



Relationships between the built environment, socio-demographic factors and adolescents' access to food establishments

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Abstract

Youths in the U.S. experience health problems due to unhealthy eating behaviors. In terms of physical and social environmental factors, youths encounter problems with accessing healthy food. The purpose of this study was to determine the degree to which the built environment and socio-demographic factors affect teenagers' probability of visiting healthy or unhealthy food establishments.

Participants' frequencies of visiting healthy/unhealthy food establishments were obtained from the Teen Activities and Transportation Enterprise Project (TATE) survey. Food environments location data were collected from the Providence Plan and the Rhode Island Yellow Pages. Sociodemographic data were obtained using the TATE survey and statistics from the Providence Public School Department. Multinomial logistic regression models were used to explore the degree to which youths' frequency of visiting healthy/unhealthy food establishments were linked to availability and youths' socioeconomic status. The models reveal that the availability of healthy food establishments within walking distance from home, the frequency of visits, gender, employment status, and ethnicity significantly affect visitation to unhealthy food environments ($p < 0.05$). The availability of unhealthy food within walking distance, the number of members living in the household, the number of cars in household, birth-nation of the student and the student's father are not significant.

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Introduction

A major public health crisis facing today's youth is the pandemic increase in overweight and obesity^{1,2,3,4}. According to the 2007-2008 report, 18.1% of adolescents between the ages of 12-19 are considered obese. Ethnic/racial disparities exist and Black and Hispanic/Latino youth are more likely to be overweight and obese compared to white adolescents¹. Given the detrimental physical, social, and mental consequences of obesity among youth⁵, more research regarding the risk factors related to the development of overweight and obesity are warranted. An area of research which is still somewhat unexplored is the role of the built environment on adolescents' dietary and physical activity behaviors.

The built environment includes a range of physical and social elements that make up the structure of a community^{6,7,8}. Examples of the physical food environment include access to eating establishments such as fast food restaurants, and access to grocery stores, convenience stores, etc. Examples of the social environment include the social norms surrounding eating⁹. The built food environment can affect dietary behaviors and obesity rates through creating a climate that can either promote or inhibit energy consumption¹⁰. A recent review of the built environment and obesity found that 84% of the included studies reported a statistically significant positive association between some aspect of the built environment and obesity¹¹. In general, results of the studies found that lower prevalence of overweight and obesity were linked with increased access to supermarkets^{12,13,14} and decreased access to fast food restaurants^{15,16}. Greater BMI was also associated with higher area-level disadvantage scores of the census tract where participants shopped^{17,18}. However, most of these studies were conducted with either adults or young children; none of the studies examining the built food environment were conducted with adolescents.

Although studies have found significant relationships between access to eating establishments and prevalence of overweight and obesity, the cost of food is also an important factor. For example, an increase in the prices of healthful food, i.e. fruits and vegetables, has been shown to result in higher BMI for youths. In addition, a lower cost for higher fat foods such as meats also resulted in greater BMI levels^{19,20,21}.

Because adolescents are typically too young to drive and therefore are more likely to remain within their proximal environment, and they tend to have access to disposable income²², it is important to examine the relationships between adolescents' access to food retailers and restaurants, specific spatial factors and demographic variables²³. Thus, the purpose of this study was to determine the degree to which the built environment and socio-demographic factors affect teenagers' probability of frequenting healthy or unhealthy food establishments.

Methods

Study area

The study area is the City of Providence and the areas one kilometer beyond the border of Providence. As this study finds the availability of food establishments around



home and school within a walking distance of one kilometer for youths, areas in other cities adjunct to Providence within one kilometer were considered within the spatial area for analysis. However, buffered areas including natural barriers, such as the river were excluded from the study area. For instance, East Providence areas are adjacent to Providence, but between the cities, there is a river, making it impossible for youth to access a destination across the river.

Study sample

The study's sample consisted of one hundred and twenty-two inner-city, low-income, and primarily first-generation immigrants. Students were in the 9th to 12th grades, from an inner-city school in Providence, Rhode Island. Sixty-three percent were female and 37 percent were male. The largest ethnic group of students was Hispanic (59%), and approximately half reported Spanish as their primary language (54%). The second largest ethnic group was African-Americans (20%). Approximately 57 percent of the students were born in Rhode Island and 14 percent were born in the Dominican Republic. Students primarily described themselves as being a member of an immigrant family; eighty percent of parents were not born in the United States, with most coming from the Caribbean and Latin America. The majority of the students came from a two-headed, married household (49%) and 34 percent came from a household headed by a single female. Using the eligibility for free and reduced lunch statistics from the Providence School Department as a proxy for economic status, this population was mostly low-income, where 71.2 percent of the students received a free lunch and 13.6 percent received a reduced lunch rate.

