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What does a person's eating identity add to environmental influences on fruit and vegetable intake?

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Abstract

Objective—To evaluate whether knowledge of a person's eating identity (EI) can explain any additional variation in fruit and vegetable intake above and beyond that explained by food environment characteristics, perceptions of the food environment, and shopping behaviors.

Design—Cross-sectional study

Setting—A total of 968 adults were recruited for a telephone survey by the Survey Research Laboratory in an eight-county region in South Carolina.

Subjects—The survey queried information on shopping behaviors, perceptions of the food environment, demographic and address information, fruit and vegetable intake, and EI. EI was assessed using the Eating Identity Type Inventory, a 12-item instrument that differentiates four

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Conflicts of Interest
There are no conflicts of interest to disclose.

Authorship
X.M. wrote the manuscript and analyzed the data. A.D.L. and C.E.B. developed the idea for this manuscript; A.D.L. provided oversight for the statistical analyses and edited the manuscript critically. B.A.B. outlined the statistical analyses and contributed to the editing of the manuscript. T.L.B. conducted initial analyses and contributed to the editing of the manuscript. C.E.B reviewed and edited the manuscript and contributed to the discussion. All authors read and approved the final manuscript.

Ethical Standards Disclosure
This study was conducted according to the guidelines laid down in the Declaration of Helsinki and all procedures involving human subjects/patients were approved by the University of South Carolina's Institutional Review Board. Verbal informed consent was obtained from all subjects/patients. Verbal consent was witnessed and formally recorded.

eating identity types: healthy, emotional, meat, and picky. Statistical analyses were restricted to 819 participants with complete data.

Results—Healthy EI and picky EI were significantly and directly related to fruit and vegetable intake, with coefficients of 0.31 (p-value<0.001) for healthy EI and −0.16 (p-value<0.001) for picky EI, whereas emotional EI (β=0.00, p-value=0.905) and meat EI (β=−0.04, p-value=0.258) showed no association. Shopping frequency also directly and significantly influenced fruit and vegetable intake (β=0.13, p-value=0.033). With the inclusion of EI, 16.3% of the variation in fruit and vegetable intake was explained.

Conclusions—Perceptions and GIS-based measures of environmental factors alone do not explain a substantial amount of variation in fruit and vegetable intake. EI, especially healthy EI and picky EI, is an important, independent predictor of fruit and vegetable intake and contributes significantly to explaining the variation in fruit and vegetable intake.

Keywords

Eating identity; Perceptions; GIS-based; Environmental; Fruit and vegetable intake

Introduction

Fruit and vegetable intake has many health benefits (Slavin & Lloyd, 2012). Given that current national consumption patterns fall markedly short of recommendations (Dietary Guidelines Advisory Committee, 2015; Kirkpatrick, Dodd, Reedy, & Krebs-Smith, 2012), health promotion programs have targeted psychosocial characteristics, behaviors, and environmental attributes to increase fruit and vegetable intake. In the past decade, the residential food environment has received increasing attention as one attribute of the built environment that may contribute to poor dietary choices (Morland, Wing, & Roux, 2002; Moore, Roux, Nettleton, & Jacobs, 2008; Rose & Richards, 2004; Michimi & Wimberly, 2010; Aggarwal et al., 2014; Bodor, Rose, Farley, Swalm, & Scott, 2008). Our research group has shown previously that the food environment influences fruit and vegetable intake among household food shoppers in a study of eight counties in South Carolina, although this effect is not direct but instead acts indirectly through food shopping behaviors (Liese et al., 2014). Moreover, despite extensive information on food environments, shopping behaviors, and perceptions of the food environment, we were able to explain only 3% of the variation in fruit and vegetable intake (Liese et al., 2014). However, previous studies by our group and others have shown that psychological aspects are also important in explaining fruit and vegetable intake (Devine, Sobal, Bisogni, & Connors, 1999; Blake, Bell, Freedman, Colabianchi, & Liese, 2013; Bisogni, Connors, Devine, & Sobal, 2002).

