Journal of Healthy Eating and Active Living
2021, Vol. 1, No. 3, pages 98-110

Peer Reviewed Research

Neighborhood Built Environment Impacts Park Use of Diverse, Low-Income Mothers With Their Children

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Abstract
Built environment features, including parks, often exacerbate health disparities. We examined built environment perceptions and park use among a population at high risk for negative physical health outcomes: racially diverse, low-income mothers across the United States. Perceived safety from crime and living near a park were associated with more frequent park use for mothers with their children, and neighborhood walkability was linked to longer park visits. However, only 40% of mothers lived within a 10-minute walk of a park, and overall perceptions of walkability and safety from crime were low. To enhance physical activity and health of low-income mothers with their children, investments are needed to close disparities in park access and improve neighborhood safety.

***Keywords*:** crime, parents, physical activity, race, walkability, youth

Built environment features can encourage physical activity, contributing to healthy lifestyles and enhancing physical health (Smith et al., 2017). Neighborhood walkability, which refers to a neighborhood's ability to support safe and efficient walking to amenities, is often linked to physical activity (Carr et al., 2010). Parks are a key component of walkable neighborhoods, and both access to parks and active transportation to parks, such as walking and biking, can positively impact physical activity (Hunter et al., 2015; Van Dyck et al., 2013). Simply living near parks, especially large parks, may be associated with better physical health (Stark et al., 2014).

Although neighborhood walkability, active transportation infrastructure, and access to parks are associated with more physical activity and better physical health (Fields et al., 2013; Lee et al., 2015; Mama et al., 2015a), enduring environmental injustices mean that minority and low-income neighborhoods are less likely to contain high-quality infrastructure associated with healthy behaviors. For example, studies have shown that historically marginalized areas are less walkable (e.g., have fewer sidewalks; Cutts et al., 2009; Fields et al., 2013), and may contain fewer or less-well-maintained parks than higher-income areas (Vaughan et al., 2013). Minority neighborhoods often have less acreage of recreational

space, smaller park size, and lower quality facilities (Rigolon et al., 2018)—all discrepancies that negatively influence physical activity and health. Furthermore, compared to wealthy areas, lower-income and high-minority neighborhoods are also more likely to have incivilities (e.g., litter, vandalism), unhealthy retail (e.g., fast food restaurants; Parsons et al., 2015), and disamenities (e.g., crime, traffic) that negatively influence residents' levels of physical activity and park use (Casagrande et al., 2009; Cutts et al., 2009; Parsons et al., 2015). Thus, built environment disparities can magnify health disparities, placing historically marginalized groups (e.g., low-income residents, racial/ethnic minorities) at higher risk of negative health outcomes.

In addition to physical infrastructure, perceptions of the built environment also impact health (Parsons et al., 2015; Penilla et al., 2017). Even when walkable features are present, concerns about crime and traffic safety can hinder park use and physical activity, including active transportation to parks (Cutts et al., 2009; Marquet et al., 2019b). Despite these associations, perceptions of built environment features, active transportation to parks, and park use behaviors are rarely studied together as a means of health promotion within minority populations.

Disparities in ethnoracial minority health outcomes—partly stemming from built infrastructure—are disproportionately present in mothers with young children (e.g., children aged 5–10 years; Casagrande et al., 2009). For instance, when compared to White populations, ethnoracial minority women have worse physical health, are typically more sedentary, and tend to fall short of recommended physical activity levels (Mama et al., 2015b). Mothers, especially, often feel obligated to care for the family and may have low perceived physical activity competency, limiting their ability to become active role models for their children (Tavares et al., 2009). Although studies have demonstrated positive associations between parental support and child physical activity levels, direct correlations between parental and child physical activity rates are either weak or equivocal (Petersen et al., 2020). Some research has found that mothers are often sedentary (e.g., supervising) while their children are active and playing (Hnatiuk et al., 2017), potentially negatively impacting parents' physical health. Considering these relationships, researchers and practitioners have advocated for interventions to promote co-participation in physical activity for mother-child dyads, given the more widely cited importance of parent-child co-participation in physical activity (Hesketh et al., 2014; Hnatiuk et al., 2017).