Data sets

This study was designed to explore what teenagers do during a typical semester. Within a classroom setting, students were instructed to develop a list of at least 15 out-of-home regular or occasional activities, including the location and the mode used to access the activity. All food related activities provided the data for this paper. In this study three main datasets: students' socio-demographic data, their food activity lists, and the location data of local food businesses, were used to explore factors related to the frequency of visiting healthy and unhealthy food establishments.

Socioeconomic Background and Activity Lists

The dependent variable in our model represents the actual number of visits to food establishments of one hundred and twenty-two Feinstein High School students in Providence, RI. Independent variables used to predict eating behavior describe the individual and the individual's household. Socioeconomic and cultural data include ethnicity, gender, age, U.S. citizenship status, birthplace, and employment status. Since students were not directly asked about household income, several variables were used to describe the economic standing of the household including the number of cars in the household, the number of household members and employed members, head of



household type, and the birthplace of the mother and father. Students were also asked if they were employed part-time and if they were eligible for the free or reduced National School Lunch Program. These variables were included in the models to better understand how the individual, the household structure, and the social and cultural status of this student population affect eating patterns outside the home.

Students recorded a total of two thousand and nine activities, approximately 16.5 activities (2009 divided by 122) per student. The record field contains information about each activity pursued by the student, i.e. the students' ID numbers, names of places where students pursued activities, activity types, activity time duration, frequency of the activity, time of day the activity takes place, distance between activities and home locations, modal use, and individuals accompanying the students to the activity. The activity type field reveals that the majority of the activities were related to food visits (n=653, 33%) to fast-food establishments, dining, grocery stores, and convenience stores. All food related activity choices form the dependent variable, including the frequency of visits to specific food establishments, which are weighed against the eating pattern variables.

Food establishments Location Data

The food location dataset was treated as an independent variable. Location data of food establishments were collected from the Providence Plan (PP), a private nonprofit organization that has been working with the State Health Department to improve the health of Providence residents, and the Rhode Island Yellow Pages. The PP provided information on the location of 6,221 local food businesses. The dataset includes business names, addresses, license numbers, license types, and the number of chains. From the Rhode Island Yellow Pages, we captured data from 209 local businesses with names, addresses, and types of businesses based on the North American Industry Classification System (NAICS). The two datasets were combined, cleaned, and overlapping entries were eliminated.

In order to restrict our food environment dataset to businesses related to teenagers' eating behaviors, we used the NAICS code from the Yellow Pages to eliminate liquor stores, pubs, taverns, nightclubs, and cigarette stores, due to limitations on who can enter. In addition non-profit food stores or markets, hospitals, residential care facilities, elderly housing, and nursing homes were removed. Establishments serving food as a supplemental service were also eliminated, i.e. restaurants in hotels, inns, lodging places, and cafeterias in schools or civic clubs. Catering businesses carrying food or cooks to places requiring food services were also excluded. According to NAICS, a caterer is an industry comprising establishments primarily engaged in providing single-based food services, so that these businesses generally have equipment and vehicles to transport meals to events or prepare food onsite. Graduation parties, wedding parties, retirement parties, and trade shows are examples. However, caterers serving food in established places were considered general restaurants. If the business license type was "caterer or commissary" and the NAICS code was "caterer," the business was eliminated. On the



other hand, if the license type was “caterer or commissary” and the NAICS code was “full service restaurants” or “limited service restaurants,” the business was included in the analysis. Finally, businesses having no address, business type or NAICS code were eliminated. After editing the dataset based on these criteria, 3,250 records entered our analysis.

Categories of food environments

Prior to categorizing food stores or restaurants as an healthy, intermediate healthy, or unhealthy food resource, it was important to develop an understanding of the types of food these places provide. Some food stores or markets deal with a single type of food, such as healthy food (e.g. fruits, vegetables, and other organic food) or unhealthy food (e.g. burgers, fried chicken, or pizza). These classifications are clear-cut. However, in the case of food stores providing both unhealthy and healthy food, such as general family restaurants, classification is more complex. The straightforward way to classify this type of food store or restaurant is to survey all items sold at the location. However, the time and cost of surveying all the food sold in a store would be great.