Eating identity (EI) is a psychosocial determinant of diet that helps explain the motivators of food choice behaviors (Abrams & Hogg, 1999; Allom & Mullan, 2012; Bisogni et al., 2002; Kendzierski & Costello, 2004b; Strachan & Brawley, 2009; Blake et al., 2013; Harmon, Blake, Armstead, & Hebert, 2013). It is now recognized that multiple types of EIs exist that influence dietary and food choice behaviors (Bisogni et al., 2002; Blake & Bisogni, 2003; Devine et al., 1999; Jabs, Sobal, & Devine, 2000). Indeed, we reported previously that EI, which was developed to assess affinity with four specific eating behavior types (healthy, meat, picky, and emotional), is associated with dietary intake (Blake et al., 2013). Multiple studies have demonstrated that people who describe themselves as healthy eaters have healthy diets and are more receptive to nutrition education messages (Bisogni et al., 2002; Devine, Connors, Bisogni, & Sobal, 1998; Devine et al., 1999; Kendzierski, 2007; Kendzierski & Costello, 2004a; Strachan et al., 2009). In our previous study, higher healthy EI scores were associated with higher intakes of fruits and vegetables and grams of fiber and a lower percentage of total kilocalories from fat, whereas higher picky and meat-eating EI scores were associated with less-healthy dietary intake. It is likely that EI also influences how people perceive and interact with their food environments.

Kremers et al. showed preliminary evidence that environmental factors may have an impact on health behaviors (energy balance–related behaviors), likely via a mediated path through individual-level factors, i.e., motivation and ability (Kremers et al., 2006). A healthy food environment that offers plenty of options may increase motivation to consume healthy foods. However, studies focusing on the mediating and moderating effects of potential motivational and environmental determinants are largely lacking (Brug, 2008). Thus, the purpose of the present study is to evaluate whether knowledge of a person's EI can explain any additional variation in fruit and vegetable intake above and beyond that explained by the previously identified food environment characteristics, perceptions of the food environment, and shopping behaviors.

Methods

Detailed survey procedures and methods of the study have been described previously (Liese et al., 2014). A total of 968 adults were recruited for a telephone survey by the Survey Research Laboratory in an eight-county region in South Carolina. The survey queried information on shopping behaviors (name and address of the store in which respondents conducted the majority of their grocery shopping and the frequency of shopping at that store), perceptions of the food environment (Echeverria, ez-Roux, & Link, 2004; Mujahid, ez Roux, Morenoff, & Raghunathan, 2007; Moore et al., 2008; Moore, Roux, & Brines, 2008; Moore, ez Roux, Nettleton, Jacobs, & Franco, 2009), demographic and address information, fruit and vegetable intake (Thompson et al., 2004; Thompson et al., 2005), and EI (Bisogni et al., 2002; Blake et al., 2003; Blake, Jones, Pringle-Washington, & Ellison, 2010; Caplan, 2013; Devine et al., 1999; Kendzierski et al., 2004a). EI was assessed using the Eating Identity Type Inventory (EITI) (Blake et al., 2013), a 12-item instrument that differentiates four eating identity types: healthy, emotional, meat, and picky. Meat EI was included in the current study of fruit and vegetable intake because our initial study showed an inverse association between meat EI and fruit and vegetable intake. The initial study demonstrated the validity and reliability of the EITI (Blake et al., 2013). Additionally, we utilized validated data on the retail food environment of the entire study region (Liese et al., 2010). Detailed descriptions of these variables can be found in papers by Liese et al. (Liese et al., 2014; Liese et al., 2010) and Blake et al. (Blake et al., 2013).

Our statistical analyses were restricted to 819 participants with complete data after listwise deletion of missing geospatial data, fruit and vegetable intake, perceptions, shopping behaviors, and EI information. Because the distributions of shopping frequency and distance to primary store were skewed, these variables were Winsorized at the 95th percentile. The relationships between a) GIS-based measures of supermarket availability, b) perceptions of the availability of healthy foods in the neighborhood and ease of shopping access, c) shopping behaviors (distance and frequency), d) EI, and e) fruit and vegetable intake were examined through path analysis using PROC CALIS in SAS v9.4. Because the perceptions variables are theoretically related to one another, as are the two shopping behavior variables, the reciprocal nature of these two sets of variables was reflected in the model using double arrows (Figure 1). We report standardized beta coefficients and p-values for paths and explained variation for endogenous variables in a simplified version, focusing on the statistically significant associations only (p-value<0.05) in Figure 2. Unlike regression models, a single path analysis model (similar to structural equation modeling) tests a theoretical model that is believed to be applicable to a general population comprised of persons of differing ages, race/ethnic groups, marital status, and genders. In other words, if we believed that the conceptual model we developed would not apply equally to women and men; we would evaluate the fit of the model for each gender separately. The same rationale would apply to any other covariates. Thus, a path analysis model does not control for factors that are considered confounders in regression analysis because it would result in overspecification of the model (Hermstad, Swan, Kegler, Barnette, & Glanz, 2010).

