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Relationships Between Physical Activity and Neighborhood Walking Characteristics: Analysis of the 2015 National Health Interview Survey

Colby Brown

ABSTRACT

RELATIONSHIPS BETWEEN PHYSICAL ACTIVITY AND NEIGHBORHOOD WALKING CHARACTERISTICS:
ANALYSIS OF THE 2015 NATIONAL HEALTH INTERVIEW SURVEY

By

COLBY DALE BROWN

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Abstract

INTRODUCTION: Adults engage in walking and other physical activity for a variety of reasons. Previous research has shown that neighborhood characteristics play a role in the decision-making process to walk or participate in physical activity in one's local neighborhood. Neighborhood characteristics may include access and nearby availability to sidewalks, paths, trails, markets, libraries, theaters, public transportation, and parks.

AIMS: The purpose of this work is to examine the association between neighborhood characteristics and participation in physical activity

METHODS: The 2015 National Health Interview Survey (NHIS) data was used. Participant data consisted of demographics and measures of physical activity. Neighborhood characteristics included accessibility and nearby availability of convenient walking spaces. Descriptive statistics and logistic regression models were used. Sampling weights were considered in the analysis, with comparisons made between unweighted and weighted results. The SAS SURVEY procedures were explored.

RESULTS: The total study sample was comprised of 33,672 participants. Weighted results showed 8,103 (238%) were physically active and participant characteristics included 51.8% female and 64.9% White/Caucasian. The weighted mean age was 47.1 years with a mean body mass index of 30.5. The majority of participants reported having trails/paths (85.1%) and parks (71.8%) available nearby and most reported walking for leisure or transportation (62.6%). Having trails/paths available nearby was associated with being physically active (OR 1.21 95% CI: [1.03,1.42], p=0.0245), as well as having places of entertainment like libraries or theaters (OR 1.18 95% CI: [1.08,1.30], p=0.0006). Parks being available to the participants also showed an association (OR 1.24 95% CI: [1.11,1.38], p=0.0002).

DISCUSSION: Neighborhood characteristics associated with physical activity included others walking in and around the neighborhood, paths and trail availability, shops/markets, libraries/theaters, and having parks or a place to relax nearby. These study results may be useful to decision-makers about what to build in and around neighborhoods for improved health of those communities.

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Author's Statement Page

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1. Introduction

Low levels of physical activity create problems for health and may contribute to non-communicable disease (Lee et al., 2012). Lee et al (2012) specifically state that physical inactivity and sedentary lifestyles increase modifiable risk factors in non-communicable diseases, like diabetes and certain types of cancer. Physical inactivity is a public health concern and levels in physical activity are limited as people age. Population life expectancy has been on the rise in recent decades. Table 1 provides information from the World Health Organization (WHO) showing the increase in life expectancy beginning in the year 2000 through the year 2015. In the year 2000, the average length of life was 76.8 years in the year 2000, the life expectancy increased to 79.3 years for both sexes by the year 2015.

The WHO is projecting the size of the world's population will grow over the next few decades. This may be due in part to increases in life expectancy. Increases in life expectancy (Table 1) creates another barrier to an active lifestyle since increases in age are associated with decreases in physical activity (McPhee et al., 2016). Physical activity is essential older adults and lends to improved quality of life (Anokye et al., 2012). However, life expectancy is not the only potential barrier that interferes with physical activity. Urbanization (e.g., migration from rural to urban areas) continues to increase (Table 2) (WHO, 2016). Neighborhood characteristics in urban areas may possibly hinder participation in physical activity due to a lack of sidewalks recreational area, or park availability. Fear of crime in certain locales, as well as high traffic areas, may hinder participation in physical activity (e.g., outdoor activities) (WHO, 2016). Accessibility to a neighborhood setting that promotes physical activities through urban planning and design may help increase activity levels (Humpel, Owen, & Leslie, 2002).

Neighborhood characteristics, including its physical characteristics (i.e. residential density, mixed land uses, street layouts and block lengths), may contribute to an increase or decrease in physical activity (Saelens, Sallis, Black, & Chen, 2003). In addition to these characteristics, neighborhood characteristics also may include existence of sidewalks, walking paths or trails, local shops (i.e. supermarkets), churches, restaurants, accessible public transportation and public parks. (Diez Roux, 2001).

The purpose of this research project is to examine the association between neighborhood characteristics and participation in physical activity. A secondary data analysis using the National Health Interview Survey will be conducted to assess this relationship.

