Neighborhood Environment and Adherence to a Walking Intervention in African-American Women

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ABSTRACT

This secondary analysis examined relationships between the environment and adherence to a walking intervention among 252 urban and suburban midlife African-American women. Participants received an enhanced or minimal behavioral intervention. Walking adherence was measured as the percentage of prescribed walks completed. Objective measures of the women's neighborhoods included: walkability (land use mix, street intersection density, housing unit density, public transit stop density), aesthetics (physical deterioration, industrial land use), availability of outdoor (recreational open space) and indoor (recreation centers, shopping malls) walking facilities/spaces, and safety (violent crime incidents). Ordinary least squares regression estimated relationships. We found presence of one and especially both types of indoor walking facilities were associated with greater adherence. No associations were found between adherence and the other environmental variables. The effect of the enhanced intervention on adherence did not differ by environmental characteristics. Aspects of the environment may influence African-American women who want to be more active.

Key Words: African Americans, Neighborhood, Walking

African-American women are less physically active than their White counterparts and at increased risk for obesity and related diseases including coronary heart disease, type 2 diabetes, and certain cancers (Marshall et al., 2007). Increasing physical activity among African-American women may help to reduce their excess disease risk and related racial/ethnic disparities. Most extant interventions to increase physical activity focus on educating and motivating individuals. While these approaches to behavior change are important, supportive environments may be a necessary prerequisite in order for individuals to successfully change their behaviors and adhere to interventions (Sallis, Bauman, & Pratt, 1998). Without supportive environments, even the most highly motivated or knowledgeable individuals may encounter barriers (e.g., high crime, scarce recreation facilities) that hinder their ability to be more active.

Outside the context of physical activity interventions, accumulating empirical evidence suggests aspects of the neighborhood environment may support or impede physical activity behaviors including walking, though relatively few studies have included substantial numbers of African-American women (Committee on Physical Activity, Health, Transportation, and Land Use, 2005). Some aspects of the built environment such as "walkability" may promote walking as a means of transportation (Li, Fisher, Brownson, & Bosworth, 2005; Suminski, Poston, Petosa, Stevens, & Katzenmoyer, 2005). "Walkable" neighborhoods are considered to have greater proximity and mix of destinations to which to walk (e.g., land use mix) and directness and variety of walking routes (e.g., street connectivity). Studies suggest that pleasant neighborhood aesthetics promote walking by increasing enjoyment, whereas negative aesthetics may heighten safety concerns or reduce enjoyment (Giles-Corti et al., 2005; Rhodes, Brown, & McIntyre, 2006). Close proximity to exercise facilities or spaces (e.g., parks, recreation centers, shopping malls) may facilitate walking (Addy et al., 2004; Li et al., 2005). Fear attributed to

violent crime may be a deterrent to physical activity (Boslaugh, Luke, Brownson, Naleid, & Kreuter, 2004; Nies, Vollman, & Cook, 1999).

Despite research suggesting that the environment may influence physical activity including walking, little is known about how the environment impacts behaviors of those participating in physical activity interventions (King et al., 2006; King, Toobert et al., 2006). Few studies have examined the extent to which adherence to behavioral physical activity interventions depends on supportive environments (King, Toobert et al., 2006). Furthermore, extant studies we identified that examined relationships between the environment and physical activity among intervention participants have relied on participants' self-reports to measure the environment, rather than on objective environmental measures (King et al., 2006; King, Toobert et al., 2006)

Therefore, guided by an ecological framework (Stokols, 1996), the purpose of this secondary analysis was to examine whether the environment affected individuals' success in a behavioral physical activity intervention. Specifically, we examined relationships between objectively measured aspects of the environment and adherence to a home-based walking intervention among midlife urban and suburban African-American women. Neighborhood walkability and availability of walking facilities/spaces were hypothesized to positively influence adherence, whereas lower neighborhood safety and unpleasant neighborhood aesthetics were hypothesized to negatively affect adherence. We also tested whether the environment moderated the effect of the enhanced intervention on adherence, hypothesizing that the enhanced intervention had a stronger impact on adherence among participants residing in more supportive environments.

