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RESEARCH

Original Research

Relationship between Home Fruit and Vegetable Availability and Infant and Maternal Dietary Intake in African-American Families: Evidence from the Exhaustive Home Food Inventory

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ABSTRACT

Background The availability of foods in the home is likely to be related to consumption. We know of no studies that have reported this association in African-American participants, and few studies have examined home food availability using objective methods.

Objective This study aimed to assess the association between objective measures of fruits and vegetables in the home with reported infant and maternal diet in low-income African Americans.

Design A cross-sectional study design was used to compare food availability and dietary intake. The Exhaustive Home Food Availability Inventory used barcode scanning to measure food availability in the home. Maternal and infant diet was assessed by 24-hour recall.

Subjects/setting Eighty African-American first-time mother/infant dyads were recruited from Wake and Durham counties in North Carolina.

Statistical analyses performed Adjusted mean dietary intake of infants and mothers was calculated within tertiles of food and nutrient availability using analysis of variance. The bootstrap method was used to estimate *P* values and 95% confidence intervals. Models were adjusted for mother's age, household size, shopping and eating-out behavior.

Results Infants and mothers living in homes in the highest tertile of availability of energy, nutrients, and fruits and vegetables tended to have the highest consumption, respectively; however, statistically significant associations were more likely to occur with infant diet than maternal diet. The relationship was strongest for infant consumption of fruit, with an average of 103.3 g consumed by infants who lived in homes in the highest tertile of availability, compared to 42.5 g in those living in homes in the lowest tertile ($P<0.05$).

Conclusions Availability of fruits and vegetables in the home was associated with intake of those foods in a sample of African-American mothers and infants. Results support making changes in the home environment as a method of promoting changes in fruit and vegetable intake.

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There is growing evidence that the environment is an important cause of obesity (1-6). A "toxic" or "obesogenic" environment has been described as one that provides an almost unlimited convenient supply of highly palatable, energy-dense foods, coupled with conditions that encourage sedentary behaviors and discourage physical activity (4). Although meso- and macro-level environments, such as neighborhoods and communities (7), are undoubtedly important, micro-level environments, specifically the home (2,4,5,8,9), may have a more direct influence on behaviors that are critical to obesity development in young children (10). Social factors in the home environment that are hypothesized to influence children's diets include parents' eating habits and child-feeding practices (10-13). Physical influences have focused mainly on the availability of foods (in particular, fruits and vegetables [F/V]) in the home (3,14). Several studies examining the relationship between home food availability and diet have found that increased availability of certain foods is related to the consumption of those foods (9,14-24). The extensive work by Baranowski, Cullen, and others has demonstrated that home food availability/accessibility of F/V is related to child food consumption (3,14,21,22,25,26). This work has advanced our understanding of the dynamics between availability and in-

take, but is limited by its use of predefined checklists that assess only some of the foods in the home. Such a targeted data-collection method can reduce the burden for study staff and participants; however, it restricts the information gained. An exhaustive inventory of all foods in the home can provide data that allows investigators to describe the total amounts of foods and nutrients available and provides a denominator for other forms of assessments (eg, percentage of household energy available from F/V). Previous work of this exhaustive nature has also been conducted predominantly in the homes of white populations (14) and, to our knowledge, none have provided separate estimates for African Americans. Food selection is highly linked to culture, and it is likely that the foods in the home differ in ethnically and socially distinct households. Work is needed that examines different populations, particularly those known to be at higher risk for obesity. The purpose of this article is to describe the association between home food availability of F/V with infant and maternal diet in African-American homes using the Exhaustive Home Food Availability Inventory; an open inventory method of measuring all food in the home.

METHODS

Participants

Participants were recruited from those enrolled in The Infant Care Project, a longitudinal study of African-American first-time mother/infant dyads observed in their home environment (27-29). Participants in the Infant Care Project were recruited through clinics for the Supplemental Food Program for Women, Infant and Children in Wake and Durham counties in North Carolina. Consequently, all participants were below the poverty line. For the current study, we contacted 112 eligible mothers with 12- to 18-month-old infants and 80 (71%) agreed to participate. The study design included plans for three assessments in each household, each separated by approximately 2 months. All participants of the Infant Care Project were eligible to take part. However, because our goal was to perform repeated measures of the same household environment, we considered participants ineligible after a move to a new residence. Of the 80 participating households, 64 were successfully measured three times, 10 were measured twice, and 6 were measured once; in sum, producing 218 inventories. The main reason for not participating in the repeat assessments was change in residence. When multiple measures were available, the mean values were used for analyses. Participants were provided financial incentives for participating in the home food inventory research. This study was approved by the University of North Carolina public health institutional review board on research involving human subjects and all participants provided informed consent.

Home Food Availability Inventories

The Exhaustive Home Food Availability Inventory was used to measure all foods and beverages in participant homes. This is an observational measurement tool that uses scanning technology to record the presence and description of home food availability. Full details of the method have been described previously (30). In brief, researchers systematically scan barcodes of food and beverage items using a FoxPro data entry program (V6.0; The Sage Group$_{Plc}$, Newcastle upon Thyme, UK), which links Universal Product Code numbers to a reference database containing food identification and nutrient information. A commercially available database with 60,000 food items (Gregg London© 2011; http://www.glondon.com) was originally uploaded to serve as the basis for a reference database. The data entry program has the capacity to upload information when barcodes are not available, which permits exhaustive recording of all food items in the home. At the end of the study, approximately 8,400 new items were added to the database.

F/V included those that were fresh, dried, frozen, and canned or jarred, but excluded pickles. We generated our own generic barcodes to record foods that did not have a Universal Product Code barcode. These generic barcodes were linked to the nutrient reference database using nutrient composition information data from the US Department of Agriculture Standard Reference (31).

Dietary Intake

The 24-hour dietary intake records were collected for infant and mother using the Minnesota Nutrition Data System for Research (2005, University of Minnesota Nutrition Coordinating Center, Minneapolis); a Windows-based dietary analysis program designed for the collection and analysis of 24-hour dietary recalls. Recalls were performed by trained researchers with the mother reporting intake for her infant. Initial recalls were performed in person during a home visit and subsequent recalls were performed via telephone interviews.

Other Measurements

In addition to the food inventories, other measures were taken by trained staff during home assessments, including anthropometry and self-reported information on age, household size and composition, food-shopping behaviors, and frequency of eating out. Adult height was measured using a portable stadiometer to the nearest 0.5 cm. Infant recumbent length was measured using a portable rigid length board to the nearest 0.1 cm. Weight was measured on an electronic digital scale to the nearest 0.1 kg. The number, sex, and ages of all members of the household were obtained. Shopping behaviors were measured using three items that queried usual shopping frequency, number of days since last shop, and whether this was a large or small shop. Participants also reported the number of times per week that they usually consumed breakfast, lunch, dinner, and snacks outside the home. A weighted score was used to adjust for meal size, with 1.5 assigned to dinner/supper eaten outside the home and 1.0 assigned to all other meals, including snacks.

For analytic purposes, a weighted score was also created to indicate household size adjusted for differences in energy needs. Weights were defined using the age- and sex-appropriate energy intake from the Dietary Reference Intakes (32). For each household member, a value was created and expressed as a proportion of the energy