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Fresh produce consumption and the association between frequency of food shopping, car access, and distance to supermarkets

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ABSTRACT

Background. Fresh fruit and vegetables are important components of a healthy diet. Distance to a supermarket has been associated with the ability to access fresh produce.

Methods. A randomly sampled telephone survey was conducted with the main shopper for 3000 households in New Orleans, Louisiana in 2011. Individuals were asked where and how often they shopped for groceries, frequency of consumption of a variety of foods, and whether they had access to a car. Bivariate models assessed the relationship between four outcomes: car access, distance to the store patronized by the respondent, number of monthly shopping trips, and daily servings of produce. Structural equation modeling (SEM) was used to distinguish direct and indirect effects.

Results. In bivariate models, car access was positively associated with number of shopping trips and produce consumption while distance was inversely associated with shopping trips. In SEM models, produce consumption was not associated with car access or distance, but to the number of monthly shopping trips.

Conclusion. The frequency of shopping is associated with car access but a further distance deters it. Access to stores closer to the shopper may promote more frequent shopping and consumption of produce.

Introduction

Fresh fruit and vegetables, having low energy density and high fiber content, are important components of a healthy diet and are associated with reduced chronic diseases and optimal weight management (Hung et al., 2004; Serdula et al., 1996; Joint WHO/FAO Expert Consultation on Diet, 2002; Guidelines Advisory Committee, 2010; Winkleby & Cubbin, 2004; Yao & Roberts, 2001; Rolls et al., 2004).

Individual consumption of fresh fruit and vegetables is dependent upon both the availability of produce in the consumer environment and personal and household characteristics. Factors known to be associated with fruit and vegetable consumption include age, gender, race, education level, income, and household size/children in the household (Casagrande et al., 2007; Tamers et al., 2009; Kimmons et al., 2009; Laforge et al., 1994).

Car ownership or access may be another important factor to consider when exploring the relationship between access to healthy food and consumption of fruit and vegetables. This is a particularly important concern for low-income households which may have less car availability and, therefore, greater challenges for making healthy food purchases (Caraher et al., 1998). Findings from a study in Glasgow, Scotland, suggested that, for those households without car access compared to households with car access, proximity to a supermarket had a stronger association with increased fruit consumption (Thornton et al., 2012). Low-income residents in Austin, Texas, identified constraints related to food purchasing (specifically time and money) as particularly strong for those lacking vehicle access (Clifton, 2004). Additionally, lack of transportation has been identified as a common barrier for purchasing fruit and vegetables, particularly for older adults and those without cars (Haynes-Maslow et al., 2013).

Some evidence has accumulated around the association between distance to food stores, availability and consumption of fresh produce. Previous research in New Orleans, Louisiana, found a significant positive association between shelf space dedicated to fresh vegetables in

Abbreviations: SEM, structural equation modeling; BRFSS, Behavioral Risk Factors Surveillance System; BMI, body mass index.

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neighborhood stores and resident consumption of fresh vegetables (Bodor et al., 2008). A positive association between access to supermarkets and fruit consumption was found among participants of the National Food Stamp Program (Rose & Richards, 2004). Fruit and vegetable consumption was higher among residents with a large grocery store in their neighborhood compared to those without such a store and higher among residents with increased supermarket density in the residential census tract compared to those with lower supermarket density (Zenk et al., 2013; Morland et al., 2002). Much of this previous research, however, considers the distance to the closest food retail outlet instead of the distance to the food retail outlets actually patronized by neighborhood residents. Drewnoswski et al. found that only 14% of participants in a population-based study in Seattle, Washington shopped at their closest supermarket (Drewnoswki et al., 2012).

New Orleans has documented food access issues with many neighborhoods across the city that are considered food deserts and food swamps as well as a history of racial disparities in access to supermarkets (Rose et al., 2009, 2011). Areas are considered food deserts if they are low-income and far from a supermarket (USDA, 2014). Food swamps often exist in food deserts and are areas with an abundance of unhealthy foods (Rose et al., 2009). Considering that New Orleans has a median income well below national levels (New Orleans: $44,379; US: $ 51,371) (US Census Bureau, 2012) many low-income individuals without car access may face multiple barriers to shopping in areas where supermarkets are located and be constrained to shopping at those stores located closest to them geographically.