METHOD

Intervention

The Women's Walking Program was a 12-month intervention trial that included a 24-week adoption phase and a 24-week maintenance phase (Wilbur et al., In Press). Using a quasi-experimental design, either an enhanced or minimal behavioral intervention was randomly assigned to one of two federally qualified community health centers located in predominately African-American communities in Chicago. Recruitment efforts were targeted within three miles of the health centers and consisted of distribution of print materials, presentations at community sites, and newspaper announcements (Wilbur et al., 2006). Referrals through participants' social networks led to additional women joining the study. To facilitate implementation and address seasonal variations, women were staggered into the intervention. The adoption phase was completed between 2002 and 2005. Both intervention groups received a tailored walking prescription, which was to walk two times per week for the first 4 weeks and to gradually progress to walk three to four times per week for 20-30 minutes within a moderate intensity target heart-rate range as determined by a baseline maximal aerobic fitness test. The enhanced intervention group also received motivational workshops and tailored, supportive telephone calls. The major emphasis of the intervention was planned leisure-time walking at a location of each participant's choice (e.g., neighborhood, mall), although women were also encouraged to incorporate walking for transport (e.g., to store, to public transportation).

Participants

Two-hundred and eighty-one midlife African-American women met the eligibility criteria and participated in the intervention's adoption phase. Eligibility criteria included ages 40-65 years, no major signs or symptoms of cardiovascular disease, sedentary (reporting no

participation in regular moderate or vigorous exercise for 30 minutes two or more times a week in the preceding 6 months), and in the preparation (has taken some steps to be active and intends to take action in the next 3 months) or contemplation stage (intends to take action in the next six months) of motivational readiness (Wilbur et al., 2006). Participants lived throughout the City of Chicago (n=187) and 36 suburban municipalities (n=94). One hundred and fifty-six women were recruited to the enhanced intervention community health center; 125 were recruited to the minimal intervention community health center. Intervention groups did not differ at baseline on demographic characteristics, activity level, body composition, or fitness (Wilbur et al., 2006). The present study excluded 3 women whose neighborhoods overlapped with Indiana and 26 women who did not return walking data during the adoption phase; thus, 252 women comprised the sample. The 26 women without walking data had lower incomes, were more likely to smoke, and had higher cholesterol (Wilbur et al., In Press).

Measures

Walking Adherence

Adherence to walking frequency was calculated as the percentage of the prescribed minimum 68 walks completed during the adoption phase. Heart rate monitors, walking log books, and an automated telephone response system provided walking data (r = 0.73-0.83) (Wilbur et al., In Press). Data corresponding to the dates participants walked were compared among these data sources and duplicate data eliminated. To be conservative, participants were assumed not to have walked if no data were recorded in any particular week.

Neighborhood Environment

Participants' home addresses were address-matched using ArcGIS 9.1 StreetMap (ESRI, Redlands, CA, 2005). Based on the assumption of a 30-minute walk at a moderate pace (4

m.p.h.), one-mile radii around participants' homes defined their neighborhoods. Environmental features were extracted from existing data using ArcGIS 9.1 (ESRI, Redlands, CA, 2005). Built environmental characteristics were selected from a recognized typology of the built environment: land use patterns (spatial arrangement of walking destinations such as residences, stores, offices), transportation systems (infrastructure connecting activities), and design (aesthetic, physical, and functional qualities) (Committee on Physical Activity, Health, Transportation, and Land Use, 2005).

Walkability. Building on prior work (Frank et al., 2006; Leslie et al., 2007; Saelens, Sallis, & Frank, 2003), a 4-item neighborhood walkability index was derived as the mean of standardized scores, with higher scores indicating greater walkability (characterized by evenly mixed land use, connected streets, high residential density, high public transit stop density): land use mix (Frank et al., 2006), street intersection density (Cerin, Saelens, Sallis, & Frank, 2006), housing unit density (Boer, Zheng, Overton, Ridgeway, & Cohen, 2007), and public transit stop density (Rundle et al., 2007). The entropy index measured *land use mix* (Frank, Schmid, Sallis, Chapman, & Saelens, 2005). Scores on this index can range from 0 to 1.0, with higher scores indicating a more even distribution of five predominant neighborhood land uses [residential, retail (e.g., retail stores), office/professional (e.g., office buildings), institutional (e.g., educational, religious facilities), cultural/entertainment (e.g., museums)] posing potential walking destinations. The data source was the 2001 Land Use Inventory, which used a minimum polygon size of 0.25 acres in Chicago and 1 to 2.5 acres outside Chicago (Northeastern Illinois Planning Commission/Chicago Metropolitan Agency for Planning (NIPC/CMAP), 2001).

