

## Research Article

# Barriers to Physical Activity in East Harlem, New York

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**Background.** East Harlem is an epicenter of the intertwining epidemics of obesity and diabetes in New York. Physical activity is thought to prevent and control a number of chronic illnesses, including diabetes, both independently and through weight control. Using data from a survey collected on adult (age 18+) residents of East Harlem, this study evaluated whether perceptions of safety and community-identified barriers were associated with lower levels of physical activity in a diverse sample. **Methods.** We surveyed 300 adults in a 2-census tract area of East Harlem and took measurements of height and weight. Physical activity was measured in two ways: respondents were classified as having met the weekly recommended target of 2.5 hours of moderate physical activity (walking) per week (or not) and reporting having engaged in at least one recreational physical activity (or not). Perceived barriers were assessed through five items developed by a community advisory board and perceptions of neighborhood safety were measured through an adapted 7-item scale. Two multivariate logistic regression models with perceived barriers and concerns about neighborhood safety were modeled separately as predictors of engaging in recommended levels of exercise and recreational physical activity, controlling for respondent weight and sociodemographic characteristics. **Results.** The most commonly reported perceived barriers to physical activity identified by nearly half of the sample were being too tired or having little energy followed by pain with exertion and lack of time. Multivariate regression found that individuals who endorsed a greater number of perceived barriers were less likely to report having met their weekly recommended levels of physical activity and less likely to engage in recreational physical activity controlling for covariates. Concerns about neighborhood safety, though prevalent, were not associated with physical activity levels. **Conclusions.** Although safety concerns were prevalent in this low-income, minority community, it was individual barriers that correlated with lower physical activity levels.

## 1. Introduction

Diabetes prevalence for Blacks and Latinos in the US are nearly double that of Whites (11% of Blacks, 10% of Mexican Americans, and 5% of Whites have diabetes) and Blacks and Latinos have higher obesity prevalence than Whites [1, 2]. Physical activity is proven to help prevent and control diabetes, both independently, and through weight control [3].

East Harlem, New York is a predominantly low-income, Black and Latino community at the epicenter of the intertwined epidemics of obesity and diabetes. East Harlem has the highest prevalence of obesity and the highest diabetes mortality rate in New York City and its residents have insufficient resources to cope with the myriad of environmental, social, nutritional, and stress-related forces that fuel

these epidemics [4]. The built environment is believed to play a large role in generating health disparities by creating differential opportunities to engage in recreational physical activity, resulting in “obesogenic environments” [5–7]. Neighborhood safety and aesthetics including maintenance, cleanliness, and open space have been shown to influence the utilization of space for both recreational and routine physical activity [8–10]. Perceptions of neighborhood safety may be particularly salient among those residents in lower-income urban settings, where crime is more prevalent [11]. Indeed, surveys find that racial/ethnic minorities and those of lower socioeconomic status are the most likely to rate their neighborhoods as unsafe [12]. However, research to date on the relationship between perceived neighborhood safety and physical activity levels has generated mixed results,

with many studies finding no relation [13]. Indeed, in low-income neighborhoods with limited personal transportation options, routine physical activity like walking may be a necessity of life in spite of safety concerns and is the least expensive, most accessible, proven effective form of physical activity.

In addition to perceived safety, other perceived barriers might also influence physical activity levels. Research in a variety of communities including older adults [14], high school, [15] and college students [16] have assessed the degree to which perceived barriers act as cognitive constraints on physical activity behavior. A handful of studies have assessed perceived barriers in racial and ethnically diverse samples. For instance, in a study of diverse rural older women, endorsing more personal barriers was negatively associated with physical activity [17] and perceived physical environmental sets of variables were significant predictors of physical activity in a similar study [18, 19].

Few quantitative studies have assessed the relationship between perceived and physical activity levels in predominately African American and Hispanic communities [20], but qualitative research on African American women's attitudes towards physical activity suggests specific barriers that may differ from white populations. For instance, feelings about their physical appearance during physical activities and issues related to personal care after activities have been identified as factors that influence African American's attitudes toward physical activity (i.e., not wanting to mess up ones hair by sweating) [21–24]. A positive body image despite their actual weight may also lower African American women's desire to engage in physical activity for weight loss [25]. One qualitative study of physical activity in Latina women in North Carolina found that gender roles, support from family/husband, child care issues, language, and isolation in the community served as barriers to engaging in physical activity [26]. Few quantitative studies have assessed perceived barriers in predominately Hispanic populations with many first-generation immigrants such as East Harlem [27, 28]. Few, if any, studies have assessed perceived barriers in low-income men.