Results

Characteristics of the study sample are presented in Table 1. The mean age of the study sample was 57 years; 33% of the participants were minorities (African American, Hispanic, or other); and 80% were female. The average self-reported fruit and vegetable intake was 4.5 servings per day. The mean emotional, healthy, meat, and picky EITI scores (standard deviation) were 2.5 (0.9), 3.7 (0.8), 3.1 (1.0), and 2.5 (0.9), respectively, with a possible range of 1–5.

Figure 2 shows a simplified representation of the full path analytic results, containing only the statistically significant paths. Healthy EI and picky EI were significantly and directly related to fruit and vegetable intake, with coefficients of 0.31 (p-value<0.001) for healthy EI and −0.16 (p-value<0.001) for picky EI, whereas emotional EI (β=0.00, p-value=0.905) and meat EI (β=−0.04, p-value=0.258) showed no association. However, emotional EI and meat EI were significantly associated with participants' perceptions of ease of shopping access, with coefficients of −0.07(p-value=0.046) for emotional EI and 0.07 (p-value=0.041) for meat EI. Meat EI was indirectly associated with fruit and vegetable intake via shopping frequency (path from meat EI to shopping frequency: β=0.08, p-value=0.020). Shopping frequency also directly and significantly influenced fruit and vegetable intake. No other direct influences on fruit and vegetable intake were observed in the path model. In totality, with the inclusion of EI, all variables in the path analysis explained 16.3% of variation in fruit and vegetable intake.

Discussion

As the present analyses show, inclusion of the EI psychosocial construct in the path analytic model made a substantial contribution to explaining fruit and vegetable intake variation in the data. With the inclusion of EI, we could explain 16.3% of the variation in fruit and vegetable intake. This was a substantial increase compared to the results of previous study, which was able to explain only 3% of the variation based on the same set of variables (including GIS-based measures of supermarket availability, perceptions of the availability of healthy foods in the neighborhood and ease of shopping access, shopping behaviors (distance and frequency)) but without EI (Liese et al., 2014). There were no other substantial changes in the other coefficients in the updated path model compared to the previous analysis on the food environment and fruit and vegetable intake by Liese et al. (Liese et al., 2014).

The current study found that a higher healthy EI score was significantly and directly associated with higher fruit and vegetable intake. This finding was consistent with a previous finding by Strachan that people who identified themselves as healthy eaters had healthier dietary intakes (Strachan et al., 2009). This finding was also consistent with the previous study by Blake et al. (Blake et al., 2013). The inverse and direct association between picky EI and fruit and vegetable intake was also consistent with previous studies (Bisogni et al., 2002; Blake et al., 2003; Blake et al., 2013). In Blake's study, they also found that meat EI was negatively associated with fruit and vegetable intake (Blake et al., 2013). However, in the path model, no direct association was found regarding meat EI and fruit and vegetable intake. Although there was a path from meat EI to fruit and vegetable intake via shopping frequency, this indirect effect was difficult to quantify. The discrepancy of the relationship between EI and fruit and vegetable intake could be due to the fact that the initial study did not take into account food environmental factors (either GIS- or perception-based) and shopping behaviors. Our findings were consistent with Brug's review (Brug, 2008) and Kremers' study (Kremers et al., 2006). Environmental factors, including increased access to different types of food, influence food choices (Brug, 2008; Kremers et al., 2006). Nevertheless, these findings suggest that a person's EI, based on the person's own experiences that portray an aspect of his or her overall self-identity, is important in understanding food choices and, ultimately, dietary intake.

EI used in our study is only one of many constructs of psychosocial determinants of dietary intake. Self-efficacy is another psychosocial construct, but it is not likely to have the same or a similar effect on food choices. For example one might have a high self-efficacy for cooking and a meat-eating identity that leads them to have high saturated fat intake and potentially low fruit and vegetable intake. The only time these two constructs would align is if an individual has both a high self-efficacy and an EI for a similar behavior, i.e., high self-efficacy for choosing healthy foods and a healthy EI.

Moreover, EI was an important psychosocial determinant of perceptions of the food environment, as the path model demonstrated that some types of EI (such as emotional and meat) were significantly associated with the perception of ease of shopping access. Results in our analyses suggest that self-identity in relation to food and eating may influence personal perception of the food environment.