As a measure of street connectivity, *street intersection density* is the number of street intersections per acre (minus water) in the neighborhood. Following Forsyth and colleagues'

GIS procedures (Forsyth et al., 2006), street intersections were calculated using the 2004 U.S. Census Bureau TIGER/Line street file (U,S, Census Bureau, 2004). Intersections involving expressways or on/off-ramps were excluded and corrections made for intersections where roads converged but were not aligned (using 10-meter buffers).

Housing unit density is the number of housing units per acre (minus water) in the neighborhood, derived from 2000 U.S. Census Summary File 1 block data (U.S. Census Bureau, 2002). For blocks intersecting the border of the neighborhood, data were apportioned according to the percentage of the block falling within the neighborhood.

Public transit stop density is the number of public train [Chicago Transit Authority (CTA), Metra] and bus (CTA, Pace) stops per acre (minus water) in the neighborhood derived from Regional Transportation Authority data (Regional Transportation Authority, 2004). Pace buses operate in the suburbs; however, only Pace bus routes, not stops, were available. Pace buses stop anywhere along routes according to passengers' needs; therefore, we estimated the number of Pace stops by dividing a neighborhood's total length of Pace routes by its average block length, based on the assumption of one stop per block.

Aesthetics. Indicators of unpleasant neighborhood aesthetics are physical deterioration and industrial land use. Physical deterioration was measured as the mean of two standardized scores: percentage of vacant housing units and percentage of net land area that was predominately abandoned buildings or rubble lots (alpha=0.79). Industrial land use was measured as the percentage of net land area that was predominately industrial. Percentage of vacant housing was derived from 2000 U.S. Census Summary File 1 block data (U.S. Census Bureau, 2002) and percentage of abandoned buildings or rubble lots and percentage of industrial land use were from the 2001 Land Use Inventory (Northeastern Illinois Planning

Commission/Chicago Metropolitan Agency for Planning (NIPC/CMAP), 2001).

Availability of walking facilities/spaces. We measured availability of outdoor walking spaces and indoor walking facilities. Availability of outdoor walking spaces is the percentage of net land area in the neighborhood that was predominately recreational open space, based on the 2001 Land Use Inventory (Northeastern Illinois Planning Commission/Chicago Metropolitan Agency for Planning (NIPC/CMAP), 2001). The first indoor measure is presence of a public recreation center with an indoor track or treadmill in the neighborhood. "Fitness centers" or "recreation centers" operated by municipal governments were identified based on a 2004 dataset for the City of Chicago (City of Chicago, 2004) and through websites and telephone contacts for other municipalities in 2006. For all facilities, inquiries were made in summer 2006 regarding availability of an indoor track or treadmill. The second indoor measure is presence of an indoor shopping mall (at least 500 ft^2 gross leasing area) within five miles (street-network distance) of women's homes, derived from 2003 National Research Bureau data from NIPC/CMAP. The latter two measures were combined to create a three-level variable for indoor walking facilities: neither facility type, either public recreation center with indoor track or treadmill in neighborhood or a shopping mall within five miles, or both facility types.