Using community-based participatory research methods this study evaluated perceived safety and other perceived barriers to physical activity with self-reported data from a 2-census tract area of East Harlem, New York. In 2007, a new coalition, “Communities IMPACT (Inspired and Motivated to Prevent And ConTrol) Diabetes” formed. This Centers for Disease Control and Prevention (CDC)-funded Center aimed to use community-based participatory approaches to implement and disseminate interventions that build on local community resources and comprehensively combat the rising tide of diabetes and diabetes-related disparities. IMPACT leaders organized a community-academic taskforce to identify specific elements of the community, built, social, and medical environments that may be altered to foster improved diabetes prevention and control as described elsewhere [29, 30].

As suggested by partners during the grant-writing phase of the partnership, they selected a subneighborhood (two

census tracts) within East Harlem (known as the Sector of Excellence to Eliminate Disparities, or “SEED”) for intensive focus. The taskforce reasoned that local concentrated efforts could harness disparate local resources and bring together diverse clinical, community, service, and religious leaders to take action. After discussing many potential interventions to enhance physical activity, healthy eating, and diabetes detection, prevention, and management, they decided they first needed to better understand local barriers to preventing and controlling diabetes. To achieve this goal, the partnership surveyed local community residents to gain insight into the ways characteristics of the neighborhood, particularly safety and perceived barriers, influence physical activity levels.

## 2. Methods

*2.1. Survey Sample.* An evaluation subcommittee of the taskforce, with community and academic members, developed, piloted, and conducted the survey to assess sociodemographics, medical history, diabetes risk perception, physical activity, diet and weight, community resources, and diabetes knowledge and to gather anthropometric measures of weight and height from willing participants. Sociodemographic data was designed to be comparable to the data for these same 2 census tracts in the 2000 Census. Inclusion criteria consisted of living in the SEED, age 18 and older, and the ability to speak either English or Spanish.

In contrast with population surveys generated from random digit dialing that may undersample hard to reach lower-income residents, recruitment for the community member survey took place on the sidewalk via street intercept. Potential survey sites were selected based on the following criteria: (1) publicly accessible building or space or permission to use space obtained from building supervisor; (2) space for a semiprivate interview. At each selected site, interviewers approached individuals who appeared to be adults over the age of 18 in front of the venue and invited them to participate. We recruited and surveyed 300 willing residents of the SEED who consented to participate in the survey. Nine participants were excluded as they did not have full data to assess residency within the SEED area, thus, data for 291 individuals were included in the study.

The final sample was predominately female (62.7%), Latino (56.0%), and low income (<15,000/year) (63.0%). Nearly 70% of the sample was overweight or obese. The samples' sociodemographic characteristics are summarized in Table 1.

### 2.2. Measurements

*2.2.1. Dependent Variable.* Physical activity and diet are notoriously difficult to measure via self-report with no true gold standard. As such, we chose to limit the respondent burden in these areas and target our queries towards items most likely to provide the community coalition with targets for intervention. Physical activity was measured

TABLE 1: Sociodemographic characteristics of the survey respondents.

Demographics	% (N)
Female	62.8% (182)
Mean age (years), sd	42.6 ± 16.7
18–24	17.6% (51)
25–34	19.0% (55)
35–44	19.0% (55)
45–54	19.0% (55)
55–64	12.8% (37)
65+	12.8% (37)
Race	
Black/African American	30.8% (90)
Latino	55.8% (162)
White	11.7% (34)
Other	1.7% (5)
Acculturation	
Born in US	58.1% (169)
Speaks mainly English at home	63.6% (185)
Speaks mainly Spanish at home	34.7% (101)
Speaks other language at home	1.7% (5)
Education	
Less than 8th grade	12.7% (30)
Less than high school	25.3% (60)
High school/GED	39.2% (93)
At least some college	22.4% (53)
Low income (< \$15,000/year)	62.9% (132)
Weight	
Overweight (BMI 25–29.9)	29.0% (79)
Obese (BMI 30+)	40.0% (108)
Overweight or Obese (BMI 25+)	69.0% (187)