2. Literature Review

2.1 Physical Activity

Physical activity is defined as movement by skeletal muscles that requires energy expenditure (WHO, 2017). Physical inactivity is a major contributor to chronic disease, disability, and premature mortality that is not limited to specific ages and must be addressed with all age groups (Haskell, Blair, & Hill, 2009). The WHO estimates that 60% of the world's current population does not take part in enough physical activity, with adults in developed countries most likely to be inactive. Data on the health benefits are favorable for youth, specifically in biomarkers for cardiovascular disease, metabolic syndrome, increased bone and muscle strength and less adiposity (Strong et al., 2005). The benefits are extensive for adults (18-64 years of age) and include reduction in risk of falls, injuries from falls, cardiovascular disease, hypertension, type 2 diabetes, types of cancers and anxiety (Nelson et al., 2007). In addition to the reduced risks for adults that participate in physical activity, active seniors (65+

years of age) report 'less depression, better cognitive function and report higher scores on indices of health-related quality of life'. Increases in an older adults' endurance and strength can contribute to sustained physical independence (living in unassisted living conditions) (Nelson et al., 2007). The benefits for active seniors and adults are encouraging but there is evidence of decreased physical activity as age increases (McPhee et al., 2016; Anokye et al., 2012).

The CDC's 2008 Physical Activity Guidelines for Americans provides guidelines for the amount of physical activity to undertake, which suggests adults should aim for exceeding 150 minutes per week for moderate to light activity or 75 minutes per week for vigorous activity ("CDC - Current Physical Activity Guidelines," 2008). Achieving additional benefits may be possible by being physically active for longer amounts of time. (Lauer, Jackson, Martin, & Morrow, 2017). Physically active individuals may benefit from longer and healthier lives. However, as of 2008, only one in five adults met these published standards ("CDC - Current Physical Activity Guidelines," 2008).

These science-based guidelines aim help Americans aged 6 and older improve their health through appropriate amounts of physical activity (U.S. Department of Health and Human Services, 2008). The CDC makes this information freely available on their website (https://www.cdc.gov/cancer/dcpc/prevention/policies_practices/physical_activity/guidelines.htm) andhttps://health.gov/paguidelines/guidelines/summary.aspx. Similar guidelines are also published by the World Health Organization (http://www.who.int/dietphysicalactivity/factsheet_adults/en/).

2.2 Neighborhood Characteristics

Neighborhood characteristics may include structures such as sidewalks, walking paths or trails, local shops (i.e. supermarkets), churches, restaurants, accessible public transportation and public parks. This type of research has received increasing attention in the past three decades (Diez Roux, 2001). Prior to that, the association between individual-level risk factors (i.e. blood pressure, cholesterol levels, risk of chronic disease, race, smoking status, sex) and neighborhood characteristics (i.e. societal make up of community, depravity of community, neighborhood conditions like crime level) received little attention (Diez Roux, 2001). Public health interests include the built environment, as well as location of residence and the relationships between physical and social environments. (Diez Roux, 2001; Diez Roux, 2007; Robert J. Sampson, Jeffrey D. Morenoff, & Gannon-Rowley, 2002).

Urban planners often consider neighborhoods or communities with respect to the possibility of pedestrian activity. Pedestrian-oriented or walkability may be used to describe neighborhoods based on 5 constructs. First, density of the development is considered, which refers to the amount of people residing in a given area. Next are the mix of land uses that can be defined as how many ways a common area of land can be used. Third, street network with high connectivity indicates the availability of routes through a locale. Another consideration is the amount of space from the street to buildings. Lastly, desirable aesthetic qualities may be considered, such as the attractiveness or appeal of a location. These qualities can make walking or physical activity more viable and appealing (Handy, Boarnet, Ewing, & Killingsworth, 2002).

Neighborhoods or communities that are not densely populated, do not use areas of land for multiple purposes, limited number of streets connecting to other roads or destinations,

small amounts of space between streets and buildings for walking and poor appeal of locations can help label a community as more automobile oriented, in that walking is a significant challenge (Handy, Boarnet, Ewing, & Killingsworth, 2002).

Measurements considered in studies of neighborhood characteristics have also included crime and safety of walking/jogging paths, sidewalk availability, and quality of sidewalks (Kwarteng, Schulz, Mentz, Zenk, & Opperman, 2014). In addition, paths leading to other facilities used in physical activity, amount of traffic in an area, terrain characteristics (i.e. hills), convenience of local facilities, scenery, wild animals or unconfined animals, weather, and proximity of facilities to the individual residence (Humpel, Owen, & Leslie, 2002; McGinn, Evenson, Herring, Huston, & Rodriguez, 2007). Aesthetic qualities and available facilities were commonly identified as meaningful characteristics associated with physical activity (McGinn, Evenson, Herring, Huston, & Rodriguez, 2007; Hoehner, Ramirez, Elliott, Handy, & Brownson, 2005).

