Published in final edited form as:

Am J Prev Med. 2016 November ; 51(5): e119–e127. doi:10.1016/j.amepre.2016.04.019.

Adult BMI and Access to Built Environment Resources in a High-Poverty, Urban Geography

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Abstract

Introduction—The purpose of this study is to examine the relationship between BMI and access to built environment resources in a high-poverty, urban geography.

Methods—Participants (aged 35 years) were surveyed between November 2012 and July 2013 to examine access to common health-enabling resources (grocers, outpatient providers, pharmacies, places of worship, and physical activity resources). Survey data were linked to a contemporaneous census of built resources. Associations between BMI and access to resources (potential and realized) were examined using independent *t*-tests and multiple linear regression. Data analysis was conducted in 2014–2015.

Results—Median age was 53.8 years (N=267, 62% cooperation rate). Obesity (BMI ≥ 30 kg/m²) prevalence was 54.9%. BMI was not associated with potential access to resources located nearest to home. Nearly all participants (98.1%) bypassed at least one nearby resource type; half bypassed nearby grocers (realized access >1 mile from home). Bypassing grocers was associated with a higher BMI (*p*=0.03). Each additional mile traveled from home to a grocer was associated with a

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Author contributions are as follows. Study concept and design: ELT and STL. Acquisition of data: JAM, MEP, and STL. Analysis and interpretation of data: all authors. Drafting of the manuscript: all authors. Critical revision of the manuscript for important intellectual content: all authors. Statistical analysis: ELT, VE, and JAM. Obtaining funding: STL. Administrative, technical, or material support: STL. Supervision: STL. Final approval of the version to be published: all authors.

STL is founder and co-owner of a social impact company NowPow, LLC, developed as the sustainable business model expected by a Centers for Medicare and Medicaid Services Health Care Innovation Award (1C1CMS330997-03-00, 2012-15). This award did not directly support the research described in this manuscript. No other financial disclosures were reported by the authors of this paper.

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0.9 kg/m²–higher BMI (95% CI=0.4, 1.3). Quality and affordability were common reasons for bypassing resources.

Conclusions—Despite potential access to grocers in a high-poverty, urban region, half of participants bypassed nearby grocers to access food. Bypassing grocers was associated with a higher BMI.

Introduction

Racial and ethnic disparities in obesity and obesity-related disease are growing in the U.S.^{1,2} According to the Centers for Disease Control and Prevention, African American and Hispanic people are 50% more likely than non-minorities to be obese; non-Hispanic blacks have the highest age-adjusted rates of obesity (47.8%) compared with non-Hispanic whites (32.6%).^{1,2} These disparities have been attributed to residential segregation by race^{3,4} and growth in the geographic concentration of poverty in urban neighborhoods.^{5,6} Public health efforts to eliminate obesity-related disparities have thereby prompted a focus on the built environment, within high-poverty minority communities, as a potentially mutable factor.¹

Defined as the physical spaces or structures created by people for day to day use,⁷ the built environment can enable people to maintain a healthy body weight or it can promote obesity. The availability of fresh food,^{8,9} recreational spaces,¹⁰ and community spaces^{11,12} has been associated with lower rates of obesity. Alternatively, fast food restaurants and decayed physical structures have been associated with higher rates of obesity.¹³ Other studies have found no association between the built environment and body weight.^{14,15} One longitudinal experiment followed obesity-related outcomes of public housing residents in five major U.S. cities over 14 years. People who were randomized at baseline with the opportunity to move from a neighborhood with high levels of poverty to a neighborhood with low levels of poverty were less likely to develop severe or morbid obesity.¹⁶ This finding suggests the possibility of a causal relationship between neighborhood characteristics and obesity among low-income people. Although prior studies have focused mainly on proximity to resources in the built environment as the driver of this relationship,¹⁷ little is known about how individual use of built resources relates to patterns of obesity. One prior study demonstrated that only one in seven participants reported shopping at the nearest supermarket,¹⁸ suggesting that most participants bypassed nearest supermarkets to access food. However, contrary to expectations, additional travel to a supermarket was not associated with a higher risk of obesity.¹⁸

Northridge and colleagues⁷ describe a multilevel ecosocial model to explain the pathways through which differential access to built resources can influence health. This model identifies the built environment as an intermediate factor that is particularly elastic to policy manipulation, including land use and community development strategies. Similarly, Andersen's model¹⁹ identifies “enabling resources” as the only “highly mutable” factor in the pathway to health, in comparison with other characteristics (demographics, health beliefs) that may be less sensitive to external change. Andersen describes the presence of resources as “potential access,” and the use of resources as “realized access.” This study

applies concepts from both of these theoretic frameworks to describe potential versus realized access to enabling built resources.