Benefits of co-participation in physical activity for mothers and children can be realized through recreation activities in parks and active transportation to parks (French et al., 2017). However, compared to men, women often engage in fewer park visits, shorter duration of park visits, and lower levels of park-based physical activity (DeRose et al., 2018). These disparities are even more pronounced in women with children, especially in high-poverty neighborhoods (DeRose et al., 2018; Greer et al. 2017). An enhanced understanding of low-income parental perceptions of neighborhood environments and parks—particularly how the extent of concerns over walkability and safety relates to actual park visitation—is the first step in facilitating more physical activity across generations of this vulnerable subpopulation (Ogletree et al., 2020).

The purpose of our study was to examine park use correlates—including perceptions of walkability, safety from crime, safety from traffic, and perceived park proximity—among diverse low-income mothers with their children, a population often lacking access to high-quality health-promoting infrastructure. We first characterized mothers' perceptions of the built environment, including aspects such as neighborhood walkability, crime safety, traffic safety, and park proximity. We then examined the influence of these factors on three key components of park use associated with physical activity within the mother-child dyad: active transportation to parks, park use frequency, and park visit duration. To address our purpose, we investigated the following hypotheses: (1) Perceptions of the built environment (i.e., perceived walkability, safety from crime, traffic issues, and perceived park proximity) positively influence park use behaviors (i.e., active transportation to parks, park visit frequency, and park visit duration); and (2) Race/ethnicity and residential location (urban/rural) will act as confounding variables.

Methods

Data Collection

We collected data using an online survey distributed to a racially diverse sample of parents across the United States. The survey was distributed to a purchased panel of respondents from the online survey platform Qualtrics. At the request of the researchers, the survey was administered to a national sample of low-income, predominantly ethnoracial minority parents across all 50 United States. Qualtrics used quota sampling to meet our criteria for sociodemographic variables of interest, including race/ethnicity and income. For income, only respondents with household incomes less than $42,786 (80% of federal median household income) met inclusion criteria. Additionally, we oversampled ethnoracial minority groups to obtain a sample with 80% BIPOC[1] respondents. Only parents and guardians of children aged 5–10 years old were included in the sample. In this study, our analysis focused exclusively on women (mothers; 85% of total respondents, N = 1,374), as this subpopulation has some of the lowest rates of physical activity nationwide (Hnatiuk et al., 2017). Sampling occurred over a period of 50 days from September to November 2018. Median response time was

[1] BIPOC: Black, Indigenous, and People of Color; a more inclusive way to refer to people of color for Black and Indigenous individuals.

about 8 minutes. Response rates could not be calculated due to the way Qualtrics recruits participants, though they employ a method of data scrubbing to ensure response quality (Boas et al., 2018). This study was approved by our institution's IRB prior to data collection.

Survey Instrument

Independent Variables

The survey contained questions regarding perceptions of neighborhood characteristics and park visitation behaviors. Perceptions of the neighborhood environment assessed four components identified in the literature as important features for promoting physical activity and park use: (a) walkability, (b) safety from crime, (c) traffic issues, and (d) living within a 10-minute walk from a park. The first three were represented by latent variables comprising statements with 4-point Likert scales adapted from established metrics in prior research with similar audiences (Millstein et al., 2011; Rosenberg et al., 2009). Three walkability items related to whether alternative walking routes are available, whether intersections are close together, and whether walkways adequately connect streets together. Three items assessing safety from crime related to whether the respondent sees and speaks with other people when they walk, whether pedestrians can be seen by cars, and whether the streets were well lit at night. Three items assessing traffic issues related to the speed of cars, presence of exhaust fumes, and amount of traffic. These statements followed the prompt: "How much do you agree with the following statements regarding [streets/safety from crime/safety from traffic] in your neighborhood?" with response options ranging from 1 = strongly disagree to 4 = strongly agree. Park proximity was a perception-based variable asking respondents to select whether there was a park within a 10-minute walk from their home. This variable was dichotomized, where 0 = no and 1 = yes. This and similar measures of perceived park proximity have been used in prior studies (Bancroft et al., 2015; Ries et al., 2009).