using 4 self-report items assessing average daily and weekly walking time and recreational activities modified from the International Physical Activity Questionnaire (IPAQ) [31]. To capture both routine physical activity and physical activity specifically for recreation, we generated and assessed two separate dichotomous outcome variables. First, we divided respondents between those who met the CDC’s recommendation of engaging in at least 2.5 hours per week of moderate physical activity (see: <http://www.cdc.gov/physicalactivity/everyone/guidelines/adults.html>), in this case, those who reported walking for at least 2.5 hours per week or approximately 20 minutes a day and those who did not meet this standard. Second, to capture recreational physical activity, we asked respondents “What do you like to do to be physically active?” For respondents reporting a physical activity other than walking (specifically running/jogging, bicycling, playing a team sport and going to the gym), we coded them as engaging in a leisure time physical activity. Respondents could choose more than one category, but respondents were coded according to whether they participated in a leisure time physical activity at all, not according to how many.

**2.2.2. Perceived Safety and Barriers to Physical Activity.** Six-item dichotomous measures of perceived barriers to physical activity were developed with input from the community coalition concerning perceptions of barriers to physical activity believed to be widely held within the community and are summarized in Table 4. Respondents were asked whether or not they agreed with each of the six barriers (Yes/No). The barriers were then summed to create a composite measure of the number of barriers endorsed. In addition, a battery of six items was asked about perceptions of neighborhood safety in relation to neighborhood social capital. This measure was adapted from a measure used in a previous study of perceived neighborhood safety and physical activity [11]. Respondents were asked to rate how safe from crime they considered their neighborhood to be and to rate how safe they feel in a series of locations and situations (e.g., walking alone on a street in your neighborhood at night/day; taking the public bus during the night/day) using a 4-point likert scale. We generated a composite measure of neighborhood safety by dichotomizing the individual questions into generally perceived safe/unsafe categories and then summing the results.

**2.2.3. Controls.** Because one’s excessive weight can affect perceptions of barriers to physical activity including pain with exertion [32], we controlled for participants current body mass index (coded as overweight or obese from our anthropometric measures of height and weight). In addition, current weight-loss efforts were measured using self-report including whether individuals were using physical activity or exercise to lose weight or maintain their current weight. We controlled for a variety of additional demographic factors: sex, age, race/ethnicity, education, and acculturation (if respondents speak Spanish at home and if they were born in the US).

**2.3. Analysis.** Two multivariate logistic regression models with perceived barriers and concerns about neighborhood safety were modeled separately as predictors of engaging in recommended levels of exercise and recreational physical activity, controlling for respondent weight and sociodemographic characteristics. We first modeled the relationship between the number of perceived barriers to physical activity and reported physical activity levels (time spent walking and participation in recreational physical activity apart from walking), controlling for overweight/obese, age, race/ethnicity, gender, acculturation, and whether or not individuals were trying to lose weight. We then ran the same model with neighborhood safety as the main predictor variable. We stratified the analysis by race/ethnicity and gender to detect group specific differences.

### 3. Results

With regards to self-reported physical activity, at a median of 7 hours per week or about 1 hour per day, respondents to the survey reported walking a great deal. The overwhelming majority of the sample (80.0%) met the weekly

TABLE 2: Physical activity (self-report).

Hours per week spent walking	7.0 (median), 12.5 (sd)
Hours per week spent walking (men)	14.0 (median), 10.8 (sd)
Hours per week spent walking (women)	5.25 (median), 14.2 (sd)
% meeting recommendation of 2.5 hrs of moderate physical activity/wk	80.0% (89.0% men, 75.0% women)
Physical Activity (what things do you like to do to be physically active?)	
% reporting some physical activity apart from walking	72.0% (80.0% male, 67.0% female)
% walking	65.2%
% cycling	20.6%
% sports	17.9%
% dance	14.1%
% going to the gym	13.4%
% running	11.7%

recommendation of at least 2.5 hours of moderate intensity exercise, 88.0% of men and 75.0% of women. In regards to recreational physical activity, walking was also the most commonly reported physical activity that respondents liked to do to be physically active (65.2%). Apart from walking, 72.0% of the sample reported engaging in at least one other form of recreational physical activity including cycling (20.6%), playing sports (17.9%), dancing (14.1%), going to the gym (13.4%), and running (11.7%) (Table 2).

While there were many self-reported barriers to physical activity, the most commonly reported was being too tired or having little energy (45%). Pain with exercise (35%), lack of time (30%), dislike of exercise (30%), and difficulty being active (28%) were also commonly identified barriers. Lack of safe spaces for exercise was a relatively less commonly cited barrier, reported by only 20% of the sample, despite nearly half those surveyed (45%) considering the neighborhood to be somewhat or very unsafe (Table 3).

