



Examining the role of residential segregation in explaining racial/ethnic gaps in spending on fruit and vegetables



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ABSTRACT

The present study used nationally-representative data from the U.S. Consumer Expenditure Survey (CE) merged with census-track data from the 2010 United States Census to model racial/ethnic disparities in spending on fresh and processed fruit and vegetables as a function of residential racial/ethnic segregation, income, household size and structure, educational attainment, marital status, age and sex. Results indicate that, in the absence of any controls, African-Americans and Hispanics tend to spend less on vegetables than non-Hispanic whites. Compared to non-Hispanic whites, African-Americans are also found to spend less on fruit. The initial analysis also shows that Hispanics spend more on fresh fruit compared to whites and blacks. However, after controlling for socio-economic status, marital status, age, sex (individual-level predictors) and residential racial/ethnic segregation (neighborhood-level predictor), racial/ethnic disparities in the spending on fruit and vegetable become insignificant. We also found that racial/ethnic segregation has a strong and negative effect on the expenditure on fruit and vegetables.

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1. Introduction

Obesity is a growing, public health concern in the United States because of its high prevalence and role in many chronic conditions (Ogden, Carroll, Kit, & Flegal, 2014; Wang & Beydoun, 2007). More than a third of U.S. adults are obese and 14% have moderate to severe obesity with a body mass index (BMI) of 35 or greater (Flegal, Carroll, Kit, & Ogden, 2012). Abundant research shows that the lack of access to healthy foods is a major contributor to the country's growing obesity epidemic (e.g., Block & Kouba, 2006; Wang & Beydoun, 2007; Zhang & Wang, 2004). Healthy food cost is a significant barrier to the adoption of better diets, especially by low-income households (Drewnowski & Darmon, 2005; Frazão, Meade, & Regmi, 2008; Mozaffarian, Hao, Rimm, Willett, & Hu, 2011; Zhang & Wang, 2004). However, income and prices are not the only factors that determine consumption of healthy foods, such as fruit and vegetables. A growing body of evidence indicates that health disparities in nutrition are attributable not only to social class, but also to race/ethnicity (Wang & Beydoun, 2007; Zhang & Wang, 2004).

Racial/ethnic gaps in the dietary behavior are well established (Dubowitz et al., 2008; Lorson, Melgar-Quinonez, & Taylor, 2009; Zenk et al., 2005). Prior research have reported poorer nutritional intake among African Americans and Hispanics compared with

non-Hispanic whites (Gooding, Walls, & Richmond, 2012; Subramanian, Acevedo-Garcia, & Osypuk, 2005). Particularly, several studies conducted on adults as well as children and adolescents have found differences in fruit and vegetable intake among the U.S. major between the racial/ethnic groups (Urrutia-Rojas et al., 2008; Zenk et al., 2005). It has been argued that lower consumption of fruit and vegetables among racial/ethnic minorities, as compared to non-Hispanic whites, is a contributing factor to the racial disparities in health (Centers for Disease Control and Prevention, 2007; Zenk et al., 2005).

Building on this line of research, the present study models racial/ethnic health disparities in fruit and vegetable expenditure as a function of not only individual characteristics but also neighborhood racial/ethnic segregation. Residential segregation is a fundamental cause of racial/ethnic health disparities (Bower, Thorpe, Rohde, & Gaskin, 2014; Chang, 2006; Kershaw, Albrecht, & Carnethon, 2013). It has been documented that racial/ethnic segregation affects nutrition through the quantity and quality of food stores in the area, which, in turn, determine access to nutritious foods and the availability and affordability of fresh produce (Chang, 2006; Kwate, 2008; Yi, Ruff, Jung, & Waddell, 2014).

The aim of the present study is to contribute to the literature on health disparities in several important ways. First, this study is among the few to focus on expenditure on fruit and vegetables and not on their intake. From an economic point of view, fruit and

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vegetables intake may not be the best proxy for the quality of produce (Block & Kouba, 2006; Drewnowski & Darmon, 2005). Moreover, prior research (Frazão et al., 2008; Lin, Ver Ploeg, Kasteridis, & Yen, 2014) has found a moderately positive relationship between price and quality of fruit and vegetables. Second, unlike earlier studies (e.g., Dubowitz et al., 2008; Gordon-Larsen, Harris, Ward, & Popkin, 2003; Pearson, Russell, Campbell, & Barker, 2005), we differentiate between spending on fresh and processed fruit and vegetables. This distinction is important because prior research has documented that processed fruit and vegetables tend to have higher contents of added sugar, salt and other preservatives than fresh fruit and vegetables (Rickman, Barrett, & Bruhn, 2007). Emphasizing the key nutrients in fresh vegetables and fruit, it is enough to say that diets rich in fresh fruit and vegetables are associated with a lower risk of some of the main causes of morbidity, including obesity (Dubowitz et al., 2008; Gordon-Larsen et al., 2003). Third, we used the most recent data from the Consumer Expenditure Survey (CE) merged with tract-level data from the 2010 United States Census. This allowed us to conduct multilevel hierarchical analyses of the relationship between neighborhood racial/ethnic segregation (level-2 factor) and the expenditure on fruit and vegetables, while controlling for household's socioeconomic background and other level-1 variables. Finally, our large sample size – 58,547 households – provides ample statistical power to detect racial/ethnic differences in the expenditure on fruit and vegetables attributable to neighborhood racial/ethnic segregation.