This study uses primary individual data (including measured BMI) obtained from a population-based study and primary built environment data obtained from a contemporaneous census on Chicago's South Side to describe the distribution of common health-enabling resources (grocers, outpatient providers, pharmacies, places of worship, physical activity resources) and how access to resources relates to BMI. Based on inconsistencies from prior studies, this study tests the null hypothesis that there is no systematic association between the presence of nearby enabling resources (potential access) and BMI within a high-poverty, urban region. Building on prior studies, it also retests the hypotheses¹⁸ that: (1) many people bypass nearby enabling resources to access more-distant enabling resources (realized access); and (2) the distance traveled to realize access is associated with a higher BMI.

Methods

Study Design and Participants

This study was conducted within a 62-square mile area on Chicago's South Side, a densely populated (528,000) urban region with a high proportion of African American (77%) and Hispanic (13%) people living in poverty (55% <200% federal poverty level).²⁰

Using a list of probabilistically sampled addresses, the study sample was recruited between November 2012 and May 2013 from two geographic epicenters: one including a predominantly African American population (five contiguous census tracts), and one including a predominantly Hispanic population (two contiguous census tracts). Contact was attempted by letter, then by phone, and finally by in-person visits. Eligible individuals included those aged ≥35 years who spoke English or Spanish. This study was conducted with approval from the University of Chicago IRB and with written documentation of informed consent.

Data Collection

Survey data and biomeasures were collected by trained interviewers; most were college students (48%) or local residents (43%); 23% were Spanish-speaking. Hour-long, in-person interviews were conducted in peoples' homes using computer-assisted personal interviewing software (Qualtrics)²¹ on tablets.

Asset data were obtained from a comprehensive census conducted by the 2012 MAPSCorps program (www.mapscorps.org).²² MAPSCorps provides science, technology, engineering, and mathematics training for Chicago South Side youth who work with science-oriented college students to identify and classify every open and operating, public-facing business and organization in the region.²³ In 2012, MAPSCorps identified >8,000 assets in the study region: 153.9 assets per 10,000 population including 1.2 pharmacies, 1.2 physical activity resources, 3.7 grocers, 4.1 outpatient clinics, and 17.6 places of worship.

Measures

Data on sociodemographic characteristics (age, self-identified race, ethnicity, gender, income, and education) were collected using items adapted from national surveys.^{24–26}

To capture “potential access” to resources, MAPSCorps data were used to identify the “nearest resource” for a subset of common enabling resource types identified as important levers by the Robert Wood Johnson Foundation Commission to Build a Healthier America,^{27,28} including access to health care (e.g., outpatient providers, pharmacies), access to healthy food (e.g., grocers), opportunities for physical activity (e.g., gyms, fitness classes), and promoting a culture of health in neighborhoods (e.g., places of worship). Although not the full range of resources identified by the Robert Wood Johnson Foundation framework, the resources included in this study are integrally linked, directly or indirectly, to a healthy environment that enables healthy body weight.²⁷ It is important to acknowledge that some resources (e.g., pharmacies) may contain items that negatively influence body weight (e.g., junk food) in addition to the items that positively influence body weight (e.g., sports equipment, scales, fresh produce²⁹). Using ArcGIS, version 10.1, Euclidian distance and driving time were calculated, in miles and minutes (at legal speed without traffic or stoplights), between the participant’s home and each nearest resource. Both distance and driving time were calculated because the survey did not elicit the mode of transportation used (e.g., walking, bus), which could influence access to each resource. U.S. Department of Agriculture walkability³⁰ or convenient facilities³¹ criteria were applied to define a “nearby resource” as those resources located 1 mile or 5 minutes from the participant’s home, respectively. Definitions for “nearby” are based on different approaches in the prior literature,^{30,31} and are not equivalent (e.g., 1 mile does not equal 5 minutes). Applying Andersen’s behavioral model,¹⁹ nearest or nearby resources indicated “potential access” to resources; “bypassing” was defined as not using nearest or nearby resources relative to home (Appendix 1).

