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Eating Behaviors and Social Capital are Associated with Fruit and Vegetable Intake Among Rural Adults

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Abstract

Few studies have focused on determinants of fruit and vegetable intake in rural areas. This study examined the relationship between demographics, socioeconomic status, social capital, eating behaviors, and fruit and vegetable intake for a large rural sample. Data from 1220 rural adults participating in the 2006 Brazos Valley Community Health Assessment Survey were used. Multivariable regression results demonstrated eating a regular breakfast (p-value ≤ 0.001) was positively and drinking sugar-sweetened beverages (p-value = 0.010) was negatively associated with fruit and vegetable intake. Being female, older, and having higher levels of education and social capital were associated with consuming more fruit and vegetables. This analysis provides evidence that contextual aspects are important for understanding fruit and vegetable intake in rural areas.

Keywords

fruit and vegetable intakes; fast food; sugar-sweetened beverages; breakfast; social capital; rural adults

Introduction

The consumption of sufficient amounts of fruit and vegetables underpins an overall healthy diet. Increased consumption of fruit and vegetables has been shown to reduce the risk for several major chronic diseases such as cancer,[1] diabetes[2] and heart disease.[3–5] In addition, diets consisting of more nutrient-rich foods such as fruits are associated with lower body weight, less weight gain, and reduced obesity rates.[6–8] Prior studies have identified a variety of determinants associated with fruit and vegetable consumption[9] including individual demographic and socioeconomic factors (e.g. age, gender, education and income),

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[10, 11] eating behaviors,[12] environmental and social influences, including access to healthy foods[13–15] and social capital.[10, 16, 17]

Social capital is considered to be a social resource[18–20] that provides social support[17] and benefits.[21] According to Bourdieu, social capital is defined as "the aggregate of the actual or potential resources which are linked to possession of a durable network of more or less institutionalized relationships of mutual acquaintance and recognition.[22] Portes explained how social capital functions in three ways: as a normative influence, as a source of familial and extrafamilial social support.[23]

Research finds that stronger social networks and social norms contributed to a greater change in fruit and vegetable consumption;[16] and individuals with more social support had healthier diets.[24] An intervention measured the influence of social context (e.g. social support and social capital) on fruit and vegetable consumption and found social ties and social norms to be important.[16] Poortinga found a relationship between social support, social capital and daily fruit and vegetable consumption.[17] Individuals who were lacking in social support were less likely to consume at least five servings daily. Analysis demonstrated individuals with higher levels of social capital on the community level were more likely to consume two to five servings of fruit and vegetables daily. Both social capital and fruit and vegetable intake had positive and significant effects on self-rated health.[17]

Most Americans do not achieve the recommended levels of fruit and vegetable intake.[25–27] In rural areas, individuals also are not meeting the recommendations for fruit and vegetable intake[28–32] and consuming even fewer servings than the national average.[33] Approximately 20% of the American population resides in rural areas.[34] However, few U.S. studies have focused on eating behaviors for rural residents[24, 35] or the determinants of fruit and vegetable consumption in small-town, rural areas or rural agricultural communities.[29, 30, 32, 36–38] Research findings indicate that a higher frequency of sugar-sweetened beverage consumption among rural residents was associated with a higher body mass index (BMI).[35] Results from a study of rural adolescents found an association between a higher Healthy Eating Index (HEI) score and higher levels of social support; the HEI incorporated items for fruit and vegetable, fast food, and soda consumption.[24]

The classification of rural areas across a Rural-Urban continuum of six categories recognizes the complexity of rurality.[38] The official U.S. Census Bureau defines rural areas as areas with fewer than 2500 residents.[39] Generally, food sources are not evenly distributed in many rural areas, where residents experience loss of grocery stores and greater travel distances to obtain food.[40, 41] Rural areas are unique and require targeted research and interventions to address health disparities.[42] Many rural areas are geographically isolated; rural residents typically are poorer, less educated, older, and have lower access to health care services than those living in urban areas.[31, 42]

In addition, social factors, such as social support and social capital, have been identified as determinants for health in rural areas.[43–45] Studies show social capital[36, 46] and fruit and vegetable consumption[47–50] vary between rural and urban areas, and variations in social capital may contribute to differences in fruit and vegetable intake between rural and urban areas. We identified no studies that considered individual and contextual factors (e.g. social capital, additional eating behaviors) as influences on fruit and vegetable intake for individuals living in rural areas. This analysis uses an ecological perspective to consider individual level influences such as healthy and unhealthy eating behaviors and socioeconomic characteristics and influences of the social environment conceptualized as social capital (see Figure 1). Thus, the purpose of this paper is to simultaneously examine demographic and socioeconomic characteristics, social capital, and eating behaviors to

understand their association with fruit and vegetable consumption in a large sample of rural adults.