Multivariate regression of perceived barriers found that reporting a greater number of perceived barriers was associated with a lower odds of meeting the weekly recommendation of 2.5 hours of moderate exercise (OR = 0.72,  $P < 0.01$ ). Additionally, individuals who perceived more barriers to physical activity were less likely to report engaging in some form of recreational physical activity other than walking (OR = 0.72,  $P < 0.01$ ). Perceived safety of the neighborhood, on the other hand, was not associated with significantly lower amounts of time spent walking or engaging in recreational physical activity (Table 4). Men spent more time walking and were more likely to engage in leisure time physical activity compared with women, although safety concerns were not a significant barrier to physical activity for either men or women (analysis not shown). Overall, stratified analysis between men and women and Hispanic and Black participants did not affect the direction or significance of the results (analysis not shown).

#### 4. Discussion

In disadvantaged neighborhoods such as East Harlem, characteristics of the built and social environment, such as perceived safety, are often suggested as the greatest obstacles

to increasing physical activity [5–13]. Our results did not support the supposition that concerns about safety serve as a primary barrier to recreational and routine physical activity. Nearly half of the sample perceived their neighborhood as very or somewhat unsafe. Yet, safety concerns were reported as serving as a barrier to physical activity by only 20% of the sample and believing your neighborhood was unsafe was not associated with physical activity levels. The most commonly reported barriers to physical activity identified by nearly half of the sample were motivational—being too tired or having little energy. Lack of time and pain with exertion were also commonly cited barriers and multivariate regression found that endorsing a greater number of individual barriers was associated with reduced time spent walking and engaging in physical activity for sport controlling for covariates.

This finding contrasts with other studies that have found support for the role of perceptions of neighborhood safety in predicting physical activity levels. A study from Boston, for instance, that used a similar measure of perceived neighborhood safety found that female residents of neighborhoods with lower perceived safety at night walked less than similar women in neighborhoods perceived as safer [11]. The effect was only found for women and not for men [11]. Other studies have found mixed results with regards to the role of safety in reducing physical activity levels. Some studies have found a significant inverse association between perceived neighborhood safety and physical activity levels [33–41], but others have found no significant association [42–52].

Another striking finding from this study was the percent of individuals that met the recommendation for moderate-intensity exercise of 2.5 hrs/wk: 80% of the sample met this recommendation through walking alone. Moreover, the median of 7 hours per week of walking was well above the recommended amount and translates into an hour a day of moderate intensity exercise. This contrasts with studies from other parts of the country finding low levels of physical activity in predominately Latino communities. For instance, a study of Latina women in Chicago found much lower rates of physical activity, with only 36% meeting current recommendations for moderate or vigorous physical activity [27]. Although it is possible that respondents exaggerated the actual amount of walking per day, it is also plausible

TABLE 3: Perceived barriers to physical activity and neighborhood safety.

Perceived Barriers	% Responded yes
You are too tired or do not have the energy	44.5
It hurts to exercise	34.5
You do not have the time	30.4
You do not like exercising	30.0
It is difficult to be physically active	28.0
You do not have a safe place to exercise	20.3
Mean number of perceived barriers to exercise	2
Neighborhood safety	% Reporting very or somewhat unsafe
How safe from crime do you consider your neighborhood to be?	45.3
Please rate how safe you feel in each of the following locations or situations:	
Walking alone on a street in your neighborhood at night	41.3
Taking the train/subway at night	46.9
Taking the public bus at night	35.5
In a park or playground during the day	17.5
Taking the train/subway during the day	11.6
Taking the public bus during the day	3.5

TABLE 4: Perceived barriers and safety concerns and engagement in routine and recreational physical activity.