Safety. Annual number of police-reported incidents of violent crimes (homicide, robbery, aggravated assault, sexual assault) in the neighborhood measured neighborhood safety. Increasing numbers of violent crime incidents indicate less neighborhood safety. Due to data limitations, two different data sources and measures were used. For neighborhoods entirely within the City of Chicago, exact counts of reported crime incidents obtained from Chicago Police Department data were used (City of Chicago Police Department, 2002-2005). For neighborhoods completely outside Chicago, crime densities (number of crimes per unit land

area) from municipalities, weighted according to the proportion of the neighborhood in each municipality, were applied. Crime data for municipalities outside Chicago were obtained from the Annual Illinois Uniform Crime Report Database (Illinois State Police, 2002-2005). For neighborhoods partially within and partially outside Chicago, exact crime counts for the Chicago portion were combined with weighted crime densities for the suburban portions. Crime counts were assigned to each woman based on the year corresponding with the majority of her 24-week adoption phase.

Covariates

Assignment to the enhanced versus minimal intervention group was measured as a dichotomous variable. Age was measured in years and centered on the sample's mean. Educational attainment was categorized as high school diploma, GED, or less; technical school or some college; and college degree (reference category). Annual household income was an 11-category ordinal-level variable measured in $10,000 increments, ranging from less than $10,000 (0) to more than $100,000 (10); it was treated as a continuous variable in the regression analysis. Twenty women were missing data on annual household income, and four of them were also missing education data; the sample's median was used to impute missing values. Because of differences in the measurement of some environmental variables (e.g., violent crime), we also included residence in a Chicago neighborhood versus a suburban neighborhood (reference category) as a covariate. Women were classified as living in a Chicago neighborhood if at least 75% of the neighborhood's land area was in the City of Chicago; women whose neighborhood did not meet these criteria were classified as living in a suburban neighborhood.

Statistical Analyses

We used ordinary least squares regression to estimate relationships between the environment and walking adherence. Interaction terms were added to test whether environmental characteristics moderated the effect of the enhanced intervention on adherence. Multilevel modeling was not used because neighborhoods were individually defined based on participants' home addresses and 97% of participants did not share a census block with other participants. Because the distribution of walking adherence was skewed to the right, a logarithm transformation was used which produced an approximate Gaussian distribution. Model diagnostics were within acceptable limits.

RESULTS

Table 1 shows descriptive statistics for participant characteristics (n=252) overall and by residence in a Chicago neighborhood or suburban neighborhood. Participants' mean age was 48.6 years, and 40.5% had a college education. Participants' annual household incomes ranged from less than $20,000 (13.8%) to more than $100,000 (9.1%), with nearly half (47.4%) having an annual household income in excess of $50,000. When compared with residents of Chicago neighborhoods, residents of suburban neighborhoods had significantly higher annual household incomes and educational attainment. On average, participants completed 38.1% of the prescribed walks, including an average of 44.5% and 28.8% of the prescribed walks for the enhanced intervention group and minimal intervention group, respectively (t = -3.487, p = 0.001). Chicago and suburban neighborhood residents completed a similar percentage of the prescribed walks.

As shown in Table 2, on average, participants lived in neighborhoods in which 8.9% of the land area was predominately industrial and 3.9% was predominately recreational open space

compared with 7.0% and 2.9%, respectively, in metropolitan Chicago (Cook and DuPage Counties). On average, 7.8% of housing units in their neighborhoods were vacant and 3.1% of the land in their neighborhoods was predominately abandoned buildings or rubble lots compared with 5.4% and 1.0%, respectively, in metropolitan Chicago. The annual number of violent crime incidents in their neighborhoods ranged from 4 to over 2,000, including 0 to 37 annual homicides. For comparative purposes, the 2004 homicide and violent crime rates, respectively, per 100,000 population were 9.08 and 726.95 in metropolitan Chicago and 26.49 and 1645.56 in participants' neighborhoods, on average. About 27.8% of the participants had both a public recreation center with an indoor track or treadmill in their neighborhood and an indoor shopping mall within five miles of their home. When compared with neighborhoods of suburban residents, neighborhoods of Chicago residents had significantly higher industrial land use, physical deterioration, recreational open space, annual violent crime incidents, and walkability scores (Table 2). Proportionately more residents of suburban neighborhoods had a public recreation center with an indoor track or treadmill or indoor shopping mall as compared with residents of urban neighborhoods.