2.3 Relationship Between Neighborhood Characteristics & Physical Activity

Previous studies have quantified the relationship between neighborhood characteristics and physical activity (Kwarteng, Schulz, Mentz, Zenk, & Opperman, 2014; Humpel, Owen, & Leslie, 2002; McGinn, Evenson, Herring, Huston, & Rodriguez, 2007; Duhl, Sanchez, & Europe, 1999; Handy, Boarnet, Ewing, & Killingsworth, 2002; Saelens, Sallis, Black, & Chen, 2003; Hoehner, Ramirez, Elliott, Handy, & Brownson, 2005; Booth, Owen, Bauman, Clavisi, & Leslie, 2000). These studies have shown that crime and safety of walking/jogging paths, sidewalk availability, quality of sidewalks, paths leading to nearby facilities used in physical activity, amount of traffic in an area, terrain characteristics (i.e. hills), convenience of local facilities, wild

animals or unconfined animals, weather, aesthetic qualities and available facilities are associated with physical activity.

The study by Saelens, Sallis, Black, & Chen (2003) made use of two neighborhoods selected in the 1990 Census to compare walkability access. The two neighborhoods were comparable with respect to median income and median age of inhabitants and classified as low or high walkability. The high walkability neighborhood contained a small commercial concentration along the main street, whereas the low walkability neighborhood was primarily residential with commercial type buildings at its periphery. Also, the high walkability neighborhood had majority grid-like street construction characterized by short block lengths and fewer cul-de-sacs “which is indicative of greater street connectivity.” and the low-walkability neighborhood differed with respect to block lengths, mixture of grid-like and curvilinear street patterns, and more cul-de-sacs. A survey was also administered to obtain self-reported opinions on residential density, proximity to, and ease of access to, non-residential land uses such as restaurants and retail stores, street connectivity, walking/cycling facilities like sidewalks or trails, aesthetics, traffic safety and crime safety. Statistically significant differences between the neighborhoods were found with respect to body mass index, with favorable results for the high walkability group. Those study results “provides support for the hypothesis that macroenvironmental factors and trends in neighborhood design could be contributing to the obesity epidemic” (Saelens, Sallis, Black, & Chen, 2003).

It'd been common in the health literature to characterize a neighborhood with respect to its walkability (Houston, Basolo, & Yang, 2013; Leyden, 2003). Those authors referred to a neighborhood with walkability as one that scores high with respect to the following specific

qualities: residential density, mix land use, connectivity, and aesthetics. Residents of neighborhoods characterized with high-walkability reported higher residential density, mix of land use, street connectivity, aesthetics and safety. These residents also reported more minutes of physical activity than those that lived in low-walkability neighborhoods (Saelens, Sallis, Black, & Chen, 2003).

Other important neighborhood characteristics found in previous studies to be associated with physical activity included accessibility, aesthetics and safety of a neighborhood (Humpel, Owen, & Leslie, 2002). Having access to local facilities like parks and shops can increase physical activity participation. This relationship is stronger when individuals observe others being physically active (Hoehner, Ramirez, Elliott, Handy, & Brownson, 2005), sidewalks and paths are available (Booth, Owen, Bauman, Clavisi, & Leslie, 2000) and the walking environment in good condition (Kwarteng, Schulz, Mentz, Zenk, & Opperman, 2014).

3. Methods

3.I *Data Source & Sample*

The data used in this study were obtained through the National Health Interview Survey (NHIS). The data are widely used throughout the Department of Health and Human Services to track progress toward the achievement of national health objectives and is also available to the public. The survey is a cross-sectional household interview survey that targets civilian non-institutionalized persons that reside in the United States at the time of interview. The survey is continuously collected throughout the year to avoid seasonal biases and produces nationally representative samples each quarter. This dataset was chosen because of its popular use in the public health community and public availability.

The NHIS is a complex multistage probability sample that incorporates clustering and stratification. Data collected during the years from 1985-2015 used a process of oversampling of selected racial and ethnic groups. Each person selected from these groups represents a small number of individuals from that specific racial or ethnic group. The use of sampling weights corrects for the oversampling and creates a more nationally representative sample. The survey for this project is comprised of data from the year 2015. The total 2015 NIHS study sample included 33,672 individuals that were used in the analysis. The adults sampled were assigned weights reflecting the probability of being sampled. Accounting for the sampling weights allows for generalizability to a nationally representative sample.

Two 2015 NHIS data files were used, including the sample adult and the cancer file. Adults in the study were defined as 18 years of age or older. Participant characteristics were obtained from the sample adult file. Physical activity and neighborhood characteristics were obtained from the sample adult cancer file.