Dependent Variables

Our survey assessed three aspects of park use: (a) active transportation to parks, (b) park use frequency, and (c) park visit duration. Active transportation to parks was assessed with a dichotomous variable (0 = drives or takes public transit and 1 = walks or bikes) with responses to the question "What is the usual mode of transportation you and your child use to go to the park?" Park use frequency was measured with a single question, "How often do you visit a park with your child?" rated on a scale from 1 to 5 (daily, weekly, monthly, occasionally, or never). Similarly, park use duration was measured with the question "On a usual park visit with your child, how long do you stay in the park?" (less than 15 minutes, 15–30 minutes, 31–59 minutes, 1–2 hours, or more than 2 hours). We treated park use frequency (1 item) and duration (1 item) as continuous variables, following approaches used in other studies (Rhemtulla et al., 2012).

Confounding Variables

We collapsed race/ethnicity, reported by the parent, into a series of dummy variables with White as the reference group. Races/ethnicities—referring to the mothers' race/ethnicity—included were White, Black, Latinx, Asian, other race/ethnicity, and two or more races. We treated White Latino individuals as Latino and other races as non-Latino, which is in line with Census treatment. Location type, based on respondents' zip codes, was used to detect effects of location on independent and dependent variables. Location was classified using National Center for Education Statistics (NCES) classifications: city, suburban, town, and rural, where urban areas were defined as the combination of the city and suburban categories and rural areas were defined as the grouping of town and rural categories (Geverdt, 2018). We collapsed these locations into a single binary variable such that 1 = urban (city + suburban) and 0 = rural (town + rural).

Analysis

We first calculated sample descriptive statistics and frequencies for built environment and park use variables. We conducted crosstabs to assess the breakdown of park access by race/ethnicity and analyses of variance (ANOVA) to assess differences in walkability, safety from crime, and safety from traffic by race/ethnicity.

Hypothesis Testing

Following these initial analyses, we tested our hypotheses (restated below) using structural equation modeling (SEM): (1) Perceptions of the built environment (i.e., perceived walkability, safety from crime, safety from traffic, and perceived park proximity) positively influence park behaviors (i.e., active transportation to parks, park visit frequency, and park visit duration); (2) Race/ethnicity and residential location (urban/rural) will act as confounding variables.

We analyzed relationships among these variables using a two-step analytical process comprising confirmatory factor analysis (CFA) followed by SEM. CFA is a construct validation process in which groups of items are assessed for their ability to represent latent constructs (e.g., the three walkability items represent "perceived walkability"; Brown, 2015). Full information maximum likelihood estimation was used, and all analyses were conducted in R version 4.0.2. We consulted model fit statistic values, factor loadings, and modification indices to improve model fit and to achieve a parsimonious model according to guidelines specified in the literature, though we did not use strict cutoff criteria (Brown, 2015). Model fit statistic values used to guide the model trimming process were robust CFI ($\geq$.95), robust RMSEA ($\leq$.08), and SRMR ($\approx$.07) (Savalei, 2018). Factor loading scores deemed acceptable were $\geq$0.3. Although model respecification is not ideal, it is used often in studies of public opinion (Brown, 2015).

After a measurement model was finalized, we used SEM to test our hypotheses. SEM is a way to estimate multiple regression equations at different levels simultaneously and is considered a robust analysis for psychometric data, as the present study uses (Brown, 2015). Our exogenous variables included the four built environment variables (i.e., walkability, crime, traffic, and park access), and our endogenous variables were the three park use behavior variables (i.e., active transportation, park use frequency, and park visit duration).

Results

Demographic Attributes of Sample

Demographic information is displayed in Table 1. The sample consisted of 1,374 mothers living in the United States at the time of the survey. Nearly all states were represented, with the most respondents from New York, Texas, and California. Approximately half of the sample (48%, n = 655) reported incomes less than $25,000, and only 20% ($n$ = 276) were White. Nearly 90% of respondents lived in urban areas.