To assess the reasons for not using (bypassing) nearest resources, participants were asked a series of questions about the two grocers and two pharmacies that were located closest to their home, based on Euclidean distance. Participants were shown photographs of each grocer and pharmacy and asked: *Do you know this place?* Participants who reported knowing the place were asked: *In the past 12 months, how often did you go to this place?* Participants who reported never using the place were asked: *Why don’t you buy most of your groceries/medicine here?* Interviewers coded these open-ended responses as: *poor quality, high price, can’t take the bus, too far, hours are inconvenient, or other*. “Other” responses were later coded by the investigators using grounded theory and axial coding techniques. All responses were subsequently grouped into the following categories: poor quality, high price, preference, inconvenience, safety concerns, health system factors (e.g., lack of insurance), lack of awareness, or other. To develop internal consistency, coding was performed by two investigators and discrepancies were resolved by the research team.

To capture “realized access” to resources, survey items were adapted from the Los Angeles Family and Neighborhood Survey.³² Survey participants were queried about the one place they usually go to exercise, see a doctor, buy medicine, and attend spiritual services. Participants were also asked about the two places they go to buy most of their groceries.

Following the interview, MAPSCorps 2012 data were used to identify or verify the addresses of each “utilized resource,” and ArcGIS, version 10.1 to calculate Euclidian distance and driving time between the participant’s home and each utilized resource. Utilized resources indicated “realized access” to resources.¹⁹

Height and weight were measured at the time of interview to calculate BMI, using digital scales and measurement tapes based on a previously described protocol.^{33,34} BMI was calculated as $\text{mass/height}^2 \times 703 \text{ kg/m}^2$.

Statistical Analysis

Participants with incomplete height or weight data were excluded from all analyses (4.5%). Overall missingness was low for all survey items (4.5%), with the exception of income (8.2%). Descriptive statistics were calculated for sociodemographic characteristics and to quantify distances and driving times to nearest and utilized resources.

Independent *t*-tests were used to detect significant differences in BMI between those who bypassed and those who did not bypass nearby resources. Respondents were limited to those who had at least one nearby resource for each resource type. The distribution of reasons for bypassing the nearest grocer or pharmacy was described.

Unadjusted and multiple linear regression models were used to evaluate relationships between BMI (continuous dependent variable) and measures of the built environment (continuous independent variables), including distance and time to each nearest and utilized resource type. For this analysis, if a participant reported using two grocers, the distance and time to each grocer were averaged, because participants reported using each grocer with a similar frequency distribution in the sample population (Appendix 2).

All regression models adjusted for age and gender; other sociodemographic characteristics considered for inclusion were race, education, and income based on known relationships to the dependent variable.^{4,35} Self-reported health status,³⁶ routine physical activity,³⁷ and vehicle access,³⁸ were also considered for inclusion, which have been identified in prior studies as related to the environment and BMI. Finally, duration of residence was considered for inclusion, because limited exposure to the neighborhood’s built environment would be expected to attenuate the relationship between the environment and BMI. Models were built for each primary independent variable of interest. Preliminary models included all covariates associated with BMI ($p < 0.10$, student’s *t*-test). Using backward selection, each covariate was removed from the model starting with the least significant variable; variables significant to the model ($p < 0.10$, log-likelihood ratio test) or demonstrating a meaningful change in effect (change in coefficient $> 20\%$) were reentered into the model. Final models adjusted for age, gender, education, and/or self-reported health status.

Data analysis was conducted in 2014–2015 using Stata, version 13.1.

Results

The overall response rate was 45%; the cooperation rate was 62% (N=267).³⁹ Of the 950 fielded addresses, 267 households completed interviews, 167 eligible households did not

complete interviews, 261 households had unknown eligibility, and 255 households were ineligible (e.g., respondents aged <35 years). Most respondents identified as non-Hispanic black (69%) or Hispanic/Latino (19%). The majority of participants (60%) reported living in their neighborhood for >5 years. Obesity prevalence (BMI ≥ 30) was 55% (Table 1).