Methods

Sample and Study Design

This study used data from adult participants in the 2006 Brazos Valley Health Assessment (BVHA) who resided in one of the six rural counties in the Brazos Valley region of Texas. The BVHA was developed through a collaboration among local and regional academic and community-based organizations for the following purposes: to identify factors influencing health status, to recognize health-related issues and needs of the local community, to locate resources within the region, and finally, to produce a source of reliable information that may be utilized in developing effective solutions to identified health-related problems.[51] Approximately 3500 respondents were identified with a response rate of 73.8% (2584 respondents). More than 1500 adults (18.7% minority, 73% female, and 13.9% with less than a high school education) who resided in the six rural counties were recruited for the BVHA by a professional independent survey research firm into a large community assessment through random digit dialing and follow-up mailed survey; detailed methodology has been previously described.[51, 52] Within a subsample of rural adults (n = 1625), 1220 respondents had complete responses for demographic and sociodemographic characteristics, social capital, and nutrition items. These responses were retained for the analytic sample (n = 1220). The Texas A&M University Institutional Review board approved the study protocol and all participants provided written informed consent.

Measures

Fruit and vegetable intake—Fruit and vegetable intakes were separately measured by a validated, self-reported two-item screener.[53, 54] One item asked participants to report the number of servings of fruit (1/2 cup of fruit or 3/4 cup fruit juice) usually consumed each day; the second item targeted the number of servings of vegetables (1/2 cup cooked or 1 cup raw) consumed daily. A combined fruit and vegetable intake variable was calculated as the total of both fruit and vegetable intakes. This summed measure was constructed as the chief dependent variable because an increase in combined fruit and vegetable intake is a common goal among interventions.[55] Furthermore, many public health recommendations combine fruit and vegetable intake.[56–58]

Eating behaviors—Eating behaviors were selected based on prior community-based work in North Carolina and included consumption of fast food, sugar-sweetened beverages, and breakfast meals.[59, 60] Weekly fast food consumption ("How many times a week do you eat fast food meals?"), daily sugar-sweetened beverage consumption ("How many cans of regular soda (not diet) or glasses of sweet tea do you drink on an average day?"), and weekly consumption of regular breakfasts ("How many days a week do you eat a regular breakfast meal?") were determined from the mailed survey.

Social capital—A standardized social capital index was created from survey items originally developed by Burdine *et al.*[61] using an iterated principal factor method (Release 11, 2010 Stata Statistical Software, College Station, TX). This scale focuses on the extrafamilial dimension of social capital as identified by Portes.[23] Previously, this scale has only been used for analytic purposes in the context of this health assessment and a dissertation.[62] Respondents were asked to rate six items on a five point scale: "Strongly Agree" to "Strongly Disagree." The first item was a positive statement, followed by five negative statements. The first item was reverse coded for the following index construction. Factor loadings for the social capital items are in parentheses: "If there is a problem in my

community, the people who live here work together to get it resolved (0.59). People in the community where I live are only out for themselves (0.73). I am afraid when I am out alone after dark in my community (0.42). In my community, a small group of people have all the power (0.66). I feel like an outsider in my community (0.72). There is nothing I can do to solve problems in my community when they happen (0.72).” The eigenvalue for one factor was 2.5. Chronbach’s α was 0.79, indicating the index had a good internal consistency. A social capital index was developed by dividing the score by the square of the eigenvalue. A three level categorical index was constructed based on the quartile distribution: high social capital (lowest quartile), medium social capital (middle two quartiles), and low social capital (highest quartile).63

Demographic and socioeconomic characteristics—The BVHA provided data on age, gender, household income, highest level of education completed, marital status, household composition, length of residence in the same county, and employment status.

Statistical analysis

STATA version 11 was used to generate descriptive statistics and linear regression models; $p < 0.05$ was considered statistically significant. Descriptive statistics were estimated for demographic and socioeconomic status (SES) items; social capital; daily fruit and vegetable intake; weekly fast food consumption; daily sugar-sweetened beverage consumption; and weekly consumption of regular breakfast meals.

The analysis process included determining bivariate correlations between the dependent variable, fruit and vegetable intake, and SES variables, social capital, and other eating behaviors in addition to building a multivariate regression model. Correlations between individual and environmental determinants and intake were calculated using X^2 statistics. For the regression model, variables that were associated with fruit and vegetable intake were included. Backward elimination was used to create the multivariate linear regression model used to describe the relationship of demographics and SES, social capital, and eating behaviors with fruit and vegetable intake.