Variables	(1)	(2)	(1)	(2)
	Walk 2.5 hrs/wk	Walk 2.5 hrs/wk	Engage in recreational PA	Engage in recreational PA
Perceived PA barriers (count)	0.72*** (0.087)		0.72*** (0.078)	
Perceived neighborhood safety		0.99 (0.096)		1.01 (0.089)
Normal/under weight	0	0	0	0
Overweight	0.58 (0.293)	0.77 (0.402)	1.46 (0.652)	1.83 (0.865)
Obese	1.18 (0.615)	1.28 (0.700)	0.70 (0.307)	0.88 (0.413)
Age 18–35	0	0	0	0
Age 36–55	1.01 (0.016)	1.01 (0.016)	1.02 (0.015)	1.01 (0.015)
Age 56–85	0.72 (0.328)	0.75 (0.358)	0.66 (0.269)	0.54 (0.241)
Male	2.34* (1.056)	2.04 (0.919)	2.27** (0.874)	2.73** (1.110)
Education (high school degree+)	0.81 (0.134)	0.94 (0.160)	1.28 (0.205)	1.51** (0.265)
Race/ethnicity—other	0	0	0	0
Race/ethnicity black	0.71 (0.451)	1.08 (0.642)	0.91 (0.549)	1.06 (0.640)
Race/ethnicity—hispanic	1.43 (0.908)	2.34 (1.443)	0.74 (0.445)	0.80 (0.477)
Speak Spanish at home	0.60 (0.356)	0.64 (0.378)	1.23 (0.633)	1.06 (0.563)
US born	1.27 (0.702)	1.31 (0.707)	1.19 (0.593)	0.97 (0.493)
Trying to lose weight	0.56 (0.234)	0.42* (0.195)	1.86 (0.725)	1.69 (0.707)
Constant	15.22** (16.787)	3.56 (3.698)	1.45 (1.426)	0.49 (0.486)
Observations	248	221	251	224

Standard error in parentheses

\*\*\* $P < 0.01$ , \*\* $P < 0.05$ , \* $P < 0.1$ .

that low-income areas of New York are more walkable than low-income areas in other cities. Alternatively, respondents, particularly men, may have active jobs that require a great deal of walking. In addition to walking, 72.0% of the sample reported engaging in some other form of physical activity including team sports, cycling, dancing, running, and going to the gym.

Collectively, these findings contradict typical expectations regarding the need for unique interventions in socially deprived neighborhoods like East Harlem and provides a rich

foundation to launch community-based interventions that focus on addressing motivational barriers. In the face of these cognitive barriers, changes to the built environment may go unexploited to physical activity. Given the strong preference for walking, these findings suggest that community-level efforts need to support ways for building activity into daily routines so they are not perceived as adding time to the day and requiring tremendous new sources of energy and motivation. For example, rather than designing a walking path or indoor walking trail in a random location in

the neighborhood, efforts may be more successful if that path is mapped along a highly used route such as from a central or high traffic bus stop to a housing project or to a supermarket. Furthermore, markers of distance or calories expended could be added to reinforce a sense of accomplishment to community residents as they walk these routes and to encourage more frequent use of them. In addition, efforts should be made to reinforce the notion that engaging in regular, routine exercise can increase energy levels and reduce fatigue.

Although routine exercise was prevalent, so was overweight/obesity. Nearly 70% of the sample was either overweight or obese based on our anthropometric measures. This suggests that routine exercise, even in high dosages, may not be adequate to stave off obesity in the absence of changes in the food environment.

Despite the rich data afforded by this unique community resident assessment, several limitations should be noted. Although substantial efforts were made to replicate a random sample through random selection of pre-selected block faces where recruitment was most feasible, the final sample was ultimately a convenience sample of willing residents that may not be representative of the community as a whole. The use of self-reported physical activity behaviors is inherently subject to significant recall and social desirability biases. The generalizability and comparability of results from this survey are limited by the design, which focused on a single, disadvantaged neighborhood. The findings with regards to the role of perceptions of safety and barriers to physical activity, therefore, pertain to differences among individuals within a single neighborhood rather than between neighborhoods.

## 5. Conclusions

The objective of this study was to assess levels and types of physical activity in an area with high rates of obesity and diabetes and to analyze determinants of physical activity. East Harlem is an active community, though one with high rates of obesity. Although safety concerns are often believed to deter physical activity in low-income, urban settings we did find this in East Harlem. Rather, more quotidian concerns were associated with lower physical activity levels.

## Conflict of Interests

The authors declare no conflict of interests.