The path model results are important in the context of existing US policies focused exclusively on increasing access to healthy food choice in that our findings suggest that physical access alone may not be sufficient to boost healthy food consumption. The present study underscores that environmental characteristics, including GIS-based measures of supermarket availability, perceptions of the availability of healthy foods in the neighborhood and ease of shopping access, shopping behaviors (distance and frequency), only explained only 3% of variation in fruit and vegetable intake (Liese et al., 2014). In addition, evaluations of several natural experiments have now shown that having a supermarket established in an underserved neighborhoods does not necessarily translate into use of that resource by local residents or improve healthy foods like fruits and vegetables consumptions (Cummins, Petticrew, Higgins, Findlay, & Sparks, 2005; Cummins, Flint, & Matthews, 2014; Elbel et al., 2015; Mayne, Auchincloss, & Michael, 2015).

Our study suggests that EI has an important role in explaining variation in fruit and vegetable intake, given that 16% of the variation was explained in the path model, which also included the aforementioned environmental characteristics. Thus, understanding EI of the target population is important in tailoring the programmatic interventions aimed at improving fruit and vegetable intake. For example, interventions to increase fruit and vegetable intake among people who identify as meat eaters could promote the complementarity of certain vegetables with meat dishes. To increase fruit and vegetable intake among those who identify as picky eaters might involve strategies to encourage tasting new things or pairing new foods with favorite foods. Moreover, interventions that seek to promote or instill a healthy EI may be more effective at promoting healthy dietary intake than those that emphasize only nutrition knowledge or access to healthy food. This could be important, for example, in the context of the national school lunch program (NSLP) which offers more fruit and a healthier mix of vegetables to increase the consumptions of healthy foods, yet the amounts consumed by the students are still small on average (United States Department of Agriculture & Economic Reserch Service, 2013). Thus, instilling a healthy EI in students would be a way to increase demand for healthy options. The National Football League (NFL) Fuel up to Play Sixty program founded by National Dairy Council and NFL (National Dairy Council, 2016) is an example of a program that targeted eating and physical activity behaviors by promoting a healthy identity using athletes as inspirational role models. This program targets school-aged children to improve healthy eating and physical activity by encouraging kids to be active, eat better and implement long-term, positive changes via national campaigns.

Several limitations of the current study should be noted. First, the cross-sectional nature of the study limits the causal inference of current findings. Second, we used information based on self-reported measures in the path model, except for the availability of supermarkets and shopping distance, which were objective geographical measures. Previous studies have raised the issue that a social desirability bias may exist when reporting healthy behaviors (i.e., fruit and vegetable intake, healthy eating identities, etc.). The current study was unable to determine whether social desirability bias was present here. Moreover, even though the food environment and locations of primary food stores were ground-truthed, we focused only on the primarily utilized store and assumed travel occurred from home.

Conclusions

Fruit and vegetable intake can be directly affected by EI, a domain-specific self-identity based on previous experience with food and eating. Our study indicates that the food retail environment plays a role in shaping fruit and vegetable intake, largely through individuals' perceptions of the neighborhood environment, such as the availability of healthy foods, and through shopping behaviors, such as shopping frequency. However, perceptions and GIS-based measures of environmental factors alone do not explain a substantial amount of variation in fruit and vegetable intake. EI, especially healthy EI and picky EI, is an important, independent predictor of fruit and vegetable intake and contributes significantly to explaining the variation in fruit and vegetable intake.

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Reference List

Abrams, D., Hogg, MA. Social identity and social cognition. Blackwell Oxford: 1999.

Aggarwal A, Cook AJ, Jiao J, Seguin RA, Vernez Moudon A, Hurvitz PM, et al. Access to supermarkets and fruit and vegetable consumption. American Journal of Public Health. 2014; 104:917–923. [PubMed: 24625173]

Allom V, Mullan B. Self-regulation versus habit: The influence of self-schema on fruit and vegetable consumption. Psychology & Health. 2012; 27:7–24. [PubMed: 21827291]

Bisogni CA, Connors M, Devine CM, Sobal J. Who we are and how we eat: a qualitative study of identities in food choice. Journal of Nutrition Education and Behavior. 2002; 34:128–139. [PubMed: 12047837]

Blake CE, Jones SJ, Pringle-Washington A, Ellison J. Assessing eating identities of rural African American's in the southern US. International Society for Behavioral Nutrition and Physical Activity (ISBNPA). 2010