In this region, median distance to nearest enabling resources (potential access) was 1 mile for all resource types (Table 2), thereby meeting U.S. Department of Agriculture walkability criteria for medium or high potential access to resources.³⁰ Corresponding driving time measures yielded similar results (Table 2). Despite the presence of enabling resources meeting at least medium access criteria, many participants used resources farther than the resources nearest to their homes (Table 2). Less than half of participants used the nearest pharmacy (49.4%) or grocer (33.8%); even fewer used the nearest place of worship (13.0%) or outpatient provider (7.0%). Physical activity resources met medium access criteria (median [interquartile range]=0.9 [0.4, 1.1] miles), but very few participants utilized any physical activity resources (11.2%), thereby limiting further analyses of this resource type.

For grocery stores, participants reported poor quality (56.0%) and cost (36.5%) as the most common reasons for not using the nearest resource (Appendix 3). Preference, poor convenience, and safety concerns were cited less often. For pharmacies, participants reported cost (30.5%) and preference (23.8%) as their most common reasons for not using the nearest resource, with fewer expressing concerns about quality (9.5%; Appendix 3).

Based on distance criteria (Appendix 1), most participants had a nearby outpatient provider (87.9%), grocer (91.0%), or place of worship (98.1%). Approximately half had a nearby physical activity resource (56.6%) or pharmacy (44.6%). Nearly all participants bypassed at least one nearby resource type (98.1%). Most bypassed nearby outpatient providers (92.2%) or places of worship (63.1%); almost half bypassed nearby grocers (49.6%) or pharmacies (45.8%; Table 3). Comparing BMI between groups traveling >1 mile and those traveling ≤ 1 mile, BMI was significantly higher among those bypassing grocery stores ($p=0.02$; Table 3). Comparing BMI between groups driving >5 minutes and those driving ≤ 5 minutes, BMI was significantly higher among those bypassing grocery stores ($p=0.03$), pharmacies ($p=0.04$), and places of worship ($p=0.02$; Table 3).

Respondents' BMI was not associated with distance or driving time to nearest enabling resources (potential access; Table 4). However, BMI was associated with distance to utilized grocer (realized access) in both unadjusted and adjusted models. Each additional mile traveled to the utilized grocer was associated with a 0.9 kg/m²-higher BMI ($p<0.001$; Table 4). Participants traveled an average distance of 1.7 miles farther to their utilized grocer, which was equivalent to a 1.5 kg/m²-higher BMI. Distances to pharmacy, outpatient provider, and place of worship were not significantly associated with BMI.

Participants' BMI was also associated with driving time to utilized grocer and pharmacy in both unadjusted and adjusted models. Each additional minute traveled to utilized grocer was associated with a 0.3 kg/m²-higher BMI ($p<0.001$); each additional minute traveled to utilized pharmacy was associated with a 0.1 kg/m²-higher BMI ($p=0.026$; Table 4). Driving

times to outpatient provider and place of worship were not significantly associated with BMI.

Discussion

This study supports the hypothesis that there is no systematic association between the presence of nearby enabling resources (potential access) and BMI. Prior studies hypothesize that proximity to available resources (potential access) largely influences health behavior and outcomes.¹⁷ For example, “food deserts,” geographic areas with low potential access to healthy foods, have been identified as a chief correlate of obesity.³⁰ However, other studies question these findings.^{14,15} One recent study evaluating neighborhood food outlets and BMI among adults in Los Angeles found no association between the proximity of participants’ homes to nearby food outlets and BMI.¹⁵ In the relatively homogenous population of urban-dwelling adults sampled in this study, there was no association between proximity (potential access) to any of the evaluated health-enabling resources and BMI.