3.2 *Measures & Variables*

3.2.1 Participant Characteristics

The study sample included variables for sex age, and race. Here, race includes American Indian/Alaskan Native, Asian, Black/African-American, Hispanic/Latino, White/Caucasian and Other. The Other category contains responses from the NHIS survey that were not releasable due to respondent confidentiality or other reasons. The 'Other' category also contains multiple races if more races were entered after the 'primary' race was given. Marital status was included in this analysis as a social demographic measure and was dichotomized to married or not married. Age was measured in whole years and analyzed as a continuous variable.

Body Mass Index (BMI) was calculated as a function of height and weight, and categorizations into classifications of 'underweight', 'normal', 'overweight' or 'obese'. 'Underweight' was BMI less than 18.5, 'normal' weight was BMI between 18.5 and 24.9, 'overweight' as BMI between 25.0 and 29.9, and 'obese' with BMI greater than 30.0. BMI was included as a continuous variable. Walking as an activity was dichotomized as yes or no based on a question about walking in the survey. Walking for transportation and walking for leisure were also considered in this analysis. An individual that reported walking for leisure or transportation within the past seven days was engaging in walking activity.

3.2.3 Physical Activity – Dependent Variable

A dichotomous indicator of physical activity was used as the dependent variable. This was created by combining information from several variables. The cutoff thresholds provided in the 2008 Physical Activity Guidelines for Americans were used for defining physical activity. A subject with 150 minutes of moderate to light activity per week or 75 minutes of vigorous activity per week was considered physically active (U.S. Department of Health and Human Services, 2008).

3.2.4 Neighborhood Characteristics

Neighborhood characteristics included variables that described ways to get around the neighborhood, structures in it, or facilities to visit. An indicator for each of trails and paths was used. Local shops such as supermarkets or other retailers were considered distinct from theaters, churches and places of entertainment. Indicators were created for shop, transportation stations, and places of entertainment. An indicator for parks was also included, as well as a measure of participant experience of seeing other persons walking around the

neighborhood. Lastly, measures of safety were included, including an indicator of crime and traffic, as well as if the participant had seen animals loose.

3.3 *Statistical Analysis*

Statistical analyses were conducted using Statistical Analysis System version 9.4 software (SAS Institute Inc., Cary, N.C.). The level of significance in this work was set at α=.05. Descriptive analyses were applied to participant and neighborhood characteristics stratified by physical activity status. Logistic regression was used to model the dichotomous physical activity status outcome variable. Relationships between each individual covariate and the outcome were assessed with bivariate models and relationships were also assessed in a multivariable model controlling for all variables included in the study.

A probability sample is essential for generalizing results to the population of interest. The sampling design was accounted for with use of the SAS PROC SURVEY procedures. Sampling weights were used to obtain correct standard error estimates. For purposes of comparisons, results are presented for unweighted and weighted analyses.

Descriptive analyses with unweighted and SURVEY procedures in SAS were used. PROC FREQ in SAS produces unweighted counts and unweighted percentages. PROC MEANS produces unweighted means and standard deviations. The weighted percentages were calculated with the PROC SURVEYFREQ and PROC SURVEYMEANS procedures in SAS.

Logistic regression analyses were applied. The PROC LOGISTIC procedure in SAS produces unweighted odds ratio estimates, 95% confidence intervals and associated p-values per model for each bivariate or multivariable relationship while PROC SURVEYLOGISTIC allows

the researcher to apply survey weights for the same descriptive statistics. The weighted and unweighted results were then compared for differences and similarities.

The Akaike Information Criterion (AIC) is an information criterion statistic that can be used for model comparisons, including direct comparisons of unnested models. The goal of model selection is to find a parsimonious model, which strikes a balance between too few parameters/variables, that can introduce more bias, and too many parameter/variables, that can introduce more variance that alters the precision of estimation the smaller is better AIC statistic was used in this work (Burnham & Anderson, 2004).

4. Results

4.1 Descriptive Analysis

The descriptive statistics for participant characteristics are displayed in Table 3 and the descriptive statistics for neighborhood characteristics are displayed in Table 4. The total sample size included from the NHIS 2015 data set totaled 33,672 participants with 8,103 (23.76%) categorized as physically active. The total sample is mostly comprised of Female (51.80%), White/Caucasian (64.91%), and non-diabetic (88.64%) participants. The total sample had a weighted mean age of 47.1 (0.18) years with a weighted average body mass index (BMI) of 30.5 (0.12). The majority of the total sample of participants responded with having trails/paths (85.14%; weighted) and parks available nearby (71.83%) and most reported walking for leisure or transportation (62.59%).