Blake C, Bisogni CA. Personal and family food choice schemas of rural women in upstate New York. Journal of Nutrition Education and Behavior. 2003; 35:282–293. [PubMed: 14642213]

Blake CE, Bell BA, Freedman DA, Colabianchi N, Liese AD. The Eating Identity Type Inventory (EITI). Development and associations with diet. Appetite. 2013; 69:15–22. [PubMed: 23702262]

Bodor JN, Rose D, Farley TA, Swalm C, Scott SK. Neighbourhood fruit and vegetable availability and consumption: the role of small food stores in an urban environment. Public Health Nutrition. 2008; 11:413–420. [PubMed: 17617930]

Brug J. Determinants of healthy eating: motivation, abilities and environmental opportunities. Family Practice. 2008; 25:i50–i55. [PubMed: 18826991]

Caplan, P. Food, health and identity. Routledge; 2013.

Cummins S, Flint E, Matthews SA. New neighborhood grocery store increased awareness of food access but did not alter dietary habits or obesity. Health Affairs. 2014; 33:283–291. [PubMed: 24493772]

Cummins S, Petticrew M, Higgins C, Findlay A, Sparks L. Large scale food retailing as an intervention for diet and health: quasi-experimental evaluation of a natural experiment. Journal of Epidemiology and Community Health. 2005; 59:1035–1040. [PubMed: 16286490]

Devine CM, Connors M, Bisogni CA, Sobal J. Life-course influences on fruit and vegetable trajectories: qualitative analysis of food choices. Journal of Nutrition Education. 1998; 30:361–370.

Devine CM, Sobal J, Bisogni CA, Connors M. Food choices in three ethnic groups: Interactions of ideals, identities, and roles. Journal of Nutrition Education. 1999; 31:86–93.

Dietary Guidelines Advisory Committee. Scientific Report of the 2015 Dietary Guidelines Advisory Committee. Washington (DC): USDA and US Department of Health and Human Services; 2015.

Echeverria MS, Duez-Roux AV, Link BG. Reliability of self-reported neighborhood characteristics. Journal of Urban Health. 2004; 81:682–701. [PubMed: 15466849]

Elbel B, Moran A, Dixon LB, Kiszko K, Cantor J, Abrams C, et al. Assessment of a government-subsidized supermarket in a high-need area on household food availability and children's dietary intakes. Public Health Nutrition. 2015; 18:2881–2890. [PubMed: 25714993]

Harmon BE, Blake CE, Armstead CA, Hebert JR. Intersection of identities. Food, role, and the African–American pastor. Appetite. 2013; 67:44–52. [PubMed: 23538172]

Hermstad AK, Swan DW, Kegler MC, Barnette JK, Glanz K. Individual and environmental correlates of dietary fat intake in rural communities: a structural equation model analysis. Social Science & Medicine. 2010; 71:93–101. [PubMed: 20462682]

Jabs J, Sobal J, Devine CM. Managing vegetarianism: Identities, norms and interactions. Ecology of Food and Nutrition. 2000; 39:375–394.

Kendzierski D. A self-schema approach to healthy eating. Journal of the American Psychiatric Nurses Association. 2007; 12:350–357.

Kendzierski D, Costello MC. Healthy Eating Self-Schema and Nutrition Behavior. Journal of Applied Social Psychology. 2004b; 34:2437–2451.

Kendzierski D, Costello MC. Healthy Eating Self-Schema and Nutrition Behavior. Journal of Applied Social Psychology. 2004a; 34:2437–2451.

Kirkpatrick SI, Dodd KW, Reedy J, Krebs-Smith SM. Income and race/ethnicity are associated with adherence to food-based dietary guidance among US adults and children. Journal of the Academy of Nutrition and Dietetics. 2012; 112:624–635. [PubMed: 22709767]

Kremers SP, De Bruijn GJ, Visscher TL, Van Mechelen W, De Vries NK, Brug J. Environmental influences on energy balance-related behaviors: a dual-process view. International Journal of Behavioral Nutrition and Physical Activity. 2006; 3:1. [PubMed: 16390544]

Liese AD, Bell BA, Barnes TL, Colabianchi N, Hibbert JD, Blake CE, et al. Environmental influences on fruit and vegetable intake: results from a path analytic model. Public Health Nutrition. 2014; 17:2595–2604. [PubMed: 24192274]