This study captures unique data to support an alternative hypothesis, that variations in the individual use of resources (realized access) may play an overlooked role in mediating associations between the built environment and health. The presence of a potential resource may serve as an indirect measure of resource utilization in neighborhoods with little bypassing, but becomes an ineffective measure in neighborhoods with profuse bypassing. Among this sample of predominantly high-poverty African American and Hispanic people with disproportionately high rates of obesity (55%), most (98%) bypassed at least one nearby resource to use a more distant one; half bypassed nearby grocers. Contrary to the findings presented by Drewnowski et al.,¹⁸ additional travel to a grocer was associated with a higher BMI in this study population, and may reflect barriers to realizing access in high-poverty neighborhoods. For instance, someone who travels farther to a grocery store for more-affordable prices may purchase groceries less frequently and, consequently, substitute fresh produce for processed foods with a longer shelf life. Alternatively, it could be that obesity itself changes behavior. People with a higher burden of chronic disease may be willing to travel farther for higher-quality resources, or may travel farther to avoid obesity-related social stigma.⁴⁰

Uncovering the reasons why people in high-poverty communities choose to “bypass” local resources may be essential in designing lifestyle modification strategies for high-risk populations (Appendix 3).^{41,42} One study examined 373 Philadelphia grocers in disadvantaged neighborhoods and found that the majority of participants bypassed nearby corner grocery stores for higher-quality supermarkets,⁴¹ thereby proposing quality as a modifier between resource utilization and health. This study supports these findings and suggests additional reasons that people may travel farther to use resources. Quality (e.g., “poor brand selection”), cost (e.g., “I don’t save a lot”), and personal preference (e.g., “I like to purchase in bulk”) were frequently cited reasons for bypassing the neighborhood built environment (Appendix 3).

This study has several important strengths. Many large cross-sectional studies have relied on commercially available secondary data sets to quantify the built environment.^{14,15} However,

a Chicago-based study found that a commonly used commercially available data set was only 60% sensitive using a direct observation criterion standard.²² Few studies have used directly observed census data for measures of the built environment.^{18,41} This is the only study that uses both directly observed census data of built resources collected contemporaneously with individual data on resource utilization and measured BMI.

Limitations

There are several limitations to this study. First, this is a cross-sectional analysis, which limits causal inference. Second, this study was able to describe proximity to physical activity resources, but was unable to conduct a full evaluation owing to limited participants reporting use of these resources (11.2%). Third, the survey data reflected a subset of resource types identified by the Robert Wood Johnson Foundation Commission,²⁸ but did not query use of other potentially relevant resource types (e.g., Weight Watchers). This was a single region study of a relatively socioeconomically homogenous population; generalizability to other populations may be limited and comparisons describing disparities between advantaged and disadvantaged populations were not possible. Finally, covariates addressing vehicle access and physical activity behaviors were not significant in bivariate analyses, perhaps because survey items were vulnerable to differential respondent interpretations (e.g., vehicle ownership versus use, exercise frequency versus intensity).

Conclusions

As health care shifts toward population health and value-based payments, healthcare systems are increasingly incentivized to consider neighborhood context in designing strategies that target high-risk populations. This study suggests that improving proximity (potential access) to resources may be insufficient to address the many barriers to realizing access in a high-poverty, urban setting. Consequently, further exploration of the individual use of health-enabling resources may be critical to capturing the underlying mechanisms that mediate downstream health behaviors and consequences. For example, health system–led prevention strategies could target individual barriers to access by using personalized tools to identify acceptable resources.⁴³ Public health and community development–led prevention strategies could allocate and market health-enabling resources in a way that addresses cost, quality, and other barriers. These types of strategies will be essential for improving realized access to population-matched resources in vulnerable neighborhoods.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

The project described was supported in part by grant number 1C1CMS330997-03-00 from the U.S. DHHS, Centers for Medicare and Medicaid Services. The content of this paper is solely the responsibility of the authors and does not necessarily represent the official views of the U.S. DHHS or any of its agencies. The research presented was conducted by the awardee. Findings to date may or may not be consistent with or confirmed by the findings of the independent evaluation contractor.

Support for the South Side Health and Vitality Studies (SSHVS) Population Health Studies was provided by the University of Chicago Medicine Urban Health Initiative, individual philanthropy to the Lindau Laboratory at the University of Chicago, and the Chicago Core on Biomeasures in Population-Based Health and Aging Research supported by NIH/NIH P30 AG012857 at NORC and the University of Chicago. The efforts of STL, JAM, and VE on this manuscript were also supported in part by the NIH/National Institute on Aging 1R01 AG 047869-01 at the University of Chicago. MEP and ELT were supported by the Chicago Center for Diabetes Translation Research (National Institute of Diabetes and Digestive and Kidney Diseases P30DK092949). ELT was also supported by the Ruth L. Kirschstein National Research Service Award (T32 HS000078-17).