The comparison of weighted and unweighted revealed some noticeable differences. Marital status showed the largest difference in frequency between unweighted and weighted percentages. Married changed from an unweighted percentage of (43.91%) to a weighted

percentage of (53.02%) versus not married 56.09%, 46.08%), respectively. Tables 3 and 4 show that most percentages were similar without meaningful differences observed Unweighted age changed by at least 2 years in each physical activity category with the addition of weights: Physically Active (48.7 years to 46.6 years); Not Physically Active (50.3 years to 47.3 years).

4.2 Unadjusted Logistic Regression Models

In exploratory analyses examining associations between participant characteristics and being physically active, Table 5 displays results for unadjusted logistic regression analysis. There was a larger proportion of physically active females than males, (OR 1.071, 95% CI: 1.019-1.127, p=0.0070). Interestingly, this association goes away with inclusion of sampling weights (OR 1.02, 95% CI: 0.949 – 1.098, p=0.5872). Walking for leisure or transportation is strongly associated with being physically active (OR 3.431, 95% CI:[3.138, 3.751], p <0.0001). The unweighted point estimate is slightly larger, although also statistically significant (OR 3.722, 95% CI:[3.493, 3.967], p<0.0001).

Associations between neighborhood characteristics and being physically active are displayed in Table 6. Having trails/paths or roads that are available for walking showed a positive association in the weighted analysis (OR 1.409, 95% CI:[1.244, 1.595], p <0.0001), and similar without sampling weights included (OR 1.482, 95% CI:[1.369, 1.605], p<0.0001). Places where participants could relax (i.e. parks) was positively associated with being physically active (weighted OR 1.686, 95% CI:[1.541, 1.844], p <0.0001), (unweighted OR 1.870, 95% CI:[1.756, 1.992], p<0.0001).

4.3 Adjusted Logistic Regression Models

Multivariable modeling results are displayed in Table 7. Participants having trails/paths available nearby were associated with being physically active (weighted OR 1.207 95% CI:[1.025, 1.421], p=0.0245) after controlling for all variables in the model. Park availability was associated with being physically active (weighted OR 1.236 95% CI:[1.106, 1.382], p=0.0002), (unweighted OR 1.339 95% CI:[1.232, 1.455], p<0.0001) after controlling for all variables in the model. The unweighted results for sex showed a positive association with being physically active (OR 1.012 95% CI:[0.952, 1.076], p=0.7018). However, after applying sampling weights, this association was interestingly negative, suggesting a change in direction. Having trails or paths available (weighted OR 1.207 95% CI:[1.025, 1.421], p=0.0245), entertain nearby (weighted OR 1.182 95% CI:[1.076, 1.299], p=0.0006), parks nearby (weighted OR 1.236 95% CI:[1.106, 1.382], p=0.0002) and walking for leisure or transportation (weighted OR 3.133 95% CI:[2.803, 3.502], p<0.0001) were positively associated with being physically active after controlling for all variables in the model. However, surprisingly, the results for having sidewalks was negative (weighted OR 0.832 95% CI:[0.741, 0.933], p=0.0018).

5. Discussion and Conclusion

The purpose of this study was to assess the relationship between neighborhood characteristics and their influence on participating in physical activity. Physical activity defined specifically as meeting the CDC guidelines for being physically active Neighborhood characteristics that were positively associated with being physically active included having trails, paths or roads that are available, entertainment nearby, and parks in close proximity. Sidewalk availability had an inverse relationship with being physically active. This is an

unexpected result and warrants further investigation. Walking for leisure or transportation was strongly associated with being physically active. Promoting walking activities in the community and neighborhood may be beneficial for encouraging physical activity. The findings in this study are aligned with previous study findings on the relationship between neighbor characteristics and being physically active. The probability sample provided a nationally representative sample that allows for generalizing study results. The NHIS study uses a cross sectional survey and allows for descriptive analyses. Causal inferences are not realistic in this setting. Work of this kind can be useful in the development and planning of future randomized studies to assess specifics of neighborhood characteristics that would be most beneficial in promoting physically activity in a selected community.