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## References

- [1] C. C. Cowie, K. F. Rust, D. D. Byrd-Holt et al., "Prevalence of diabetes and impaired fasting glucose in adults in the U.S. population: National Health and Nutrition Examination Survey 1999–2002," *Diabetes Care*, vol. 29, no. 6, pp. 1263–1268, 2006.
- [2] A. V. Diez-Roux, F. J. Nieto, L. Caulfield, H. A. Tyroler, R. L. Watson, and M. Szklo, "Neighbourhood differences in diet: the Atherosclerosis Risk in Communities (ARIC) study," *Journal of Epidemiology and Community Health*, vol. 53, no. 1, pp. 55–63, 1999.
- [3] R. J. Sigal, G. P. Kenny, D. H. Wasserman, C. Castaneda-Sceppa, and R. D. White, "Physical activity/exercise and type 2 diabetes: a consensus statement from the American Diabetes Association," *Diabetes Care*, vol. 29, no. 6, pp. 1433–1438, 2006.
- [4] The City of New York, "Community Health Survey," *Epiquery*, 2012, <http://www.nyc.gov/html/doh/html/community/community.shtml>.
- [5] R. E. Walker and I. Kawachi, "Race, ethnicity and obesity," in *The Oxford Handbook of the Social Science of Obesity*, J. Cawley, Ed., pp. 257–275, Oxford University Press, 2011.
- [6] K. M. Booth, M. M. Pinkston, and W. S. C. Poston, "Obesity and the built environment," *Journal of the American Dietetic Association*, vol. 105, no. 5, pp. S110–S117, 2005.
- [7] J. F. Sallis, M. A. Adams, and D. Ding, "Physical activity and the built environment," in *The Oxford Handbook of the Social Science of Obesity*, J. Cawley, Ed., pp. 433–451, Oxford University Press, 2011.
- [8] B. E. Molnar, S. L. Gortmaker, F. C. Bull, and S. L. Buka, "Unsafe to play? Neighborhood disorder and lack of safety predict reduced physical activity among urban children and adolescents," *American Journal of Health Promotion*, vol. 18, no. 5, pp. 378–386, 2004.
- [9] M. S. Mujahid, A. V. D. Roux, M. Shen et al., "Relation between neighborhood environments and obesity in the multi-ethnic study of atherosclerosis," *American Journal of Epidemiology*, vol. 167, no. 11, pp. 1349–1357, 2008.
- [10] D. A. Cohen, T. A. Farley, and K. Mason, "Why is poverty unhealthy? Social and physical mediators," *Social Science and Medicine*, vol. 57, no. 9, pp. 1631–1641, 2003.
- [11] G. G. Bennett, L. H. McNeill, K. Y. Wolin, D. T. Duncan, E. Puleo, and K. M. Emmons, "Safe to walk? Neighborhood safety and physical activity among public housing residents," *PLoS Medicine*, vol. 4, no. 10, pp. 1599–1607, 2007.
- [12] D. K. Wilson, K. A. Kirtland, B. E. Ainsworth, and C. L. Addy, "Socioeconomic status and perceptions of access and safety for physical activity," *Annals of Behavioral Medicine*, vol. 28, no. 1, pp. 20–28, 2004.
- [13] N. Humpel, N. Owen, and E. Leslie, "Environmental factors associated with adults' participation in physical activity. A review," *American Journal of Preventive Medicine*, vol. 22, no. 3, pp. 188–199, 2002.