Liese AD, Colabianchi N, Lamichhane AP, Barnes TL, Hibbert JD, Porter DE, et al. Validation of 3 food outlet databases: completeness and geospatial accuracy in rural and urban food environments. American Journal of Epidemiology. 2010; 172:1324–1333. [PubMed: 20961970]

Mayne SL, Auchincloss AH, Michael YL. Impact of policy and built environment changes on obesity-related outcomes: a systematic review of naturally occurring experiments. Obesity Reviews. 2015; 16:362–375. [PubMed: 25753170]

Michimi A, Wimberly MC. Associations of supermarket accessibility with obesity and fruit and vegetable consumption in the conterminous United States. International Journal of Health Geographics. 2010; 9:1–14. [PubMed: 20082711]

Moore LV, ez Roux AV, Nettleton JA, Jacobs DR, Franco M. Fast-food consumption, diet quality, and neighborhood exposure to fast food: the multi-ethnic study of atherosclerosis. American Journal of Epidemiology. 2009; 170:29–36. [PubMed: 19429879]

Moore LV, Roux AVD, Brines S. Comparing perception-based and geographic information system (GIS)-based characterizations of the local food environment. Journal of Urban Health. 2008; 85:206–216. [PubMed: 18247121]

Moore LV, Roux AVD, Nettleton JA, Jacobs DR. Associations of the Local Food Environment with Diet Quality: A Comparison of Assessments based on Surveys and Geographic Information Systems The Multi-Ethnic Study of Atherosclerosis. American Journal of Epidemiology. 2008; 167:917–924. [PubMed: 18304960]

Morland K, Wing S, Roux AD. The contextual effect of the local food environment on residents' diets: the atherosclerosis risk in communities study. American Journal of Public Health. 2002; 92:1761–1768. [PubMed: 12406805]

Mujahid MS, ez Roux AV, Morenoff JD, Raghunathan T. Assessing the measurement properties of neighborhood scales: from psychometrics to ecometrics. American Journal of Epidemiology. 2007; 165:858–867. [PubMed: 17329713]

National Dairy Council. [Accessed on 8-14-2017] Fuel Up Play Sixty. 2016. https://www.fueluptoplay60.com/

Rose D, Richards R. Food store access and household fruit and vegetable use among participants in the US Food Stamp Program. Public Health Nutrition. 2004; 7:1081–1088. [PubMed: 15548347]

Slavin JL, Lloyd B. Health benefits of fruits and vegetables. Advances in Nutrition: An International Review Journal. 2012; 3:506–516.

Strachan SM, Brawley LR. Healthy-eater identity and self-efficacy predict healthy eating behavior: A prospective view. Journal of Health Psychology. 2009; 14:684–695. [PubMed: 19515684]

Thompson FE, Midthune D, Subar AF, Kahle LL, Schatzkin A, Kipnis V. Performance of a short tool to assess dietary intakes of fruits and vegetables, percentage energy from fat and fibre. Public Health Nutrition. 2004; 7:1097–1106. [PubMed: 15548349]

Thompson FE, Midthune D, Subar AF, McNeel T, Berrigan D, Kipnis V. Dietary intake estimates in the National Health Interview Survey, 2000: methodology, results, and interpretation. Journal of the American Dietetic Association. 2005; 105:352–363. [PubMed: 15746822]

United States Department of Agriculture & Economic Reserch Service. [Accessed on 8-14-2017] Eating better at School: Can new policies improve children's food chioces?. 2013. https://www.ers.usda.gov/amber-waves/2013/september/eating-better-at-school-can-new-policies-improve-children-s-food-choices/