Table 1: Life expectancy (in years) at birth in United States stratified by sex

	Country				
Year	France	Germany	Mexico	U.K.	USA
1990	74.1	73.1	71.4	78.1	75.3
2000	75.9	73.1	74.7	78.7	79.1
2010	78.3	74.3	77.8	81.3	80.8
2020	80.6	76.4	80.6	83.8	82.5
2030	82.7	78.6	82.8	85.7	84.2
2040	84.6	80.9	84.7	87.3	85.9
2050	86.3	83.0	86.4	88.6	87.4

Table 2: Population (%) living in urban areas

	Country				
Year	France	Germany	Mexico	U.K.	USA
1990	74.1	73.1	71.4	78.1	75.3
2000	75.9	73.1	74.7	78.7	79.1
2010	78.3	74.3	77.8	81.3	80.8
2020	80.6	76.4	80.6	83.8	82.5
2030	82.7	78.6	82.8	85.7	84.2
2040	84.6	80.9	84.7	87.3	85.9
2050	86.3	83.0	86.4	88.6	87.4

Table 3: Descriptive statistics for demographics by physical activity status; includes unweighted counts, unweighted percentages, and weighted percentage

Variables	Physically Active Status											
	Yes				No				Total*			
	N	Unweighted (%)	Weighted (%)		N	Unweighted (%)	Weighted (%)		N	Unweighted (%)	Weighted (%)	
	8,103	24.06	23.76		25,569	75.94	76.24		33,672			
Sex												
Male	3732	46.06	48.58		11339	44.35	48.08		15071	44.76	48.20	
Female	4371	53.94	51.42		14230	55.65	51.92		18601	55.24	51.80	
Race												
White / Caucasian	5591	69.00	70.60		15264	59.70	63.14		20855	61.94	64.91	
Black / African America	786	9.70	8.80		3677	14.38	12.63		4463	13.25	11.72	
American Indian / Alaskan Native	88	1.09	0.97		304	1.19	0.94		392	1.16	0.95	
Asian	470	5.80	6.02		1513	5.92	5.89		1983	5.89	5.92	
Hispanic / Latino	956	11.80	11.33		4230	16.54	15.50		5186	15.40	14.51	
Other	212	2.62	2.28		581	2.27	1.90		793	2.36	1.99	
BMI												
Underweight	146	1.82	2.13		457	1.81	1.77		603	1.81	1.85	
Normal	2942	36.72	36.80		7733	30.60	31.72		10675	32.07	32.93	
Overweight	2716	33.89	33.69		8130	32.17	31.90		10846	32.59	32.32	
Obese	2209	27.57	27.38		8952	35.42	34.61		11161	33.53	32.90	
Marital Status												
Yes	3752	46.30	55.29		11035	43.16	52.32		14787	43.91	53.02	
No	4351	53.70	44.71		14534	56.84	47.68		18885	56.09	46.98	
Walk for leisure or transportation												
Yes	6350	82.21	81.70		13323	55.39	56.55		19673	61.91	62.59	
No	1374	17.79	18.30		10732	44.61	43.45		12106	38.09	37.41	
	Mean	SD	Mean	SE	Mean	SD	Mean	SE	Mean	SD	Mean	SE
Age	48.7	18.1	46.6	0.29	50.3	18.9	47.3	0.2	49.9	18.4	47.1	0.18
BMI	28.8	12.1	29	0.21	31.1	17.1	31	0.14	30.5	14.5	30.5	0.12

*N = Number of observations; BMI = Body Mass Index; Missing (Walking for transportation or leisure = 1893)

Table 4: Descriptive statistics for neighborhood characteristics stratified by physical activity; includes unweighted counts, unweighted percentages, and weighted percentages

Variables	Physically Active Status								
	Yes			No			Total*		
	N	Unweighted (%)	Weighted (%)	N	Unweighted (%)	Weighted (%)	N	Unweighted (%)	Weighted (%)
	8,103			25,569			33,672		
Others walk around neighborhood									
Yes	5853	90.80	88.22	17092	88.55	84.17	22945	89.11	89.15
No	593	9.20	11.78	2210	11.45	15.83	2803	10.89	10.85
Trails or paths available									
Yes	6873	89.05	88.22	20313	84.58	84.17	27186	85.67	85.14
No	845	10.95	11.78	3703	15.42	15.83	4548	14.33	14.86
Shops nearby									
Yes	4850	62.79	61.37	14227	59.23	57.27	19077	60.09	58.25
No	2874	37.21	38.63	9794	40.77	42.73	12668	39.91	41.75
Access to public transportation									
Yes	4294	56.64	54.92	13035	55.06	52.66	17329	55.44	53.20
No	3287	43.36	45.08	10640	44.94	47.34	13927	44.56	46.80
Entertainment nearby									
Yes	4145	53.78	52.19	11611	48.43	45.96	15756	49.73	47.46
No	3563	46.22	47.81	12364	51.57	54.04	15927	50.27	52.54
Relaxing place / Parks nearby									
Yes	6226	80.86	79.32	16598	69.31	69.47	22824	72.12	71.83
No	1474	19.14	20.47	7350	30.69	30.53	8824	27.88	28.17
Does traffic make it unsafe to walk									
Yes	1698	22.01	22.30	5886	24.53	23.91	7584	23.92	23.52
No	6015	77.99	77.70	18110	75.47	76.09	24125	76.08	76.48
Does crime make it unsafe to walk									
Yes	879	11.42	10.67	3489	14.59	12.99	4368	13.28	12.43
No	6818	88.58	89.33	20423	85.41	87.01	27241	86.18	87.57
Do animals make it unsafe to walk									
Yes	797	10.34	9.48	2804	11.69	10.94	3601	11.37	10.59
No	6910	89.66	90.52	21173	88.31	89.06	28083	88.63	89.41
Sidewalks available									
Yes	4962	64.29	63.06	15456	64.39	62.87	20418	64.36	62.92
No	2756	35.71	36.94	8549	35.61	37.13	11305	35.64	37.08