An easier way to classify food stores is to refer to government industry codes. Many governmental statistical bodies have tried to collect and summarize economic information in order to set economic policy, and this business information then functions as major indices of economic policies. In the U.S., there are two main industrial indexes, the Standard Industrial Classification (SIC) and the North American Industry Classification System (NAICS) established by the federal government. The industrial codes classify business establishments in terms of their types of healthy or services, size of establishment and types of services. Some scholars define food stores based on these industry code systems. Morland et al. (2002) defined types of food stores and food service places with 1997 NAICS codes. According to the codes, they classified food stores into supermarkets, grocery stores, convenience stores, convenience stores with gas stations, specialty food stores, full-service restaurants, fast-food restaurants, carryout specialty items, and bars and taverns¹⁸.

Rundle et al (2009) defined food stores as three types of food environments: healthy, intermediate, and unhealthy²⁴. Within these definitions, vegetable stores, supermarkets or grocery stores, and natural/health food stores are classified as healthy food stores. Other non-fast-food restaurants, medium-sized grocery stores, fish markets, and specialty food stores are categorized as intermediate food stores. Fast-food stores, pizza restaurants, convenience stores, bodegas, bakeries, candy and nut stores and meat markets are unhealthy food stores. Referring to Rundle’s definition of the supermarket, NAICS codes regarding food stores are classified into the three types of food stores as shown in Table 1.

Distance to Food Establishments (Cumulative Approach)

The cumulative approach model was used to measure the availability of food establishments for each youth. Although the cumulative method is an old approach and has the disadvantage of tending to omit complex factors, the method is useful if researchers have limitations in getting detailed information, and the theory can simplify reality. For these reasons, many scholars still employ the method. The availability of food establishments was measured by counting the number of food establishments around students' homes and the school within a walking distance of one kilometer, using ArcGIS, a geographic information systems program^{25,26}. After the buffer analysis, the "Intersect" tool in ArcCatalog was used to obtain the number of food establishments for each student. This number represents the availability of food establishments.

Analysis Methods

Multinomial logistic regression models determined the relationship between the probability of visiting healthy/unhealthy food establishments and the availability of healthy/unhealthy food establishments and socio-demographic factors. The multinomial logistic regression is "a form of regression which is used when the dependent variable is dichotomous and the independent variables are of any type."²⁷. The food type information of visited food establishments can be healthy, intermediate, or unhealthy. However, the three categories were transformed into binary forms, such as healthy or not (intermediate or unhealthy) and unhealthy or not (healthy or intermediate) to estimate the models and interpret the information easily. Thus, two regression models were established—a model about the probability of visiting healthy food environments and a model about visiting unhealthy food. If a student visits one healthy, one intermediate, and one unhealthy food resource, then the model for estimating the probability of visiting healthy food environments becomes 1, 0, and 0, respectively. In the case of estimating the probability of visiting unhealthy food environments, the food types of these stores would be represented as 0, 0, and 1, respectively.

If the number of explanatory variables to affect the occurrence of an event, E, is n, the equation to explain the probability of the event occurring becomes

$$p(E) = \frac{1}{1 + \exp(-z)}$$

$$z = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \dots + \beta_n x_n$$

, where p(E) indicates the probability of the event, E, occurring, and z is a linear combination of the explanatory variables, x. The parameter of each explanatory variable indicates β . Generally, we obtain the parameters by maximum likelihood methods. Logistic regression models are expressed by odds ratio (OR), so that OR can be

$$OR = \frac{P(E)}{1 - P(E)} = \exp(z)$$



Transforming the equation, using the logarithm form, the equation, explained by z , becomes a linear combination of independent variables.

$$\log\left(\frac{P(E)}{1 - P(E)}\right) = z = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \dots + \beta_n x_n$$

If a parameter, β_n of an independent variable, x_n , has a negative value, the odds ratio is less than 1, which means the probability of the event occurring decreases by an increase in the independent variable. Three models are used to explain the probability of accessing healthy food, unhealthy food, and intermediate food. This paper employs the logistic model to two cases, healthy and unhealthy food.

Results and Discussion

Cross table analysis

In terms of gender, female students tended to visit healthy food establishments more frequently than male students, and male students visited unhealthy food stores or restaurants more often than female students (Table 2). Twenty-one percent of food sources visited by females were healthy, while sixteen percent of food establishments visited by boys were healthy. Compared to other ethnic groups, Hispanic/Latino students visited more healthy food stores or restaurants (21%). Students who qualified for free or reduced lunch frequented unhealthy food establishments more often, compared to those who did not qualify.