Results

Sample characteristics

Sample characteristics are presented in Table 1. Rural respondents ranged in age from 18 to 90 years ($n = 1220$). Most respondents were women. Approximately 18% of the sample was below the poverty level. This value falls within the 14 to 22% range for poverty level reported in 2006 for rural counties in the Brazos Valley.64 Approximately 17% were low income. Non-Hispanic whites composed approximately 81% of the respondents. This value is higher than the 57 to 77% range reported in 2008 for the rural counties of the Brazos Valley.[64] Approximately 48% of respondents over the age of 25 had completed high school (data not shown). This value falls below the 67 to 74% range reported in 2000 for rural counties in the Brazos Valley.[64] Overall, the BVHA respondents did not consume the recommended five to nine servings of fruit and vegetables. More than 35% consumed less than three servings of fruit and vegetables per day. In addition, approximately 35% of respondents in rural areas consumed at least two sugar-sweetened beverages, including non-diet soda and sweet tea, daily. Approximately 74% consumed fast food at least once per week, ranging from one to five occurrences. Regular breakfasts were consumed at least once per week by roughly 81% of respondents, ranging from one to five breakfasts per week.

Multivariable regression models of fruit and vegetable intake

Results of the regression model are shown in Table 2. Age, gender, and education were statistically significant in the model for intake of fruit and vegetables among rural residents. Age was positively associated with fruit and vegetable intake, with older respondents consuming greater amounts of fruit and vegetables, though intakes fell below recommended levels. Being a woman or having completed more education levels was associated with greater fruit and vegetable consumption. Social capital was also statistically significant. Respondents reporting higher levels of higher social capital consumed more fruit and vegetables. Lower fruit and vegetable intake was associated with more frequent daily sugar-sweetened beverage consumption, though this relationship was relatively weak. Conversely, eating a regular breakfast was strongly associated with increased fruit and vegetable intake. Fast food consumption was not significant in this analysis of fruit and vegetable intake.

Discussion

Rural residents, and Americans in general, are not meeting recommendations for consumption of fruit and vegetables,[25–27, 33] but only a limited number of studies have focused on the determinants of fruit and vegetable consumption areas among rural adults.[29, 30, 36] This study examined the influence of demographics, socioeconomic status, social capital, and eating behaviors on fruit and vegetable consumption for a large rural sample to contribute new findings to the literature on fruit and vegetable intake. Evidence from this study indicates that fruit and vegetable consumption is better understood in context with the consideration of other eating behaviors. Specifically, these results indicate eating a regular breakfast increased consumption of fruit and vegetables, while consumption of sugar-sweetened beverages decreased fruit and vegetable intake.

This analysis found eating a regular breakfast was significantly associated with fruit and vegetable intake and suggests consumption of fruit and vegetables is part of an overall healthy diet, including eating regular breakfasts. The nutrition literature demonstrates regular breakfast consumption, especially of breakfast cereals, promotes better nutrition and healthy weight.[65] Additional research shows individuals who eat more fruit and vegetables engage in other healthy behaviors, such as exercise and not smoking,[66, 67] and a Swedish study demonstrates having an irregular breakfast is related to other unhealthy behaviors such as eating fewer fruits and vegetables, drinking more soft drinks, and smoking.[68]

For unhealthy eating behaviors, results indicate a negative association between both weekly fast food consumption, daily consumption of sugar-sweetened beverages and fruit and vegetable intake. Analysis showed the relationship between drinking sugar-sweetened beverages and eating fruit and vegetables to be statistically significant. However, after controlling for sugar-sweetened beverage consumption, fast food was not an influence on fruit and vegetable intake. Both coefficients for the two unhealthy eating behaviors were relatively small. Other studies also suggest a possible displacement of healthier foods, including fruit and vegetables, as the intake of unhealthy foods, such as fast food and non-diet soft drinks, increases.[69–71]

The importance of individual, social, and contextual factors to understanding fruit and vegetable consumption is supported by other studies.[9] This analysis illustrates how individual determinants such as age, gender, and education, are associated with consumption of fruit and vegetables. Results indicated income had a negative relationship with fruit and vegetable consumption, though in the model, education displaced income as a significant covariate. Several studies have shown similar findings for being female and older[25, 57, 72] and better educated.[27, 73, 74] Although neither income level was significantly associated with fruit and vegetable intake, there was a more pronounced relationship between being

lower income and eating fewer fruits and vegetables. Research indicates individuals who are low income have more food insecurity than those at poverty level who can access food and nutrition assistance resources.[75]