N = Number of observations; Missing(Others walking neighborhood = 7924, Trails/Paths = 1938, Shops/Markets = 1927, Public Transportation Access = 2416, Library/Theaters = 1989, Relaxing Place = 2024, Traffic = 1963, Crime = 2063, Animals = 1988, Sidewalks = 1949).

Table 5: Unadjusted logistic regression models for subject-level covariates; includes unadjusted unweighted and weighted odds ratio point estimates, 95% confidence intervals, and p-values

Variable	Unweighted, Unadjusted Logistic Regression					Weighted, Unadjusted Logistic Regression				
			95% Confidence Interval					95% Confidence Interval		
	OR	Lower	Upper	p-value	AIC	OR	Lower	Upper	p-value	AIC
Sex					37,158.7					265,945,865.0
Male	1.071	1.019	1.127	0.0070		1.020	0.949	1.098	0.5872	
Female	Reference									
Race				<0.0001	36,881.8				<0.0001	264,403,088.0
American Indian / Alaskan Native	0.790	0.622	1.004	0.9828		0.924	0.672	1.270	0.5241	
Asian	0.848	0.761	0.945	0.1541		0.913	0.784	1.063	0.3041	
Black / African-American	0.584	0.537	0.634	<0.0001		0.623	0.556	0.699	<0.0001	
Hispanic / Latino	0.617	0.572	0.666	<0.0001		0.654	0.594	0.719	<0.0001	
Other	0.996	0.849	1.169	0.0010		1.074	0.826	1.398	0.0374	
White/Caucasian	Reference									
BMI					36,558.7					261,662,398.0
Obese	0.649	0.609	0.691	<0.0001		0.682	0.628	0.741	<0.0001	
Overweight	0.878	0.826	0.933	0.0708		0.910	0.832	0.996	0.7185	
Underweight	0.840	0.694	1.017	0.8927		1.039	0.795	1.357	0.1423	
Normal	Reference									
Married					37,141.3					265,794,227.0
Yes	1.136	1.080	1.194	<0.0001		1.127	1.053	1.207	0.0006	
No	Reference									
Walk for leisure or transportation					33,315.9					238,889,118.0
Yes	3.722	3.493	3.967	<0.0001		3.431	3.138	3.751	<0.0001	
No	Reference									
Age					37,116.5					265,876,248.0
	0.995	0.994	0.996	<0.0001		0.998	0.996	1.000	0.0192	
BMI					36,994.5					265,097,310.0
	0.987	0.985	0.989	<0.0001		0.989	0.986	0.993	<0.0001	

OR = Odds Ratio Point Estimate; AIC = Akaike Information Criterion; BMI = Body Mass Index

Table 6: Unadjusted logistic regression models for neighborhood-level covariates; includes unadjusted unweighted and weighted odds ratio point estimates, 95% confidence intervals, and p-values

Variables	Unweighted, Unadjusted Logistic Regression					Weighted, Unadjusted Logistic Regression				
		95% Confidence Interval					95% Confidence Interval			
	OR	Lower	Upper	p-value	AIC	OR	Lower	Upper	p-value	AIC
Others walk around neighborhood					28,955.7					207,359,659.0
Yes	1.276	1.160	1.404	<0.0001		1.244	1.094	1.413	0.0008	
No	Reference									
Trails or paths available					35,112.9					250,349,290.0
Yes	1.482	1.369	1.605	<0.0001		1.409	1.244	1.595	<0.0001	
No	Reference									
Shops nearby					35,201.6					250,703,312.0
Yes	1.162	1.102	1.225	<0.0001		1.185	1.087	1.292	<0.0001	
No	Reference									
Access to public transportation					34,629.6					246,291,187.0
Yes	1.066	1.012	1.123	0.0158		1.095	1.010	1.187	0.0269	
No	Reference									
Entertainment nearby					35,095.1					249,886,979.0
Yes	1.239	1.177	1.304	<0.0001		1.284	1.191	1.383	<0.0001	
No	Reference									
Relaxing place / Parks nearby					34,716.3					248,483,845.0
Yes	1.870	1.756	1.992	<0.0001		1.686	1.541	1.844	<0.0001	
No	Reference									
Does traffic make it unsafe to walk					35,167.1					250,645,257.0
Yes	0.869	0.817	0.924	<0.0001		0.913	0.838	0.996	0.0399	
No	Reference									
Does crime make it unsafe to walk					35,044.6					249,767,686.0
Yes	0.755	0.697	0.817	<0.0001		0.801	0.713	0.899	0.0002	
No	Reference									
Do animals make it unsafe to walk					35,149.3					250,393,551.0
Yes	0.871	0.801	0.947	0.0011		0.853	0.761	0.956	0.0062	
No	Reference									
Sidewalks available					35,206.8					250,813,179.0
Yes	0.996	0.944	1.051	0.8791		1.008	0.922	1.102	0.8602	
No	Reference									