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Table 1

Participant Characteristics: South Side Health and Vitality Studies Population Health Study, Chicago, IL, 2012–2013^a

N=267	n	%
Demographic characteristics		
Age (years)		
35–50	95	35.6
51–70	136	50.9
71+	36	13.5
Gender		
Female	168	62.9
Male	99	37.1
Race		
Black non-Hispanic	182	68.9
Hispanic	51	19.3
White non-Hispanic or Other	31	11.7
Education		
Less than secondary school	71	26.6
Secondary school graduation or GED	84	31.5
Some post-secondary school	57	21.4
Post-secondary school degree	55	20.6
Income (per year)		
< \$25,000	109	44.5
\$25,000–49,999	78	31.8
\$50,000–99,999	44	18.0
\$100,000+	14	5.7
Health status		
Poor	12	4.5
Fair	74	27.8
Good	111	41.7
Very good	49	18.4
Excellent	20	7.5
Physical activity		
No routine physical activity	116	43.6
Home physical activity	76	28.6
Outdoor physical activity	44	16.5
Gym or fitness center physical activity	30	11.3
Duration of residence		
<1 month	3	1.1

N=267	n	%
1 month and <1 year	25	9.4
1–5 years	80	30.0
6–10 years	35	13.1
>10 years	124	46.4
Vehicle access		
No vehicles	72	27.2
1 or more vehicles	193	72.8
BMI (kg/m²)^b		
Underweight or normal (BMI < 25)	45	17.7
Overweight (BMI 25–29.9)	70	27.5
Obese (BMI ≥ 30)	140	54.9
<i>Mean BMI ± SD</i>	<i>31.9 ± 7.6</i>	

^a Compared to U.S. census data from the American Community Survey (2012) for each of the 7 census tracts included in our study, our sample had slightly more middle-aged females (+11.7% ages 51–70 years, +10.8% female). All other characteristics (age, gender, race, education, and income) were similar (<10% difference) to census data.

^b BMI classifications are based on: WHO. BMI Classification. Global Database on Body Mass Index, 2006.

GED, General Educational Development test

Nearest and Utilized Built Resources Measured in Euclidean Distance and Driving Time

Built resource	Euclidean distance (d, miles)			Driving time (t, min)		
	Nearest resource (d _n)	Utilized resource (d _u)	Difference ^a (d _{diff} = d _u - d _n)	Nearest resource (t _n)	Utilized resource (t _u)	Difference ^a (t _{diff} = t _u -t _n)
		Median (IQR)			Median (IQR)	
Grocery store n=255	0.6 (0.4, 0.8)	1.8 (1.1, 2.9)	1.2 (0.5, 2.2)	1.4 (1.0, 1.8)	6.8 (4.3, 10.6)	5.5 (2.8, 8.9)
Pharmacy n=160	1.0 (0.7, 1.5)	1.2 (0.5, 3.6)	0.1 (0.0, 2.5)	2.0 (1.6, 2.7)	4.8 (2.1, 12.7)	2.1 (0.0, 10.3)
Outpatient provider n=244	0.7 (0.5, 0.9)	5.0 (2.4, 8.8)	4.3 (2.1, 8.0)	1.5 (1.2, 1.9)	17.1 (9.1, 28.1)	15.7 (8.1, 26.3)
Place of worship n=154	0.4 (0.2, 0.5)	1.8 (0.6, 4.3)	1.4 (0.2, 3.9)	1.0 (0.6, 1.2)	6.5 (2.6, 14.9)	5.7 (1.5, 13.7)

IQR, interquartile range

^aDefined as the 'added distance', or 'added time', traveled from home to the utilized resource minus the distance or time traveled from home to the nearest resource.