Results from logistic regression models

The multinomial logistic model shows that the number of healthy food establishments within walking distance from home, frequency of visit to food establishments, gender, employment status, and ethnicity significantly affect visits to unhealthy food environments ($p < 0.05$) (Table 3). When the number of healthy food establishments increase, the probability to visiting unhealthy food environments significantly decreases ($p = 0.0469$). Students who live in areas with a significant number of unhealthy food establishments are slightly more likely to visit unhealthy food establishments ($OR = 1.05$). Males are two times more likely to visit unhealthy food environments ($OR = 2.10$). African Americans are three times more likely to visit unhealthy food stores or restaurants than other ethnicities ($p = 0.0144$, $OR = 2.89$). Students living with married parents visit fewer unhealthy food sources ($p = 0.0395$). Students not living with married parents are two times more likely to visit unhealthy food establishments than other students ($OR = 1.69$). Students who are not employed are two times more likely to visit unhealthy food environments than students who work ($p = 0.0187$, $OR = 2.01$).

There are fewer factors that affect visits to healthy food establishments (Table 4). Only two variables are significant; the availability of healthy food and gender. The more healthy food environments around the home location, significantly increase the frequency adolescents visit healthy food establishments ($p = 0.0393$). Students, who live in areas having more healthy food resources, are slightly more likely to visit healthy food establishments ($OR = 1.06$). Females are two times more likely to visit healthy food establishments than males ($p = 0.0267$, $OR = 1.90$). The model that predicts visits to healthy food is not sensitive to the number of unhealthy food locations within walking distance from the home location.

Conclusion

Eating is essential to sustaining our bodies and lives. Sustaining a human body heavily depends on which foods are eaten, as well as how frequently foods are consumed. Due to revolutionary changes in the food industry and the growth of wealth, most people in developed countries, especially the U.S., do not need to be concerned about the infrequency with which they are able to consume food. Unfortunately, these changes have not guaranteed that all people obtain high-quality food. Despite the fact that starvation is not a major threat in the U.S., many people suffer from diseases caused by consuming unhealthy food. Furthermore, food access differs by socioeconomic status. Many studies have proven that socially and economically disadvantaged groups are less likely to access healthy food for two main reasons: low accessibility due to incomes that are not sufficient to buy healthy food, and low accessibility to healthy food environments due to spatial segregation by race or income.

Findings



This paper is an empirical study investigating which factors influence youths' visits to food establishments and the extent of their influence. A main assumption is that the availability of food environments around youths' homes and their socioeconomic backgrounds affect their eating behaviors. In terms of the availability of food environments, more healthy food environments surrounding youths' homes encourage them to visit more healthy food establishments, whereas the existence of more unhealthy food around youths' homes encourages them to visit more unhealthy food establishments. Because children have fewer options in modal choice than adults, their eating places are often within walking distance of school and home. In terms of socioeconomic background, race, family status, income level, and cultural background, such as parents' origins, affect youths' choices of food establishments. Before testing these assumptions, the overall socioeconomic status of Providence, RI was reviewed, and the accessibility level of food sources by communities or neighborhoods in the city were calculated. After looking at the demographic and economic situations of the city, examining the accessibility levels of food environments in the city, and testing assumptions about youths' eating behaviors and several factors, this study made several important findings.

A multinomial logistic regression model was used to understand the probability of visiting unhealthy food environments. Independent factors included the availability of healthy food environments, gender, race, working status, and family status. The results revealed that the more unhealthy food stores around students' homes, increased the probability of visiting unhealthy food stores or restaurants for young people. Students, having a greater availability of unhealthy food establishments around the home location, are slightly more likely to access unhealthy food. Based on the results, the hypothesis about the availability of food environments was proven acceptable.

In addition, assumptions about the relationship between visiting food establishments and socioeconomic background can be accepted based on the results of the model. In terms of gender, male students are two times more likely to visit unhealthy food environments than female students ($OR = 2.10, p = 0.0031$). This suggests that females tend to be more concerned about the quality of food. In terms of race, if a student is African American, the student is three times more likely to be at risk of visiting unhealthy food establishments ($OR = 2.89, p = 0.0144$). The effects of being African American warrant further research. This may be linked to being socioeconomically disadvantaged compared to other races, or more likely to live with one parent families. Students living with unmarried or single parents are two times more likely to access unhealthy food environments than those who live with married parents ($OR = 1.69, p = 0.0395$). Students who do not work are two times more likely to access unhealthy food than those working ($OR = 2.01, p = 0.0187$). Employed students may be using their financial resources to support the family. Further research is needed.