Table 3 presents regression results; the model accounted for 11.8% of the variance in walking adherence (adjusted R^2=6.9%). Participation in the enhanced intervention group versus minimal intervention group had the strongest association with adherence ($p < 0.001$). In fact, adjusting for the other variables, the enhanced intervention was associated with a 99% increase in walking adherence when compared with the minimal intervention. This corresponds with an effect size of 0.97, which means the probability of an enhanced intervention participant having higher walking adherence than a minimal intervention participant was 0.97 (McGraw & Wong, 1992). [The intervention is discussed in greater detail elsewhere (Wilbur et al., In Press).]

Independent of individual demographics, intervention group, city versus suburban neighborhood residence, and other environmental characteristics, presence of either a public recreation center with an indoor track or treadmill in the neighborhood or a shopping mall within 5 miles was associated with a 44% increase in adherence as compared with having neither facility type ($p = 0.06$). Presence of both indoor facility types was associated with a 66% increase in adherence ($p = 0.02$). Contrary to our hypotheses, neighborhood walkability, aesthetics (physical deterioration, industrial land use), recreational open space, and safety were not statistically significantly associated with adherence. There was no evidence that the environment moderated the effect of intervention group on adherence (results not shown).

As an exploratory analysis, we also tested whether environmental features differentially affected walking adherence among residents of Chicago neighborhoods when compared with suburban neighborhoods. However, it is important to note that interaction terms between city-suburban neighborhood residence and environmental features were not statistically significant. As shown in Table 4, indoor facility availability was positively, but non-significantly, associated with walking adherence among Chicago neighborhood residents. In contrast, among suburban neighborhood residents, having one and both indoor facilities in relatively close proximity were associated with a 140% and 252% increase in walking adherence, respectively. Nonetheless, the suburban model explained just 4.4% of the variance in walking adherence, and the F statistic was only marginally statistically significant ($p = 0.082$).

Sensitivity analyses were conducted. First, inclusion of a wider range of demographic characteristics, season of study entry (to control for weather variations at initiation), or baseline physical fitness or activity level did not substantially alter results. Second, results excluding those women without household income or education data were consistent with those presented

here. Third, analyses of several environmental measures based on alternative neighborhood definitions (0.25- and 0.5-mile radii) revealed similar results. Fourth, results of analyses testing individual components comprising environmental indices and scales were generally consistent with those presented.

DISCUSSION

Results of this study suggest that aspects of the neighborhood environment, specifically availability of indoor walking facilities, may impact urban and suburban midlife African-American women who want to be more physically active. We identified two other studies that examined relationships between the environment and physical activity in the context of behavioral interventions (King et al., 2006; King, Toobert et al., 2006). Both examined several physical (e.g., enjoyable scenery, sidewalks) and social (e.g., crime) environmental characteristics as measured by participants' self-reports, but found few statistically significant associations. In the Activity Counseling Trial involving 874 initially sedentary adults (24% of whom were African-American), participants in the counseling intervention who reported seeing neighbors walking and who had high initial barriers self-efficacy averaged consistently higher physical activity levels across 24 months than those who did not report seeing neighbors walking (King et al., 2006). Drawing on data from five physical activity intervention trials, one study found participants residing in neighborhoods with more attractive scenery and ease and pleasantness for walking were more likely to meet national physical activity recommendations when compared with those without these neighborhood features (King, Toobert et al., 2006). Similar to King, Toobert, and colleagues (2006), we found little evidence that the effectiveness of the enhanced behavioral intervention in increasing physical activity depended on having a supportive environment. Differences in results between our study and these prior studies may be

due to several factors including differences in environmental features examined and their measurement (objective measurement in our study versus participants' self-reports) and type of physical activity (walking in our study versus physical activity more generally). Furthermore, unlike King and colleagues (King et al., 2006), we did not test whether the effect of the environment on physical activity differed by individual psychosocial variables.

We found a dose-response relationship between indoor walking facility availability and adherence such that the presence of one and especially both facility types were associated with greater adherence. Public recreational centers with exercise equipment or dedicated spaces and shopping malls may serve as important resources for African-American women – especially suburban women -- possibly by providing well-maintained spaces or equipment for walking, a safe environment, or refuge during inclement weather. Although we did not ask participants about car ownership, indoor facilities may be more accessible for suburban women due to higher levels of car ownership, a possibility supported by their higher incomes.