As supermarkets offer the most shelf space devoted to fresh fruit and vegetables compared to other types of stores, it is assumed that shopping at a supermarket would provide the best opportunity for purchase and then consumption of fresh produce (Farley et al., 2009). Because canned and frozen produce can last much longer than fresh produce, frequency of shopping is more likely to influence the household availability of fresh produce. Given the potential importance of car access to supermarket access and thereby fresh produce, we hypothesized that personal and household characteristics would be related to consumption of fresh produce through car access, distance to patronized store, and frequency of shopping (See Fig. 1). Individuals with access to a car may consume more fresh produce because they can more easily access supermarkets. We aim to examine the potential for mediating effects of car access, frequency of shopping and distance on consumption of fresh produce.

Materials and methods

Sampling and survey tool

A randomly sampled, address-based telephone survey of households in Orleans Parish, Louisiana was conducted with the household's main grocery shopper in 2011. The sample of households was obtained from Survey Sampling International and included information on randomly drawn residential addresses registered with the US Postal Service and matched to telephone numbers. The Wolfgang Frese Survey Research Laboratory at Mississippi State University conducted the survey (The Wolfgang Frese Survey Research Laboratory). Telephone numbers were dialed a maximum of eight times before being retired and followed a call schedule similar to the Behavioral Risk Factors Surveillance System (BRFSS) (Centers for Disease Control and Prevention, 2005). All study protocols and procedures were approved by the Tulane Institutional Review Board. All respondents provided oral consent prior to answering the survey questions.

The interview was approximately 15 min and addressed where and how often the respondent shopped for groceries. Specific information included the store name and location where the respondent shopped for food, number of shopping trips made per month and mode of transportation to the store. Eating habits were assessed in terms of daily, weekly, monthly, or yearly frequency of consumption of fresh, canned and frozen fruits and vegetables, chips and salty snacks, candy, pastries, sweet baked goods, diet and regular carbonated drinks and fast food. The consumption questions were modeled after the BRFSS question structure (Centers for Disease Control and Prevention (CDC), 2011). Reported amounts were calculated in terms of daily servings for analysis where one time of consumption is considered one serving. Additional variables included car ownership and car access (yes/no), education (years), gender (females coded 1; males coded 0), food assistance (yes/no), marital status (married/cohabitating or other), race (African American or other), number of children in household (none or one or more), and household size (total number of children and adults). Questions were from a previous study in New Orleans by the lead author (Gustat et al., 2012). Respondents indicated the income category that best described their annual household income and for analysis, the midpoint of the chosen category was used as a continuous variable. Self-reported weight and height were used to calculate body mass index (BMI) (kg/m^2). Respondent addresses and store locations were geocoded using ArcGIS 10 (ESRI, Redlands, CA). Driving distance from residence to patronized store was derived using the ArcGIS Network Analyst Extension (ESRI & ArcGIS; Charreire et al., 2010).

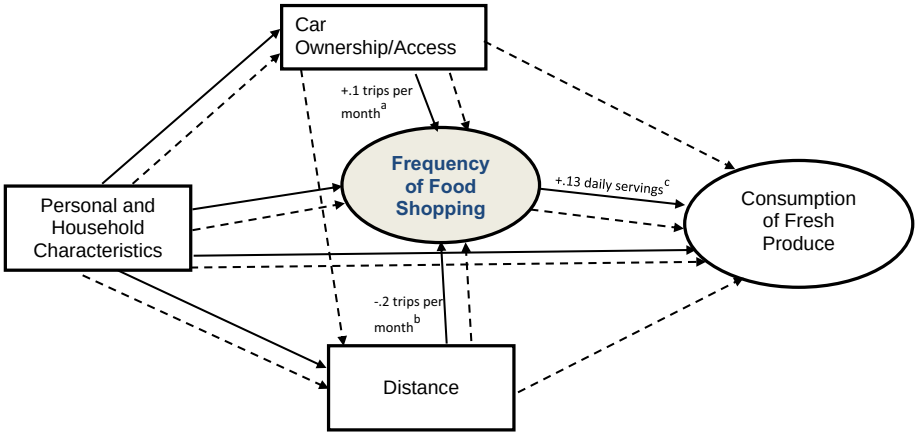

Fig. 1. Relationship between personal and household characteristics, car access, distance, frequency of food shopping and consumption of fresh produce; New Orleans, Louisiana, 2011. Dashed arrows represent hypothesized relationships; solid arrows represent observed relationships. [a]Car ownership/access was associated with an increase in 0.1 shopping trips per month. [b]Increased distance was associated with a decrease of 0.2 shopping trips per month. [c]Each additional shopping trip was associated with an increase of 0.13 servings of fresh produce per day.