OR = Odds Ratio Point Estimate; AIC = Akaike Information Criterion

Table 7: Adjusted logistic models; includes adjusted unweighted and weighted odds ratio point estimates, 95% confidence intervals, and p-values

Variables	Unweighted, Adjusted Logistic Regression					Weighted, Adjusted Logistic Regression				
		95% Confidence Interva					95% Confidence Interval			
	OR	Lower	Upper	p-value	AIC	OR	Lower	Upper	p-value	AIC
Sex					26,083.3					187,749,451.0
Male	1.012	0.952	1.076	0.7018		0.982	0.896	1.075	0.6892	
Female	Reference									
Race				<0.0001					<0.0001	
American Indian / Alaskan Native	0.874	0.664	1.152	0.4948		1.046	0.717	1.525	0.2483	
Asian	0.742	0.653	0.843	0.1597		0.808	0.677	0.964	0.3808	
Black / African-American	0.689	0.623	0.761	0.0013		0.710	0.623	0.809	0.0025	
Hispanic / Latino	0.631	0.575	0.692	<0.0001		0.656	0.577	0.745	<0.0001	
Other	0.980	0.816	1.177	0.0161		1.092	0.824	1.445	0.0647	
White/Caucasian	Reference									
BMI				0.0013					0.0051	
Obese	0.833	0.757	0.916	0.0164		0.814	0.717	0.923	0.0019	
Overweight	0.964	0.894	1.039	0.2382		0.998	0.901	1.104	0.6432	
Underweight	0.906	0.722	1.137	0.8258		1.109	0.806	1.527	0.2845	
Normal	Reference									
Married										
Yes	1.062	0.998	1.130	0.0593		1.065	0.981	1.157	0.1306	
No	Reference									
Others walk around neighborhood										
Yes	1.138	1.027	1.261	0.0134		1.106	0.965	1.267	0.1463	
No	Reference									
Trails or paths available										
Yes	1.187	1.052	1.340	0.0055		1.207	1.025	1.421	0.0245	
No	Reference									
Shops nearby										
Yes	1.022	0.937	1.115	0.6212		1.035	0.907	1.182	0.6100	
No	Reference									
Access to public transportation										
Yes	0.975	0.902	1.054	0.5267		0.969	0.864	1.087	0.5894	
No	Reference									
Entertainment nearby										
Yes	1.098	1.017	1.186	0.0170		1.182	1.076	1.299	0.0006	
No	Reference									
Relaxing place / Parks nearby										
Yes	1.339	1.232	1.455	<0.0001		1.236	1.106	1.382	0.0002	
No	Reference									
Does traffic make it unsafe to walk										
Yes	0.969	0.893	1.052	0.4571		1.010	0.905	1.129	0.8528	
No	Reference									
Does crime make it unsafe to walk										
Yes	0.857	0.774	0.949	0.0029		0.908	0.776	1.062	0.2249	
No	Reference									
Do animals make it unsafe to walk										
Yes	1.072	0.962	1.195	0.2056		0.999	0.862	1.157	0.9850	
No	Reference									
Sidewalks available										
Yes	0.838	0.773	0.908	<0.0001		0.832	0.741	0.933	0.0018	
No	Reference									
Walk for leisure or transportation										
Yes	3.308	3.066	3.570	<0.0001		3.133	2.803	3.502	<0.0001	
No	Reference									
Age	0.998	0.996	1.000	0.0246		0.999	0.997	1.001	0.4125	
BMI	0.994	0.991	0.998	0.0011		0.997	0.992	1.002	0.1823	

OR = Odds Ratio Point Estimate; AIC = Akaike Information Criterion; BMI = Body Mass Index

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