Although women were encouraged to incorporate walking into their daily lives including walking for transport, the intervention had a stronger emphasis on leisure walking. This may explain why indoor walking facility availability was positively associated with adherence, whereas no effect was found for neighborhood walkability. Indeed, because environmental influences on walking differ by walking purpose, greater attention to matching the environmental features examined to the type of physical activity targeted by the intervention is warranted in future research.

Neighborhood safety and aesthetics may affect walking for leisure or transport, but we found no association between adherence and either negative neighborhood aesthetics (physical deterioration, industrial land use) or neighborhood safety (violent crime incidents). It is possible

that positive neighborhood aesthetics are more influential or that women judge aesthetics using different criteria than those used in this study. As one participant observed, "I can see the beauty through the weeds blossoming and decorating [the neighborhood]. No matter what is going wrong there is beauty to see." Perceptions of neighborhood crime and safety may have a stronger effect on walking behavior than actual crime incidents, though studies using perceived (Ainsworth, Wilcox, Thompson, Richter, & Henderson, 2003; Eyler et al., 2003) and objective (Doyle, Kelly-Schwartz, Schlossberg, & Stockard, 2006; Kirtland et al., 2003) measures of crime have found inconsistent results among adults.

Availability of recreational open space would primarily influence leisure walking, not walking for transport. Although some studies have found a positive association between park availability and physical activity including walking (Addy et al., 2004; Cohen et al., 2007), others have found no association, including studies with midlife women (Jilcott, Evenson, Laraia, & Ammerman, 2007). Recreational open spaces may not be used by midlife African American women due to safety concerns (Bedimo-Rung, Mowen, & Cohen, 2005; Krenichyn, 2006), gang activity (Pattillo, 1998), racial discrimination (Gobster, 2002), poor quality or maintenance (Bedimo-Rung et al., 2005; Godbey, Caldwell, Floyd, & Payne, 2005), personal preferences (Bedimo-Rung et al., 2005; Godbey et al., 2005), and absence of others being physically active, including other African-American women (Cohen et al., 2007; Krenichyn, 2004).

Study Limitations

This is one of the first studies that examined how aspects of the neighborhood environment affect adherence to a behavioral physical activity intervention in African-American women. Still, this study has several limitations. First, because this is a secondary analysis,

neighborhoods were not sampled to assure maximum variation in environmental characteristics. While the descriptive statistics suggest considerable variability, it is possible that the included neighborhoods do not have sufficient environmental variation to detect environmental influences. Second, due to temporal mismatch between the years data were available for some environmental measures and the study period, environmental indicators may not reflect conditions during women's participation in the study. Third, because data are often collected at the municipal level and women's neighborhoods intersected 66 different municipalities, directly comparable data were lacking for some environmental measures (e.g., parks), resulting in measurement compromises and sometimes measures that were not directly comparable for Chicago and suburban neighborhoods (e.g., crime, public recreation centers). Fourth, because the study generally relied on administrative data sources rather than direct observational data, limited measures of environmental quality which may be derived from direct observation (e.g., street conditions, recreational facilities) were included. Fifth, the study focused on violent crime-related safety; it did not address safety from other types of crime, loose dogs, poor infrastructure (e.g., ill-maintained sidewalks), or traffic. Sixth, results of the exploratory, stratified analyses by Chicago versus suburban neighborhood residence should be interpreted with caution due to the small sample sizes and use of different data sources for public recreation centers for Chicago and the suburbs. Also of note, whereas the models accounted for a small proportion of the variance in adherence, these results are not surprising given numerous factors at multiple levels influencing physical activity and are comparable to prior studies (De Bourdeauduij, Sallis, & Saelens, 2002; Frank et al., 2005).

Implications for Practice

Individual behavioral interventions have been only partially successful in increasing physical activity across population subgroups, including African-American women. Enhancing our understanding of how the environment influences African-American women who want to be more active would inform new multilevel interventions to promote physical activity in this population. More specifically, interventions that test combined effects of individual behavioral and environmental approaches to promoting physical activity in African-American women are needed.