- [14] M. L. Booth, N. Owen, A. Bauman, O. Clavisi, and E. Leslie, "Social-cognitive and perceived environment influences associated with physical activity in older Australians," *Preventive Medicine*, vol. 31, no. 1, pp. 15–22, 2000.
- [15] K. R. Allison, J. J. M. Dwyer, and S. Makin, "Perceived barriers to physical activity among high school students," *Preventive Medicine*, vol. 28, no. 6, pp. 608–615, 1999.
- [16] S. Wilcox, C. Castro, A. C. King, R. Housemann, and R. C. Brownson, "Determinants of leisure time physical activity in rural compared with urban older and ethnically diverse women in the United States," *Journal of Epidemiology and Community Health*, vol. 54, no. 9, pp. 667–672, 2000.
- [17] S. Wilcox, M. Bopp, L. Oberrecht, S. K. Kammermann, and C. T. McElmurray, "Psychosocial and perceived environmental correlates of physical activity in rural and older African American and white women," *Journals of Gerontology*, vol. 58, no. 6, pp. P329–P337, 2003.
- [18] A. Daskapan, E. H. Tuzun, and L. Eker, "Perceived barriers to physical activity in university students," *Journal of Sports Science and Medicine*, vol. 5, no. 4, pp. 615–620, 2006.
- [19] S. G. Trost, N. Owen, A. E. Bauman, J. F. Sallis, and W. Brown, "Correlates of adults' participation in physical activity: review and update," *Medicine and Science in Sports and Exercise*, vol. 34, no. 12, pp. 1996–2001, 2002.
- [20] A. E. Eyler, S. Wilcox, D. Matson-Koffman et al., "Correlates of physical activity among women from diverse racial/ethnic groups," *Journal of Women's Health and Gender-Based Medicine*, vol. 11, no. 3, pp. 239–253, 2002.
- [21] K. A. Henderson and B. E. Ainsworth, "A synthesis of perceptions about physical activity among older African American and American Indian women," *American Journal of Public Health*, vol. 93, no. 2, pp. 313–317, 2003.
- [22] A. C. King, C. Castro, S. Wilcox, A. A. Eyler, J. F. Sallis, and R. C. Brownson, "Personal and environmental factors associated with physical inactivity among different racial—ethnic groups of U.S. middle-aged and older-aged women," *Health Psychology*, vol. 19, no. 4, pp. 354–364, 2000.
- [23] G. R. Dutton, J. Johnson, D. Whitehead, J. S. Bodenlos, and P. J. Brantley, "Barriers to physical activity among predominantly low-income African-American patients with type 2 diabetes," *Diabetes Care*, vol. 28, no. 5, pp. 1209–1210, 2005.
- [24] I. R. Mabry, D. R. Young, L. A. Cooper, T. Meyers, A. Joffe, and A. K. Duggan, "Physical activity attitudes of African American and White adolescent girls," *Ambulatory Pediatrics*, vol. 3, pp. 312–316, 2003.
- [25] K. R. Evenson, O. L. Sarmiento, M. L. Macon, K. W. Tawney, and A. S. Ammerman, "Environmental, policy, and cultural factors related to physical activity among Latina immigrants," *Women and Health*, vol. 36, no. 2, pp. 43–57, 2002.
- [26] J. Wilbur, P. J. Chandler, B. Dancy, and H. Lee, "Correlates of physical activity in urban Midwestern Latinas," *American Journal of Preventive Medicine*, vol. 25, no. 3, pp. 69–76, 2003.
- [27] E. A. Walker, A. Caban, C. B. Schechter et al., "Measuring comparative risk perceptions in an urban minority population: the risk perception survey for diabetes," *Diabetes Educator*, vol. 33, no. 1, pp. 103–110, 2007.
- [28] E. P. Cromley, L. Kleinman, M. Ramos et al., "A community-engaged approach to select geographic areas for interventions to reduce health disparities," *Progress in Community Health Partnerships: Research, Education, and Action*, vol. 5, no. 3, pp. 299–305, 2011.
- [29] L. Kleinman, D. Lutz, E. Plumb et al., "A partnered approach for structured observation to assess the environment of a neighborhood with high diabetes rates," *Progress in Community Health Partnerships: Research, Education and Action*, vol. 5, no. 3, pp. 249–259, 2011.
- [30] B. E. Ainsworth, C. A. Macera, D. A. Jones et al., "Comparison of the 2001 BRFSS and the IPAQ physical activity questionnaires," *Medicine and Science in Sports and Exercise*, vol. 38, no. 9, pp. 1584–1592, 2006.
- [31] P. Ekkekakis, E. Lind, and S. Vazou, "Affective responses to increasing levels of exercise intensity in normal-weight, overweight, and obese middle-aged women," *Obesity*, vol. 18, no. 1, pp. 79–85, 2010.
- [32] R. A. Harrison, I. Gemmell, and R. F. Heller, "The population effect of crime and neighbourhood on physical activity: an analysis of 15 461 adults," *Journal of Epidemiology and Community Health*, vol. 61, no. 1, pp. 34–39, 2007.
- [33] F. N. Piro, Ø. Noess, and B. Claussen, "Physical activity among elderly people in a city population: the influence of neighbourhood level violence and self perceived safety," *Journal of Epidemiology and Community Health*, vol. 60, no. 7, pp. 626–632, 2006.
- [34] C. M. Hoehner, L. K. Brennan Ramirez, M. B. Elliott, S. L. Handy, and R. C. Brownson, "Perceived and objective environmental measures and physical activity among urban adults," *American Journal of Preventive Medicine*, vol. 28, no. 2, pp. 105–116, 2005.
- [35] S. P. Hooker, D. K. Wilson, S. F. Griffin, and B. E. Ainsworth, "Perceptions of environmental supports for physical activity in African American and white adults in a rural county in South Carolina," *Preventing Chronic Disease*, vol. 2, no. 4, article A11, 2005.
- [36] F. Li, K. J. Fisher, A. Bauman et al., "Neighborhood influences on physical activity in middle-aged and older adults: a multilevel perspective," *Journal of Aging and Physical Activity*, vol. 13, no. 1, pp. 87–114, 2005.
- [37] R. R. Suminski, W. S. C. Poston, R. L. Petosa, E. Stevens, and L. M. Katzenmoyer, "Features of the neighborhood environment and walking by U.S. adults," *American Journal of Preventive Medicine*, vol. 28, no. 2, pp. 149–155, 2005.
- [38] N. Humpel, N. Owen, D. Iverson, E. Leslie, and A. Bauman, "Perceived environment attributes, residential location, and walking for particular purposes," *American Journal of Preventive Medicine*, vol. 26, no. 2, pp. 119–125, 2004.
- [39] J. L. Thompson, V. K. Wolfe, N. Wilson, M. N. Pardilla, and G. Perez, "Personal, social, and environmental correlates of physical activity in Native American women," *American Journal of Preventive Medicine*, vol. 25, no. 3, pp. 53–60, 2003.
- [40] J. Wilbur, P. J. Chandler, B. Dancy, and H. Lee, "Correlates of physical activity in urban Midwestern Latinas," *American Journal of Preventive Medicine*, vol. 25, no. 3, pp. 69–76, 2003.
- [41] J. Kuo, C. C. Voorhees, J. A. Haythornthwaite, and D. R. Young, "Associations between family support, family intimacy, and neighborhood violence and physical activity in urban adolescent girls," *American Journal of Public Health*, vol. 97, no. 1, pp. 101–103, 2007.
- [42] R. W. Motl, R. K. Dishman, R. P. Saunders, M. Dowda, and R. R. Pate, "Perceptions of physical and social environment variables and self-efficacy as correlates of self-reported physical activity among adolescent girls," *Journal of Pediatric Psychology*, vol. 32, no. 1, pp. 6–12, 2007.
- [43] H. L. Burdette and R. C. Whitaker, "A national study of neighborhood safety, outdoor play, television viewing, and