Limitations



This paper contributes to defining the factors that affect youths' eating behaviors in terms of physical environment and socioeconomic factors. However, this paper has three limitations in addressing youths' eating behaviors, in terms of dataset and explanatory variables. This study did not collect data on purchasing or actual eating behaviors. The source of data came from a larger activity analysis where students were asked to provide information concerning places where they typically go during a semester; thirty-three percent of these activities were visiting food establishments. Food environments were categorized into healthy, intermediate, and unhealthy, based on NAICS and other business information in the Yellow Pages. Using NAICS is a convenient method of classifying food environments. However, the NAICS system tends to simplify the characteristics of an industry, so that the code system could lose some detailed food information. For instance, even though grocery stores or supermarkets are likely to sell more healthy food than convenience stores, they also provide unhealthy food. Moreover, relatively small grocery stores and supermarkets tend to offer more unhealthy food. It is not easy to capture more detailed nutrition information with NAICS. This challenge can exist in restaurants providing both healthy and unhealthy food, such as family restaurants. Even though the criteria used in previous studies that categorized food stores based on the nutrition compositions of the stores or restaurants was employed, the loss of detailed nutrition information was inevitable. If it is possible to get the number of food items by food type for each food store or restaurant, the proportion of healthy food in the stores can be used, instead of categorizing the food stores as healthy, unhealthy, and intermediate food environments.

In the statistical models used to explain youths' food establishment visitation patterns, this study tried to find socioeconomic factors affecting visits to unhealthy and healthy food establishments, which may be influenced by one's cultural background. The mother's and father's origins were used to represent cultural background. However, these variables had very low explanatory power when analyzing youths' food visitation patterns. This result may be due to the limitations of the collected data. It is difficult to quantify cultural background. In addition, the majority of the respondents were low-income. There is practically no variability in income status. In order to overcome this disadvantage, future studies need to conduct a qualitative survey to address the effects of cultural background on eating behaviors.



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Table 1: Types of food

Food Types	Rundle's Criteria	NAICS index
Healthy	supermarkets	445110 Supermarkets
	fruits and vegetable stores	445110 Grocery stores
	natural/health food stores	445110 Food stores
		445230 Fruit/vegetable
Intermediate	other non-fast-food restaurants	422430 Dairy Product Wholesaler
	medium sized grocery stores	445220 Fish markets
	fish markets	722110 Restaurants, full service
	specialty food stores	722110 Fine dining
		722110 Family restaurants



Unhealthy	fast-food stores	445120 Convenience stores
	pizza restaurants	447110 Gasoline stations with convenience stores
	convenience stores	445210 Meat markets
	bodegas	445291 Baked goods
	bakeries	445292 Confectionery/nut stores
	candy and nut stores	722110 Steak houses
	meat markets	722110 Pizzerias, full service
		722212 Cafeterias
		722211 Limited Service Restaurants
		722211 Fast-food restaurants
		722211 Pizza parlor, limited service
		722211 Pizza delivery shops
		722211 Delicatessens
		722211 Sandwich shops
		722110 Bagel shops, full service
		722213 Beverage bars
		722213 Doughnut shops
		722213 Ice cream parlors
		722213 Pretzel shops
		722330 Mobile Food Service