If future studies confirm our findings, expanding the availability and accessibility of indoor walking facilities may be appropriate foci of community change efforts to promote leisure-time physical activity. Guided by community-based participatory research principles, partnering with community members and leaders -- ideally early in the research process -- is vital to facilitate community change efforts (Israel, Schulz, Parker, & Becker, 1998; Yancey et al., 2004). Community involvement could also help to ensure that changes meet community needs and consequently maximize utilization of facilities. Organizing transportation and expanding hours for walking are two strategies that may make indoor shopping malls more accessible, especially for urban African-American women. Another target of community change efforts may be advocating for public investment in free or low-fee indoor recreational facilities and indoor exercise equipment/spaces. Community members could provide valuable insights into potential locations and desired amenities.

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Table 1. Descriptive statistics for participants' demographic characteristics and walking adherence overall and by Chicago and suburban neighborhood residence [a]

	Overall (n=252)	**Chicago neighborhood residents (n=148)**	**Suburban neighborhood residents (n=104)**	
	Percent or Mean (Std. Dev.)	**Percent or Mean (Std. Dev.)**	**Percent or Mean (Std. Dev.)**	**p-value[a]**
Walking adherence (mean)	38.1 (35.7)	36.9 (33.5)	39.8 (38.8)	0.534
Age in years (mean)	48.6 (6.0)	48.2 (6.0)	49.1 (6.1)	0.240
Annual household income (mean) [b]	4.6 (2.7)	4.0 (2.4)	5.5 (2.8)	<0.001
Education (%)				0.035
High school degree, GED, or less	13.1	14.9	10.6	
Technical school or some college	46.4	51.4	39.4	
College degree	40.5	33.8	50.0	

[a] Independent-samples t-tests were conducted for continuous variables (adherence, age, annual household income) to compare means between Chicago neighborhood residents and suburban neighborhood residents. A Pearson chi-square statistic was used for the categorical variable (education) to compare Chicago neighborhood residents and suburban neighborhood residents.
[b] Annual household income was measured on an 11-point scale in $10,000 increments, ranging from less than $10,000 (0) to more than $100,000 (10).

Table 2. Descriptive statistics for neighborhood environmental characteristics for overall sample [a, b]

	Overall sample (n=252)				Chicago neighborhood residents (n=148)		Suburban neighborhood residents (n=104)	
	Mean	**Std. Dev.**	**Min.**	**Max.**	**Mean**	**Std. Dev.**	**Mean**	**Std. Dev.**
Neighborhood walkability [c]	-0.02	0.82	-1.83	6.53	0.33	0.78	-0.53	0.57
Land use mix	0.50	0.12	0.20	0.96	0.54	0.12	0.44	0.10
Street intersections per acre	0.18	0.05	0.05	0.47	0.20	0.04	0.15	0.05
Housing units per acre	7.22	5.22	0.76	49.81	9.20	5.46	4.40	3.21
Public transit stops per acre	0.10	0.05	0.00	0.52	0.12	0.05	0.08	0.05
Industrial land use, %	8.92	7.26	0.00	30.91	9.05	6.50	8.74	8.24
Physical deterioration [c]	0.00	0.91	-1.08	4.03	0.48	0.87	-0.68	0.38
Percent vacant housing	7.75	4.47	1.79	26.68	10.04	4.30	4.48	2.00
Percent abandoned buildings/rubble lots	3.11	3.76	0.00	28.48	4.77	3.92	0.74	1.70
Recreational open space, %	3.87	3.66	0.13	24.91	4.79	4.04	2.54	2.52
Annual violent crime incidents (10s)	70.51	55.89	0.40	206.40	104.20	45.24	20.44	27.12
Robbery	28.83	23.21	0.07	84.80	43.04	17.91	8.61	12.33
Homicide	1.08	0.94	0.00	3.70	1.56	0.87	0.39	0.52
Aggravated assault	36.44	30.67	0.25	112.50	54.93	25.49	10.13	13.24
Sexual assault	3.28	2.53	0.08	11.10	4.67	2.20	1.31	1.41
	Percent				**Percent**		**Percent**	
Indoor walking facility								
Neither facility	26.6				35.8		13.5	
Public recreation center or shopping mall	45.6				38.5		55.8	
Both facilities	27.8				25.7		30.8	

[a] No statistically significant differences on the environmental variables were found between the 252 women with walking data and the 26 women without walking data.