In addition, social capital was statistically significant in the model as an influence on fruit and vegetable intake. Two studies discussed the importance of the social environment on fruit and vegetable intake and provided some evidence indicating a positive relationship between either social support or social capital and fruit and vegetable intake.[16, 17] However, only one of these studies produced significant findings for the positive influence of social capital on consuming at least five servings of fruit and vegetables a day.[17] This analysis found social capital to be a highly significant influence on fruit and vegetable intake which further distinguishes these findings. Social capital represents a social resource that arises from the collective social functioning of a specific social context.[18–20] It is possible these measures of social capital indicate the level of social support[17] and benefits accruing from social support[21] that influence fruit and vegetable consumption. These results are supported by previous work showing a positive association between social capital and fruit and vegetable intake.[16, 17]

Although this study contributes new knowledge, it is worth noting a few limitations in this analysis. Recruitment efforts sought a representative sample for the Brazos Valley population; however, the analytical sample was over-represented in terms of age, gender, ethnicity and education. For example, rural respondents were older than the average age of adults living in Brazos Valley. Also, the population is roughly 50% women, while our sample was almost 75% women. Both racial minorities and high school graduates were underrepresented in our sample. The underrepresentation of minority groups may explain the absence of any significant association between racial category and fruit and vegetable intake. Furthermore, the underrepresentation of high school graduates may impact our estimates of the role of education in fruit and vegetable intake. Due to the cross-sectional nature of the data, causality cannot be inferred. No claims can be made suggesting that individual, environmental or behavioral determinants cause individuals to eat more or less fruit and vegetables. In addition, eating behavior data were collected using a self-report, self-administered method and as a result, there may be measurement error. There were limitations in the questions on eating behaviors. For example, definitions were not provided for fast food and regular breakfast meal; and the question on sugar-sweetened beverages did not specifically mention sugar-sweetened beverages in addition to regular soda and sweet tea.

Conclusions & Applications

Notwithstanding the limitations, this study contributes unique findings related to fruit and vegetable consumption in rural areas, specifically how other healthy and unhealthy behaviors influence intake. Results provide additional context for understanding fruit and vegetable intake and should be considered in efforts to improve nutrition and health in rural areas.

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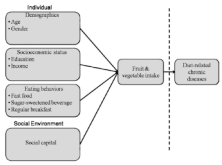

Figure 1.
Conceptual model for relationships between determinants and fruit and vegetable intake

Table 1

Characteristics of rural respondents in 2006 Brazos Valley Health Assessment (n = 1220)

Variable		
Demographics	**Mean ± SD**[a]	**% (n)**
Age (years)	54.8 ± 15.2	
Gender: % women		74.7 (912)
Minority: % White, non-Hispanic		81.2 (984)
Socioeconomic status		
Education (years completed)	12.9 ± 1.9	
Income[b]		
Poverty (≤100% FPL)		17.8 (217)
Low Income (101%–199% FPL)		17.2 (210)
Social Environment		
Social capital	2.00 ± 0.45	
Eating behaviors		
Fast food intake (frequency/week)	1.36 ± 1.13	
Sugar-sweetened beverages intake (servings/day)	1.16 ± 1.34	
Regular breakfast intake (frequency/week)	2.74 ± 1.85	
Daily fruit & vegetable intake (servings)		
Fruit	1.24 ± 0.96	
Vegetables	1.97 ± 0.91	
Combined F&V[c]	3.21 ± 1.57	

[a] SD=Standard deviation

[b] FPL=Federal Poverty Level

[c] F&V=Fruit and vegetable

Table 2

Results from multivariate regression model correlating total intake of fruit and vegetables with demographics, socioeconomic status, social capital, and eating behaviors

Variable	Rural
	Coef. (SE)[a]
Demographics	
Age	0.007* (0.003)
Gender	0.383*** (0.096)
Socioeconomic status	
Education	0.084*** (0.022)
Income[b]	
Poverty	−0.081 (0.115)
Low Income	−0.193 (0.113)
Social Environment	
Social capital	0.410*** (0.096)
Eating Behaviors	
Fast food	−0.066 (0.038)
Sugar-sweetened beverages	−0.085* (0.033)
Regular breakfast	0.255*** (0.023)
Adjusted R^2 of model	0.187
Prob. > F	0.0000
n	1220

[a] SE=standard error.

[b] Referent category: ≥200% Federal Poverty Level.

* significant at p<0.05,

** significant at p<0.010,

*** significant at p<0.001.