Research Article

Dietary Intake Contributions of Food and Beverages by Source and Food Security Status in US Adults

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ABSTRACT

Objective: To compare the consumption patterns and diet quality of foods and beverages obtained from various sources by food security status.

Design: Cross-sectional analysis of 2011–2012 National Health and Nutrition Examination Survey data.

Participants: A total of 4,789 adults (aged >19 years) with dietary intake and food security data.

Main Outcome Measures: The contribution of foods and beverages to energy, nutrients, and diet quality by locations where food was obtained was compared across food security status.

Analysis: Descriptive analysis and logistic regression.

Results: Almost all US adults consumed food and beverages obtained from grocery stores, regardless of food security status (about 95%), which accounted for one half to two thirds of total macronutrient intakes. The diet quality of foods from grocery stores was better in highly food-secure adults. Convenience stores are used most by very low food-secure adults; those foods had the poorest diet quality profile. Dietary patterns of marginally food-secure adults more closely resembled sources and intakes of low and very low food-secure adults.

Conclusions and Implications: Food-insecure adults use food sources differently, resulting in diet quality differences of foods and beverages obtained. Place-based interventions in the food environment may have differential effects by food security status.

Key Words: food security, food supplies, dietary intake, energy intake, adults (*J Nutr Educ Behav*. 2017;49:667-673.)

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INTRODUCTION

Food security is defined as all members of the household having access and resources to afford "enough food for an active, healthy life."[1] Despite recent economic improvements, food insecurity rates in the US have remained high, affecting 13% of US households.[2] At the same time, increasing policy attention have targeted the impact of the food environment on food insecurity.[3] The 2014 Agricultural Act[4] supported a $100 million Healthy Food Finance Initiative[5] to support new grocery stores in underserved neighborhoods to increase food security and foster access to food for an active, healthy life. Attempts to adapt policy to the food environment must address growing evidence that highlighted inequities in food store and restaurant access, with low-income, minority neighborhoods having a greater presence of convenience stores and fast-food restaurants and fewer full-service supermarkets.[6-9] Food environments that lack access to high-quality, low-cost healthy food were associated with poor mental and physical health outcomes, including higher rates of food insecurity and stress.[10]

Food insecurity affects dietary intakes, resulting in poorer overall diet quality.[11] Furthermore, food insecurity exists as a paradox. The resultant lack of access to affordable, nutritious foods increases the risk of malnutrition, whereas the dependence on low-cost foods to meet primal needs promotes the development of obesity.[12] Obesity among food-insecure and low-income populations is related to similar cultural challenges as faced by most Americans (eg, increasing screen time contributing to more sedentary lifestyles, increased portion sizes, greater reliance on fast/convenience foods). However, they face additional barriers to maintaining positive behaviors with limited fiscal resources.

One factors that affects low-income and food-insecure individuals' ability

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to obtain a balanced diet is that perishable, higher-quality foods may be less accessible and more expensive, and have greater potential for waste.[13] Much of the literature that examined the relationship between source and dietary patterns targeted differences in various outlets for children and the role of schools in supporting dietary intakes.[14,15] Drewnowski and Rehm[16] published the first representative article examining energy intakes by food sources across various life stages for the purposes of informing policy. Grocery, convenience, and specialty stores provide the majority of energy, with fast-food and full-service restaurants following. Additional research is needed to assess these patterns by food security status to address health disparities in the US that are related to source.

The sources people use to access food depends on many factors, including societal trends, demographics, and the food environment, and these sources can affect diet quality. For example, food purchased away from home continues to increase and is now 50.1% of overall food expenditures.[17] Purchases away from home are associated with poorer diet quality, although recent findings suggested that these increases over past few decades have plateaued.[18] Food source patterns for food-insecure families were related to sociodemographics, convenience, and location. For example, single parents purchased more fast food and low-income communities had a higher density of fast-food restaurants, especially near schools.[17,19,20] Frequent fast-food consumption is associated with dietary patterns rich in calories and low in nutrient density, contributing to obesogenic patterns.[21]

It is well established that low-income, minority neighborhoods have less access to supermarkets and supercenters that often have a greater variety and higher-quality and lower-priced goods, creating inequitable food environments.[6,22] Many low-income neighborhoods lack full-service grocery stores and farmers' markets supplying a diversity of nutrient-dense fruits, vegetables, whole grains, lean proteins, and low-fat dairy products.[22,23] Higher-income residents can compensate by using personal transportation to access healthy, low-cost food. For those without these resources, however, significant barriers prevent fresh produce purchases.[24-26] Residents without reliable transportation must rely on neighborhood convenience/corner stores where produce and perishable items are scarce or unavailable, or make trade-offs in time by finding alternative transportation.[27]

The current study compared the consumption patterns and diet quality of foods and beverages obtained from various sources by computing a Healthy Eating Index (HEI) score for these sources and then comparing HEIs across food security status. Because HEI is based on the US Dietary Guidelines for Americans,[28] there is a direct policy relevancy. The authors used these data to discuss implications for targeting food insecurity, overall dietary patterns, and the risk of nutrition-related chronic disease.

METHODS

Overview of Study

To assess the source of energy and select nutrients across food security status, the authors evaluated the food consumption patterns of 4,789 adults with complete household food security and dietary intake data from the 2011–2012 National Health and Nutrition Examination Survey (NHANES).[29] NHANES is a multistaged, stratified, nationally-representative sample of the non-institutionalized US population conducted by the Centers for Disease Control and Prevention (CDC) to assess the health and nutritional status of the US population. To enhance the assessment of underserved populations, racial and ethnic minorities, low-income, and the elderly are oversampled. The NHANES protocol was conducted under the Institution Review Board of the Centers for Disease Control and Prevention. Analysis of the deidentified public use data files does not constitute human subjects and is exempt.

Data Collection and Preparation

A trained interviewer collected personal and sociodemographic characteristics, including age, gender, race/ethnicity, and estimated annual household income, during the in-home interview as well as during the mobile examination center visit. Household food security status was assessed using the 18-item US Core Food Security Survey Module during the in-home interview.[1] The number of affirmative responses to items was used to determine the 4 levels of household food security status according to affirmative responses: highly food secure (HFS, 0), marginally food secure (MFS, 1–2), low food secure (LFS, 3–7), and very low food secure (VLFS, ≥8).

Dietary intakes were assessed from an in-person 24-hour dietary intake interview collected in the mobile examination center using the automated multiple-pass method to obtain the foods and beverages consumed and the source during the prior day. For all foods and beverages reported as consumed, participants provided the day, time, source where the food was obtained, whether it was consumed at home or away, and the name of the occasion on which it was eaten.

Sources of food provided by participants were recoded into 12 discrete categories for analysis. To assess the dietary quality of food and beverages obtained from each source, HEI-2010 scores were computed for each source using an aggregated sum of foods per participant using guidelines by Guenther et al.[30] These data were also used to identify each participant as a consumer of foods and beverages from each source.

Data Analysis

The proportion of adults obtaining food from each source was computed by food security status; in addition, odds ratios were computed, adjusted for age, gender, and race, to determine differences in likelihood of obtaining food from a source compared with those from highly food-secure households. Means and 95% confidence intervals were computed for the total HEI-2010 scores by food sources across levels of household food security status. The following formula was used to estimate the proportion of total intakes from the total day that were obtained from each food source:

$$\%\ \text{from source} = \frac{\Sigma(\textit{nutrient from source})}{\Sigma(\textit{nutrient from all sources})}$$

The sums were computed across the total sample for each level of food security status to evaluate the