[b] Based on independent-samples t-tests or Pearson chi-square tests (indoor walking facilities only), environmental characteristics differed significantly between Chicago neighborhoods and suburban neighborhoods for all variables ($p < 0.001$) except industrial land use ($p = 0.739$).
[c] Calculated as the mean of the standardized scores (z-scores) for individual components.

Table 3. Walking adherence (natural log) regressed on demographics, enhanced-minimal intervention group, Chicago-suburban neighborhood residence, and environmental features [a]

	Coefficient [b]	**(S.E.)**
Constant	2.00	(0.41)
Age [c]	0.03	(0.01)*
Education (ref: college degree)		
High school degree or less	0.30	(0.27)
Technical school or some college	-0.01	(0.18)
Annual household income		
Enhanced intervention group	0.70	(0.16)***
Chicago neighborhood (ref: suburban)	0.36	(0.26)
Walkability	-0.12	(0.12)
Physical deterioration	-0.08	(0.13)
Industrial land use	0.01	(0.01)
Recreational open space	-0.01	(0.03)
Indoor walking facilities (ref: neither facility type)		
Either public recreation center with treadmill or indoor track *or* indoor shopping mall	0.39	(0.21)*
Both public recreation center with treadmill or indoor track *and* indoor shopping mall	0.53	(0.23)**
Annual violent crime incidents (10s)	<-0.01	(<0.01)
R^2	0.118	
Adjusted R^2	0.069	
F statistic	2.443***	

* $p < 0.10$ ** $p < .05$ *** $p < .01$

[a] Lagrange Multiplier tests for spatial dependence in model residuals were not statistically significant.

[b] Because the natural log of walking adherence was used, continuous independent variables may be interpreted as the percent change in walking adherence for a one-unit change in the independent variable. For dummy variables, the percent impact of the dummy variable relative to the reference category may be derived as 100{exp [coefficient – Var(coefficient)/2] – 1} (Halvorsen & Palmquist, 1980; Kennedy, 1981).

[c] Centered on overall sample mean.

Table 4. Walking adherence (natural log) regressed on demographics, enhanced-minimal intervention group, and environmental features by residence in a Chicago neighborhood versus suburban neighborhood

	Chicago neighborhood residents (n=148)		**Suburban neighborhood residents (n=104)**	
	Coefficient	**(S.E.)**	**Coefficient**	**(S.E.)**
Constant	2.55	(0.51)	1.16	(0.75)
Age [a]	0.03	(0.02)**	0.02	(0.02)
Education (ref: college degree)				
High school degree or less	0.24	(0.33)	0.28	(0.48)
Technical school or some college	-0.20	(0.24)	0.29	(0.29)
Annual household income	0.01	(0.05)	<-0.01	(0.05)
Enhanced intervention group	0.90	(0.22)***	0.51	(0.28)*
Walkability	-0.09	(0.15)	-0.53	(0.32)
Physical deterioration	-0.10	(0.14)	0.02	(0.38)
Industrial land use	0.02	(0.02)	0.02	(0.02)
Recreational open space	-0.01	(0.03)	-0.01	(0.06)
Indoor walking facilities (ref: neither facility type)				
Either public recreation center with treadmill or indoor track *or* indoor shopping mall	0.24	(0.24)	0.96	(0.42)**
Both public recreation center with treadmill or indoor track *and* indoor shopping mall	0.20	(0.28)	1.36	(0.44)***
Annual violent crime incidents (10s)	<-0.01	(<0.01)	0.01	(0.01)
R^2	0.161		0.156	
Adjusted R^2	0.086		0.044	
F statistic	2.157**		1.397	

* $p < 0.10$ ** $p < .05$ *** $p < .01$

[a] Centered on overall sample mean.