all respondents were asked to complete a single 24-hour dietary recall interview, all subsequent waves incorporated two dietary recalls, with the first collected in person and the second by telephone 3 to 10 days later. In both interviews, each food or beverage item and corresponding quantity consumed by a respondent from midnight to midnight on the day before the interview was recorded. The in-person dietary recall (day 1) was conducted by trained dietary interviewers in the Mobile Examination Center with a standard set of measuring guides. These tools aimed to help the respondent accurately report the volume and dimensions of the food or beverage items consumed. Upon completion of the in-person interview, participants were provided measuring cups, spoons, a ruler, and a food model booklet, which contained two-dimensional drawings of the various measuring guides available in the Mobile Examination Center, to use for reporting dietary intake during the telephone interview (day 2). After the dietary interview, all reported food and beverage items were systemically coded with the US Department of Agriculture (USDA) Food and Nutrient Database for Dietary Studies. Access restrictions apply to the day-2 dietary recall data collected in the NHANES 2001-2002 wave, whereas dietary data for both recall days are released to the public for all subsequent waves.

Among the 23,865 US adults aged 18 years and older who participated in the NHANES 2003-2012 waves, 1,352 (5.7%) who were pregnant, lactating, and/or on a special diet to lose weight at the time of interview were excluded. The remaining 22,513 adults were included in the final sample.

Beverage Consumption

We identified five mutually exclusive beverage categories in the NHANES 2003-2012 waves: diet beverage, SSB, coffee, tea, and alcohol. Diet beverage includes calorie-free and low-calorie versions of sodas, fruit drinks, energy drinks, sport drinks, and carbonated water, consistent with definitions reported by the National Cancer Institute, the Centers for Disease Control and Prevention, and the Food and Drug Administration food labeling guidelines.[4,22,23] SSB includes sodas, fruit drinks, energy drinks, sport drinks, and sweetened bottled waters, consistent with definitions reported by the National Cancer Institute and Centers for Disease Control and Prevention.[2,21] Neither diet beverages nor SSBs include 100% fruit juice or milk (plain or flavored). Coffee includes any form of regular or decaffeinated coffee product or coffee substitute (eg, cereal grain beverage). Tea includes any form of regular or decaffeinated tea product. Alcohol includes beers and ales, cordials and liqueurs, cocktails, wines, and distilled liquors. The definitions of coffee, tea, and alcohol are consistent with the USDA Food and Nutrient Database for Dietary Studies food/beverage categorization. In the NHANES 2011-2012 wave, diet beverage, SSB, coffee, tea, and alcohol consist of 25, 48, 36, 29, and 33 reported beverage items, respectively. The number of reported items in each beverage category differed only slightly across survey waves. Any beverage consumption in a day is defined as >0 fluid ounces of consumption of a specific beverage category reported by a survey respondent on a dietary recall day.

Discretionary Food Consumption

The discretionary food category identifies energy-dense, nutrient-poor food products that do not belong to the main food groups or necessarily contain essential nutrients that the human body requires, but can add diversity.[1] Foods in this category can be consumed "sometimes in small amounts by those who are physically active, but are not a necessary part of the diet,"[1] Following Bleich and colleagues,[13] specific food items in the discretionary food category include cookies; pies; ice cream; confectionery; chocolate; other desserts (eg, custards, puddings, mousse, gelatin dessert); sweet rolls; waffles; cakes; pastries (eg, crepes, cream puffs, strudels, croissants, muffins, sweet breads); biscuits; hush puppies; chips; popcorn; pretzels; party mixes; and fries.[13] In the NHANES 2011-2012 wave, the discretionary food category consists of 661 reported food items. The number of reported items in the discretionary food category differed only slightly across survey waves. Any discretionary food consumption in a day is defined as consumption of >0 g of a discretionary food item reported by a survey respondent on a dietary recall day.

Calorie Intake

In the NHANES dietary interview data, calorie derived from each consumed food or beverage item were recorded based on the quantity of food or beverage reported and the corresponding energy contents. We calculated total calorie intake; calorie intake from beverage of a specific type (ie, diet