Table 1. Sample Demographics

Variable	*n*	%
Household income		
Less than $25,000	655	48%
$25,001–42,786	719	52%
Location		
Metropolitan area/urban	1,186	87%
Nonmetropolitan area/rural	183	13%
Race/Ethnicity		
White	276	20%
Black	475	35%
Asian	95	7%
Latinx	338	25%
Other	50	4%
Two or more races/ethnicities	140	10%
Age	Mean = 33.0	*SD* = 6.3
Total *N*	1,374	

Descriptive Statistics and ANOVA

Descriptive statistics for individual survey items are available in the appendix. Perceptions of walkability were highest of the three latent built environment variables (M = 2.8, SD = 0.7), perceptions of safety from crime in the middle (M = 2.7, SD = 0.7), and traffic issues were lowest (M = 2.6, SD = 0.7), with means hovering between 2 ("somewhat disagree") and 3 ("somewhat agree") on a 4-point scale. Overall, responses indicated lukewarm opinions of neighborhood walkability and safety from crime and moderately low perceptions of traffic issues. A majority of the sample did not have a park within a 10-minute walk from their house (60%, n = 817). Despite this, the majority of respondents visited parks either daily or weekly with their children (56%, n = 762), though only 21% (n = 294) walked or cycled to get there. The majority of the sample (60%, n = 806) spent less than an hour during their typical park visit, compared to the other 40% (n = 544) that spent an hour or more. The median and modal visit duration were both between half an hour and one hour.

Results of crosstabs and chi-square omnibus tests (reported in Table 2) revealed that a greater percentage of Black (41%), Asian (45%), and Latinx (43%) respondents, and respondents of two or more races/ethnicities (41%) had access to a park within a 10-minute walk of their house than White respondents (30%) and respondents of other races/ethnicities (32%).

Omnibus ANOVA results and mean difference and significance level for significant post hoc tests are in Table 3. Results showed that Black respondents perceived greater walkability than White respondents (mean difference = .195), and felt safer from crime than Latinx respondents and respondents with two or more races/ethnicities. No significant differences across race/ethnicity were found for perceived safety from traffic.

Table 2. Cross-Tabulation of Race/Ethnicity and Park Proximity*

Park proximity	Race/ethnicity						χ^2	*p*
	White	Black	Asian	Latinx	Other	Two or more		
Yes	82 (30.2%)	191 (41.4%)	43 (45.3%)	144 (43.2%)	16 (32.0%)	57 (41.0%)	15.26	.009
No	190 (69.9%)	270 (58.6%)	52 (54.7%)	189 (56.8%)	34 (68.0%)	82 (59.0%)		

Note. Total *N* = 1,350. Total park access = 40%. *Park proximity indicates respondent reported a park within a 10-minute walk of home.

Table 3. Analyses of Variance Assessing Differences by Race/Ethnicity for Walkability, Crime Safety, and Traffic Safety (top), and Post Hoc Test Results (bottom).

	M	*SD*	*MS*	*F*	*p*
Walkability*	2.81	0.73			
Race			**1.48**	**2.79**	**.016**
Residuals			0.53		
Crime safety	2.67	0.75			
Race			**2.63**	**4.75**	**<.001**
Residuals			0.55		
Traffic safety	2.58	0.73			
Race			0.44	0.85	.517
Residuals					

$Mean_i - Mean_j$	M_i (SD_i)	M_j (SD_j)	Mean difference	*p*
Black – White[1]	2.87(0.72)	2.68(0.77)	0.195	.005
Latinx – Black[2]	2.56(0.76)	2.79(0.73)	-0.226	<.001
Two or more races – Black[2]	2.57(0.77)	2.79(0.73)	-0.223	.023

Note. *Walkability failed Levene's test for homogeneity of variances; Tamhane's T2 was used as the post hoc test in this case. [1]Walkability, [2]Safety from crime.