Table 2: Students' eating behaviors versus socioeconomic background

	Healthy		Intermediate		Unhealthy		Total		χ^2 value $p < 0.05$
	n	row%	n	row%	n	row%	n	col %	
Gender									
Female	83	(21)	48	(12)	258	(66)	389	(60)	7.3009
Male	41	(16)	22	(8)	201	(76)	264	(40)	p = 0.026
RACE									
White	15	(18)	11	(13)	58	(69)	84	(13)	12.9429
Hispanic/Latino	89	(21)	41	(10)	286	(69)	416	(64)	p = 0.044
African American	9	(13)	13	(19)	45	(67)	67	(10)	
Other	10	(12)	5	(6)	66	(81)	81	(13)	
Free lunch									
Free lunch	81	(18)	56	(13)	310	(69)	447	(70)	9.4662
Reduced	18	(22)	1	(1)	64	(77)	83	(13)	p = 0.0504
Paid	21	(20)	12	(11)	73	(69)	106	(17)	
Number of household members									
1 to 2	11	(28)	3	(8)	26	(65)	40	(8)	2.875
3 to 5	46	(17)	28	(10)	197	(73)	271	(53)	p = 0.579
Over 5	35	(17)	19	(9)	148	(73)	202	(39)	
Number of hh members working									
none	1	(8)	4	(33)	7	(58)	12	(2)	8.8841
1 to 2	60	(18)	27	(8)	240	(73)	327	(64)	p = 0.0641
3 to 5	29	(17)	18	(11)	123	(72)	170	(33)	
Number of cars									
none	34	(22)	21	(13)	101	(65)	156	(24)	5.5587
1 car	30	(15)	23	(12)	141	(73)	194	(30)	p = 0.2346
2 or more cars	60	(20)	26	(9)	217	(72)	303	(46)	
Family Types									
Both Parents not married	9	(13)	8	(11)	55	(76)	72	(14)	7.8746
Both Parents married	55	(21)	27	(10)	183	(69)	265	(52)	p = 0.2474
Single Header Family	25	(17)	10	(7)	114	(77)	149	(29)	
Other	2	(10)	4	(20)	14	(70)	20	(4)	
Citizenship									
No	14	(23)	5	(8)	41	(68)	60	(12)	1.3932
Yes	78	(17)	45	(10)	330	(73)	453	(88)	p = 0.4983
Born in U.S.A									
No	33	(19)	17	(10)	124	(71)	174	(36)	0.2316
Yes	91	(19)	53	(11)	335	(70)	479	(100)	p = 0.8907
mother born in U.S									
No	75	(18)	39	(9)	298	(72)	412	(81)	0.2722
Yes	17	(17)	11	(11)	71	(72)	99	(19)	p = 0.8728
Father born in U.S									
No	73	(17)	40	(10)	305	(73)	418	(85)	1.4764
Yes	13	(18)	10	(14)	48	(68)	71	(15)	p = 0.478
Working									
No	69	(17)	35	(9)	302	(74)	406	(79)	4.6352
Yes	23	(21)	15	(14)	69	(64)	107	(21)	p = 0.0985



Table 3: Factors affecting probability to visit unhealthy food

Variable	DF	Estimate	Std. Error	ChiSq	Pr > ChiSq
Constant	1	0.8886	0.4621	3.6982	0.0545
Availability of Food Environments within Walking Distance (1km) around home					
Availability of healthy food	1	-0.0535	0.0269	3.9483	0.0469
Availability of unhealthy food	1	0.0025	0.0119	0.0436	0.8346
Frequency to visit food environments	1	0.9320	0.3968	5.5183	0.0188
Youths' Socioeconomic Background					
Males	1	0.7432	0.2517	8.7204	0.0031
African American	1	1.0600	0.4332	5.9864	0.0144
Student working	1	-0.7001	0.2978	5.5269	0.0187
Free lunch coupon	1	-0.3199	0.2501	1.6355	0.2009
Live with married parents	1	-0.5218	0.2534	4.2404	0.0395
Number of household members working	1	0.1271	0.1328	0.9159	0.3386
Number of cars in household	1	0.2216	0.1446	2.3484	0.1254
Student born in the U.S.	1	-0.3017	0.2573	1.3752	0.2409
Father born in U.S.	1	-0.3342	0.3501	0.9115	0.3397
Log L = -265.3895					
Model Chi-sq. = 37.7313 (p = .0002)					
DF = 12					



Table 4: Factors affecting probability to visit healthy food

Parameter	DF	Estimate	Std. Error	ChiSq.	Pr > ChiSq.
Constant	1	-0.9713	0.4765	4.1561	0.0415
Availability of Food environments within Walking Distance (1km) around home					
Availability of healthy food	1	0.0606	0.0294	4.2463	0.0393
Availability of unhealthy food	1	-0.0187	0.0143	1.7279	0.1887
Frequency to visit food sources	1	-0.4906	0.4470	1.2048	0.2724
Youths' Socioeconomic Background					
Males	1	-0.6410	0.2893	4.9101	0.0267
African American	1	-0.5660	0.4687	1.4585	0.2272
Student working	1	0.6347	0.3324	3.6450	0.0562
Live with married parents	1	0.5393	0.2977	3.2813	0.0701
Number of household members working	1	-0.1287	0.1563	0.6783	0.4102
Number of cars in household	1	-0.1565	0.1659	0.8905	0.3453
Father born in the U.S.	1	-0.0252	0.3897	0.0042	0.9483
Log L = -213.9345					
Model Chi-sq. = 18.4590 (p = .0477)					
DF = 10					