- obesity in preschool children," *Pediatrics*, vol. 116, no. 3, pp. 657–662, 2005.
- [44] K. Lim and L. Taylor, "Factors associated with physical activity among older people—a population-based study," *Preventive Medicine*, vol. 40, no. 1, pp. 33–40, 2005.
- [45] J. Mota, M. Almeida, P. Santos, and J. C. Ribeiro, "Perceived Neighborhood Environments and physical activity in adolescents," *Preventive Medicine*, vol. 41, no. 5-6, pp. 834–836, 2005.
- [46] R. W. Motl, R. K. Dishman, D. S. Ward et al., "Perceived physical environment and physical activity across one year among adolescent girls: self-efficacy as a possible mediator?" *Journal of Adolescent Health*, vol. 37, no. 5, pp. 403–408, 2005.
- [47] G. J. Norman, B. A. Schmid, J. F. Sallis, K. J. Calfas, and K. Patrick, "Psychosocial and environmental correlates of adolescent sedentary behaviors," *Pediatrics*, vol. 116, no. 4, pp. 908–916, 2005.
- [48] S. Adkins, N. E. Sherwood, M. Story, and M. Davis, "Physical activity among African-American girls: the role of parents and the home environment," *Obesity research*, vol. 12, pp. S38–S45, 2004.
- [49] B. E. Ainsworth, S. Wilcox, W. W. Thompson, D. L. Richter, and K. A. Henderson, "Personal, social, and physical environmental correlates of physical activity in African-American women in South Carolina," *American Journal of Preventive Medicine*, vol. 25, no. 3, pp. S23–S29, 2003.
- [50] D. R. Young and C. C. Voorhees, "Personal, social, and environmental correlates of physical activity in urban African-American women," *American Journal of Preventive Medicine*, vol. 25, no. 3, pp. S38–S44, 2003.
- [51] B. K. Sanderson, H. R. Foushee, V. Bittner et al., "Personal, social, and physical environmental correlates of physical activity in rural African-American women in Alabama," *American Journal of Preventive Medicine*, vol. 25, no. 3, pp. S30–S37, 2003.
- [52] K. R. Evenson, O. L. Sarmiento, K. W. Tawney, M. L. Macon, and A. S. Ammerman, "Personal, social, and environmental correlates of physical activity in North Carolina Latina immigrants," *American Journal of Preventive Medicine*, vol. 25, no. 3, pp. S77–S85, 2003.