Measurement Model

Results from the CFA are in the appendix. The first CFA model had poor model fit (χ^2 = 2135.42, df = 62, *p* <.001, robust CFI = .47, robust RMSEA = .169, SRMR = .161). After several iterations of model respecification, in which items were dropped based on low factor loadings, high modification indices, and low average variance explained of latent variables, a parsimonious model with robust fit indices was achieved. The items dropped were reverse-coded items, which often load poorly onto latent constructs (Ruchkin et al., 2008). The final model, with three items in each latent variable, had good fit (χ^2 = 78.34, df = 24, *p* <.001, robust CFI = .97, robust RMSEA = .045, SRMR = .032).

Structural Model Results

Results from the structural model, discussed below, are displayed in Table 4 and in Figure 1. After finalizing the latent constructs in the measurement model, measured variables were added for SEM. The first structural model had inadequate model fit (χ^2=583.45, df=108, *p*<.001, robust CFI=.821, robust RMSEA=.057, SRMR=.065). According to modification indices, it was apparent that letting the walkability and crime safety latent variables co-vary would significantly reduce the model chi-square value. After this respecification, the structural model had good fit and was retained as the final model (χ^2 = 326.64, df = 107, *p* <.001, robust CFI = .918, robust RMSEA = .039, SRMR = .035).

Table 4. Structural Model Results

Variable	Predicted by	B	SE	Z	*p*
Walk/bike to park	Traffic safety	.01	.02	.62	.53
	Crime safety	.03	.02	1.09	.27
	Walkability	-.02	.03	-.76	.45
	10 minute walk	**.35**	**.02**	**14.95**	**<.001**
Park use frequency	Traffic safety	.08	.05	1.51	.13
	Crime safety	**.26**	**.07**	**3.88**	**<.001**
	Walkability	-.06	.07	-.91	.36
	10 minute walk	**.30**	**.06**	**5.13**	**<.001**
Visit duration	Traffic safety	-.01	.05	-.24	.81
	Crime safety	**-.15**	**.06**	**-2.36**	**.02**
	Walkability	**.19**	**.07**	**2.77**	**.01**
	10 minute walk	**-.22**	**.05**	**-4.26**	**<.001**
Effects of confounders					
Traffic safety	Black	.03	.07	.41	.68
	Asian	.16	.10	1.52	.13
	Latinx	.09	.07	1.26	.21
	Other race/ethnicity	-.01	.11	-.05	.96
	Two or more races/ethnicities	.04	.09	.45	.66
	Urban/rural	.02	.07	.27	.79
Crime safety	**Black**	**.14**	**.06**	**2.25**	**.02**
	Asian	.16	.09	1.83	.07
	Latinx	-.03	.07	-.43	.67
	Other race/ethnicity	.07	.14	.49	.63
	Two or more races/ethnicities	-.07	.09	-.81	.42
	Urban/rural	-.004	.06	-.06	.96
Walkability	**Black**	**.23**	**.07**	**3.53**	**<.001**
	Asian	**.23**	**.10**	**2.40**	**.02**
	Latinx	**.17**	**.07**	**2.48**	**.01**
	Other race/ethnicity	.10	.14	.73	.46
	Two or more races/ethnicities	.12	.09	1.27	.20
	Urban/rural	-.004	.06	-.06	.95
Ten minute walk	**Black**	**.10**	**.04**	**2.90**	**.004**
	Asian	**.15**	**.06**	**2.58**	**.01**
	Latinx	**.13**	**.04**	**3.28**	**.001**
	Other race/ethnicity	.02	.07	.30	.77
	Two or more races/ethnicities	**.11**	**.05**	**2.15**	**.03**
	Urban/rural	.04	.04	.99	.32

Note. Model fit statistics: N = 1,369, robust χ^2 = 326.64, df = 107, p <.001, robust CFI = .918, robust RMSEA = .039, SRMR = .035.

Regarding active transportation to parks, park proximity (i.e., having a park within a 10-minute walk) was associated with walking or biking to the park (B = .35, p <.001). Regarding park use frequency, higher perceptions of safety from crime (B = .26, p <0.001) and park proximity (B = 0.30, p <0.001) were significantly associated with more frequent park use. And regarding park visit duration, walkability (B = .19, p = .01), crime safety (B = -.15, p = .02), and park proximity (B = -.22, p <.001) were all related to visit duration. The more walkable the neighborhood was perceived to be, the longer the park visits. Conversely, the less safe from crime respondents felt, the longer their visits to parks. Park proximity was associated with shorter park visits. Traffic safety was not significantly related to any dependent variables.