Table 3

Difference in Mean BMI Between Participants Bypassing and Not Bypassing Nearby Resources^a

Neighborhood resource	Euclidean distance (d, miles)			Driving time (t, min)		
	No bypassing	du	Bypassing	No bypassing	tu	Bypassing
	1.0	BMI (kg/m ²) ± se	p-value	5.0	BMI (kg/m ²) ± se	p-value
Grocery store	31.0 ± 0.6 (n = 116)	33.2 ± 0.8 (n = 114)	0.02*	31.2 ± 0.5 (n = 169)	33.3 ± 1.0 (n = 85)	0.03*
Pharmacy	32.1 ± 1.2 (n = 39)	31.7 ± 0.9 (n = 33)	0.6	32.3 ± 0.9 (n = 80)	34.5 ± 0.9 (n = 73)	0.04*
Outpatient provider	30.5 ± 1.9 (n = 16)	32.1 ± 0.6 (n = 189)	0.2	31.0 ± 1.5 (n = 24)	32.3 ± 0.5 (n = 211)	0.2
Place of worship	31.4 ± 1.0 (n = 52)	33.3 ± 0.9 (n = 89)	0.07	31.1 ± 0.9 (n = 62)	33.7 ± 0.9 (n = 82)	0.02*

Note: Boldface indicates statistical significance (* $p < 0.05$).

^aFor all resource types, this analysis was restricted to only those participants with 'nearby' resources, defined as 1 mile in the distance analysis (left) and 5 minutes in the time analysis (right). Participants without any nearby resources were excluded from each analysis.

Table 4

Association Between Access to Built Resources and BMI

	Distance to nearest resource (d _n)		Distance to utilized resource (d _u)	
	Unadjusted b	Adjusted b ^a BMI (kg/m ²) ± se (95% CI)	Unadjusted b	Adjusted b ^a BMI (kg/m ²) ± se (95% CI)
Neighborhood resources				
Grocery store n=255	-0.8 ± 1.8 (-4.3-2.7)	-0.7 ± 1.8 ^b (-4.2-2.7)	0.9 ± 0.2** (0.4-1.3)	0.9 ± 0.2**^b (0.4-1.3)
Pharmacy n=160	1.2 ± 0.8 (-0.4-2.8)	1.3 ± 0.8 ^b (-0.3-2.8)	0.3 ± 0.2 (0.0-0.6)	0.2 ± 0.2 ^c (-0.1-0.5)
Outpatient provider n=244	0.4 ± 1.7 (-3.0-3.8)	1.0 ± 1.7 ^d (-2.3-4.3)	0.1 ± 0.1 (-0.1-0.3)	0.2 ± 0.1 ^b (0.0-0.4)
Place of worship n=154	-1.5 ± 2.2 (-5.9-2.9)	-1.5 ± 2.2 ^b (-5.8-2.8)	0.1 ± 0.2 (-0.4-0.5)	-0.1 ± 0.2 ^d (-0.6-0.4)
	Time to nearest resource (t _n)		Time to utilized resource (t _u)	
	Unadjusted b	Adjusted b ^a BMI (kg/m ²) ± sd (95% CI)	Unadjusted b	Adjusted b ^a BMI (kg/m ²) ± sd (95% CI)
Neighborhood resources				
Grocery store n=255	-0.6 ± 0.9 (-2.4-1.2)	-0.5 ± 0.9 ^b (-2.2-1.3)	0.3 ± 0.1** (0.1-0.5)	0.3 ± 0.1**^b (0.1-0.5)
Pharmacy n=160	0.6 ± 0.5 (-0.4-1.5)	0.6 ± 0.5 ^b (-0.3-1.6)	0.1 ± 0.1* (0.0-0.2)	0.1 ± 0.1*^a (0.0-0.2)
Outpatient provider n=244	0.0 ± 0.9 (-1.6-1.7)	0.2 ± 0.8 ^b (-1.4-1.9)	0.0 ± 0.0 (0.0-0.1)	0.1 ± 0.0 ^b (0.0-0.2)
Place of worship n=154	-1.0 ± 0.9 (-2.8-0.9)	-1.0 ± 0.9 ^b (-2.8-0.8)	0.0 ± 0.1 (-0.1-0.2)	0.0 ± 0.1 ^c (-0.2-0.2)

Note: Boldface indicates statistical significance (* $p < 0.05$; ** $p < 0.01$).

^a Adjusted for age and gender.

^b Adjusted for age, gender, and self-reported health status.

^c Adjusted for age, gender, and education.

^d Adjusted for age, gender, education, and self-reported health status.