2. Racial/ethnic gaps in access to healthy foods

Evidence abounds that living in a racially/ethnically segregated neighborhood is an important risk factor limiting life chances of individuals (Bower et al., 2014; Kershaw et al., 2013). In order to maintain the subordinate status of a minority group vis-à-vis a majority group, a majority group uses segregation as a means of hampering upward social mobility of minority group members (Thomas & Moye, 2015; Williams & Jackson, 2005). As a result, living a predominantly minority neighborhood is often means living in poverty. Not only do residents in segregated neighborhoods face reduced opportunities for upward social mobility, but they also have inferior public services, higher rates of crimes, lower quality schools, etc. (Corral et al., 2015; Kershaw et al., 2013).

One of the features of segregated neighborhood that has a direct impact on the health of its inhabitants – access to healthy foods (Kwate, 2008; Morland, Wing, Roux, & Poole, 2002; Ryabov, 2012). Some researchers (White & Borrell, 2011; Williams & Mohammed, 2009) claim that racial/ethnic disparities in some chronic and preventable diseases like type-2 diabetes and hypertension reflect, in part, the legacy of racial/ethnic segregation which limits access to healthy foods. Indeed, earlier studies have noted that segregated communities are unable to meet their residents' dietary needs (Lorson et al., 2009; Story, Kaphingst, Robinson-O'Brien, & Glanz, 2008) because of a high concentration of fast food outlets (Morland & Evenson, 2009; Morland & Filomena, 2007; Wang, Kim, Gonzalez, MacLeod, & Winkleby, 2007) and a lack of community safety, after adjusting for outdoor physical activities (Kipke et al., 2007; Smith et al., 2011). Growing evidence support the existence of “food deserts,” areas characterized by higher levels of poverty and food insecurity where hunger and obesity co-exist side-by-side (Cummins & Macintyre, 2006; Morland et al., 2002; White & Borrell, 2011). On the consumer side, “food deserts” are characterized by high consumption of low-cost energy dense foods and lower intakes of fruit and vegetables (Acevedo-Garcia, Lochner, Osypuk, & Subramanian, 2003; Pearson et al., 2005).

Although there is limited literature on this topic of obesity and

community context (Chang, 2006; Dubowitz et al., 2008; Lorson et al., 2009), the relationship between racial/ethnic segregation and the expenditure on fruit and vegetable has drawn little attention. As an attempt to fill this gap in the literature, the present study models racial/ethnic disparities in fruit and vegetable consumption using multilevel regression whereby the socio-demographic effects at the individual level are nested at the neighborhood level. This technique can give us a better understanding of the relationship between racial/ethnic segregation as a neighborhood-level factor and fruit and vegetable consumption as an individual-level variable.

3. Methods

3.1. Data and sample

The data used in this study are from the U.S. Consumer Expenditure Survey (CE) which is known among researchers for its detailed coverage of households' expenditure. The CE provides detailed and extensive data on consumption expenditure, income, socioeconomic, and demographic characteristics of a large rotating sample of American households. The CE is an ongoing nationally representative survey of the non-institutionalized, civilian population. It is a rotating panel study surveying about 7000 American consumer units each quarter. The CE consists of two independent components, the quarterly interview survey and the weekly diary survey. The interview covers large monthly out-of-pocket expenditures such as housing, apparel, transportation, health care, etc. Each consumer unit is interviewed about once per quarter for five consecutive quarters. The interview survey is designed to capture expenditure data that respondents can reasonably recall for a period of 3 months or longer. The information on fruit and vegetable consumption comes from the diary survey which includes weekly expenditures of frequently purchased items such as food and beverages. Details of the survey methodology are available elsewhere (The U.S. Bureau of Labor Statistics, 2012). We chose to combine CE data over a 10 year (2002–2012) period due to the following two reasons. First, due to price fluctuations (it is the well-known feature of the business cycle that food prices, and the prices of perishable items generally, are subject to wider fluctuations than the prices of manufactured products), households tend to spend less on fruit and vegetables during the recession (Weatherspoon et al., 2013). Previous research found that, as a result of the recent recession and its aftermath (2008–2010), food choices and diet quality were significantly influenced by increasing food costs (Miller & Branscum, 2012). Therefore, knowing that expenditure patterns change over time, we combined CE data over a 10 year period in order to minimize the business cycle effect. Second, and not least important, this approach allows to create a synthetic longitudinal sample with sufficient amount of data to make statistically significant inferences about spending on fruit and vegetables.

Our sample consisted of a total of 58,547 households. There were 44,239 non-Hispanic white (hereafter referred to as “white”; reference) households, 8014 non-Hispanic black (hereafter referred to as “black”), households, and 6294 Hispanic households. It is worth noting that we do not report results for Asian households which comprise approximately 3.8% of all CE sample because our auxiliary analyses (not shown for parsimony) found no significant differences between Asian and white households in the expenditures on fruit and vegetables. Descriptive statistics for the sample, by race/ethnicity, are provided in Table 1.

The CE geocode files record each household's census tract and metropolitan area of residence. Using this information, we appended to each household's data record information describing the

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