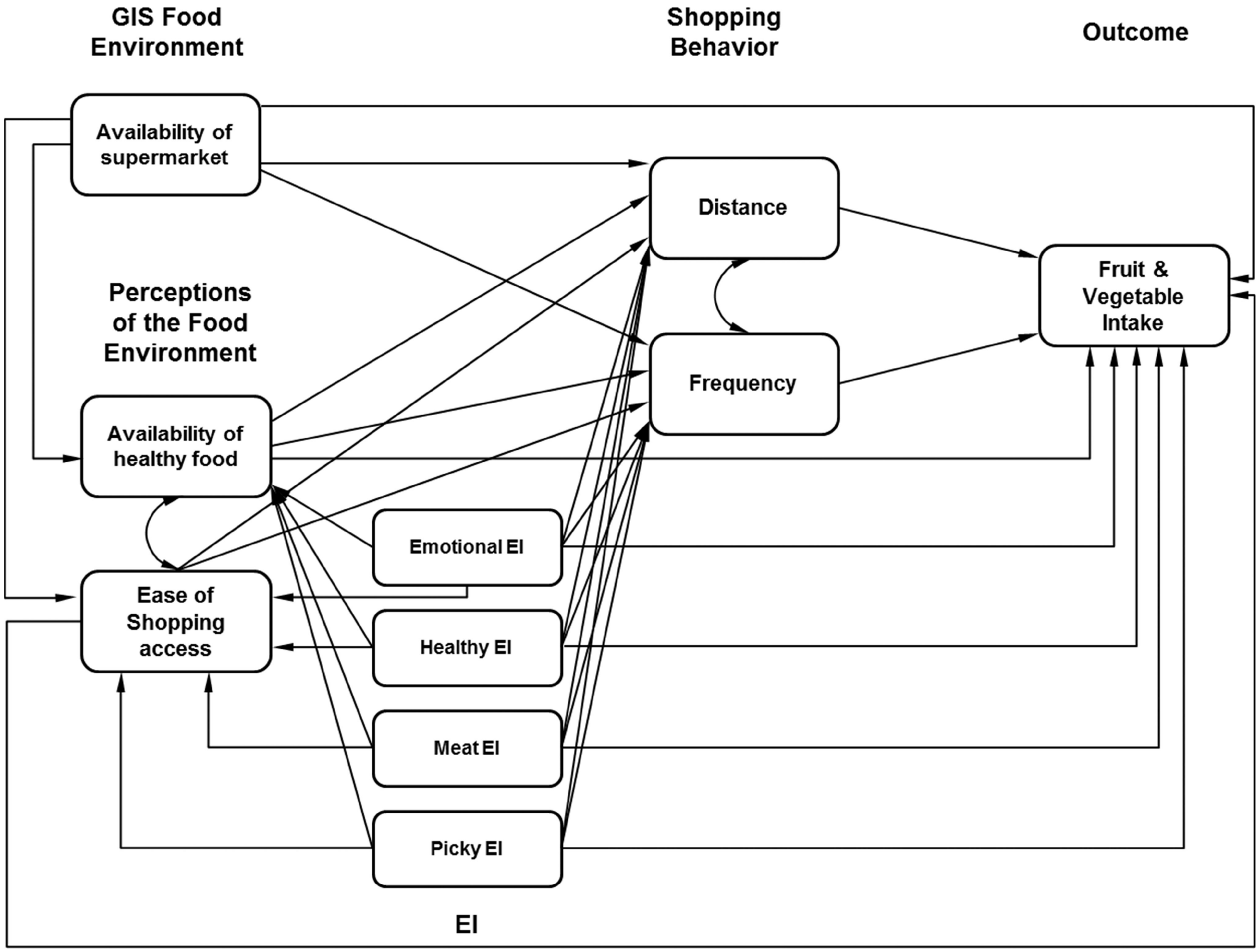

Figure 1.

Conceptual model of environmental influences on fruit and vegetable intake (GIS, geographic information system; EI, eating identity)

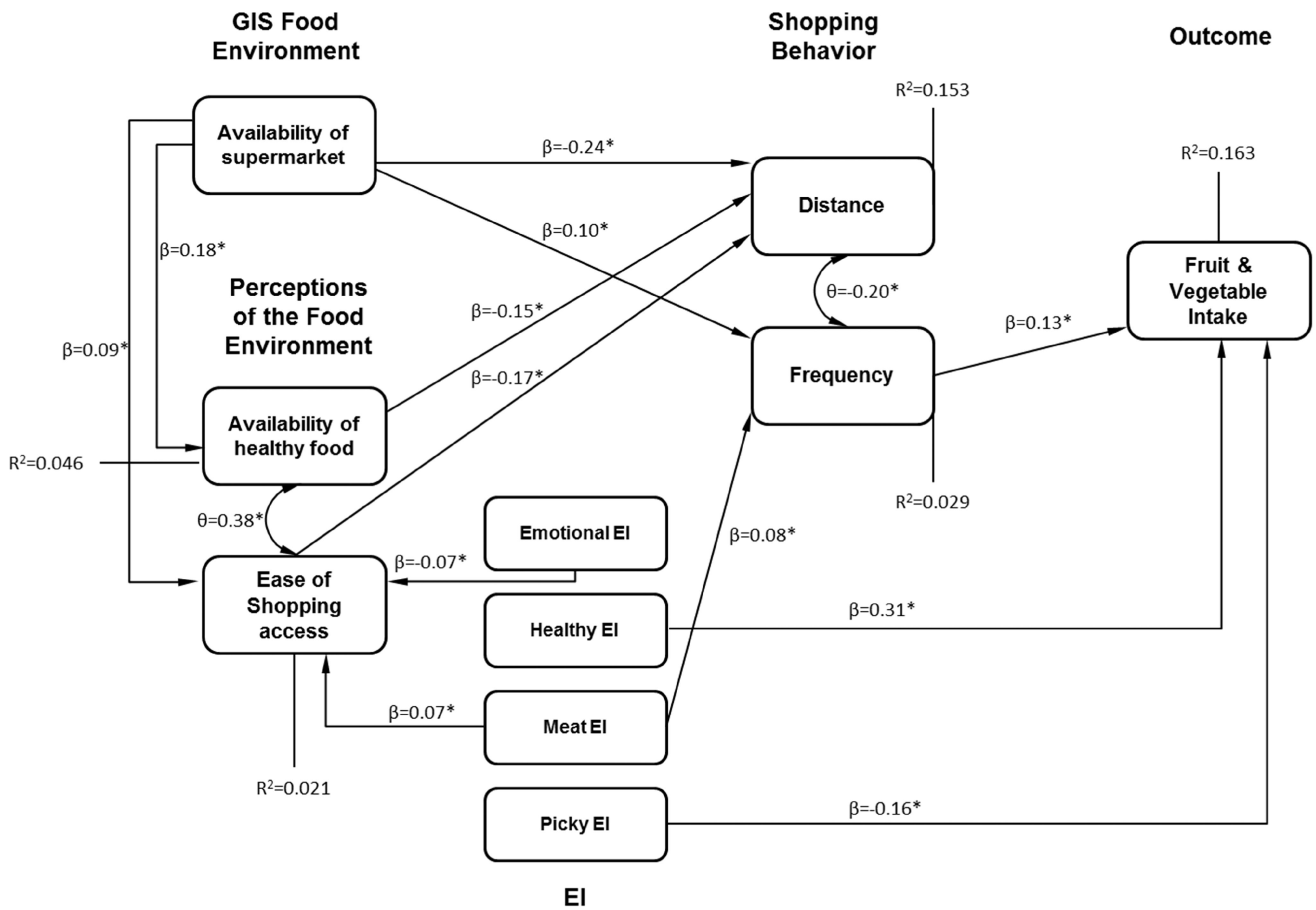

Figure 2.

Simplified path analytic model of environmental influences on fruit and vegetable intake among 819 household food shoppers who are residents of an eight-county region of South Carolina, USA, 2010. Values shown are standardized beta coefficients (β) or explained variation (R^2); * indicates statistical significance at p-value<0.05 (GIS, geographic information system; EI, eating identity)

Table 1

Descriptive Characteristics of 220 the Study Sample

	Mean (SD) or Percentage of Study Sample, n=819
Demographic Characteristics	
Age (years)	57.1 (14.6)
Minority (African American, Hispanic, other)	32.6
Female	79.5
High School Education or Less	45.2
Low/Mid Income ($39,999 or less)	42.0
Employed	43.5
EITI Scores	
Emotional EITI (range: 1–5; Cronbach's alpha: 0.76) *	2.5 (0.9)
Healthy EITI (range: 1–5; Cronbach's alpha: 0.82)	3.7 (0.8)
Meat EITI (range: 1–5; Cronbach's alpha: 0.68)	3.1 (1.0)
Picky EITI (range: 1–5; Cronbach's alpha: 0.61)	2.5 (0.9)
Perceptions of the Food Environment	
Availability of Healthy Foods (range: 0–12)	6.3 (3.6)
Ease of Shopping Access (range: 0–3)	2.1 (1.1)
Dietary Intake	
Fruit and Vegetable Intake (servings per day)	4.5 (1.6)
Food Shopping Behavior	
Distance Traveled to Primary Grocery Store (miles)	10.0 (8.5)
Frequency of Shopping (times per week)	1.9 (2.1)
GIS Food Environment	
Count of Supermarkets/Grocery Stores per Census Tract	
0	54.6
1	28.9
2	13.1
3	2.4
4	1.0
Average	0.66 (0.9)

* Cronbach's alpha information has been published previously by Blake et al. (Blake et al., 2013)