Confounding Variables

Black (B = .23, p = .001), Asian (B = .23, p = .02), and Latinx (B = .17, p = .01) mothers reported more positive perceptions of neighborhood walkability than the White reference group. Similarly, Black mothers reported more positive perceptions of safety from crime (B = .14, p = .02). Every racial group except for "other race/ethnicity" was more likely than White respondents to have a park within a 10-minute walk (see Table 4 for values). No confounding

variables were significantly related to perceived traffic safety. Living in an urban environment was not related to any built environment variables. Thus, among this low-income sample of mothers, a few different racial/ethnic minority groups reported greater neighborhood safety and walkability than their White counterparts.

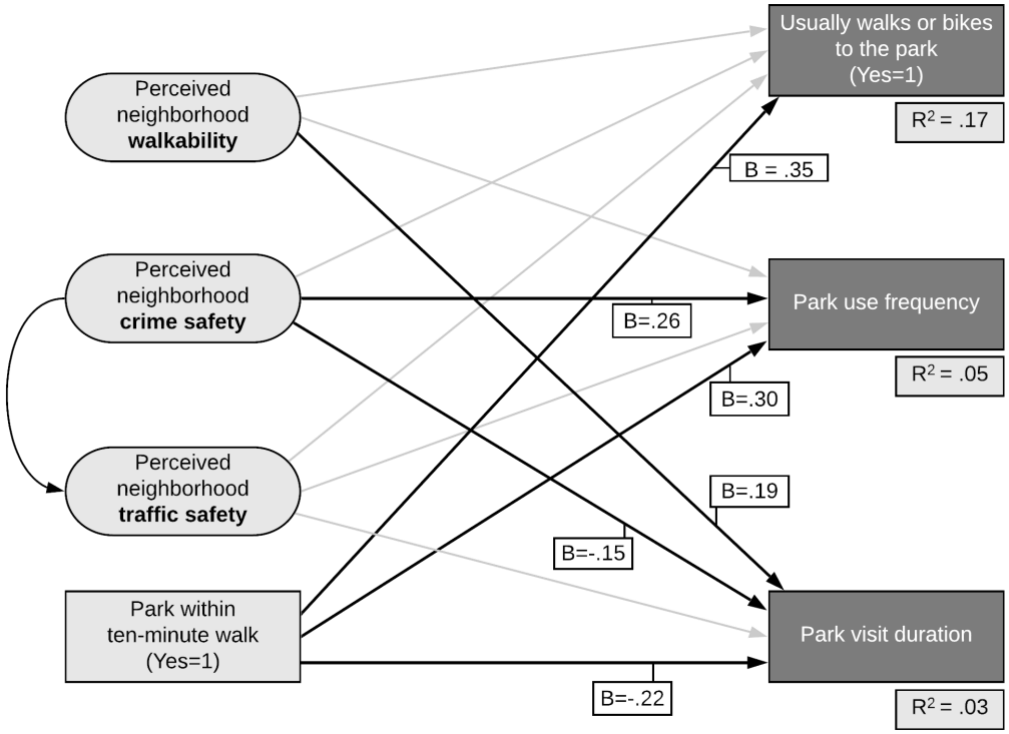

Figure 1. Graphical summary of structural model results. *Note:* Nonsignificant paths are grayed out in the figure.

Discussion

Among ethnoracially diverse, low-income mothers of young children, perceptions of a safe neighborhood free from crime were associated with more frequent park use. Previous research has revealed links between park use and subjective and objective assessments of neighborhood crime (Huang et al., 2020; Marquet et al., 2019a). The inverse relationship between perceived crime and park use is particularly prominent among women (DeRose et al., 2018) and children (Huang et al., 2020), both groups whose perceived safety may be compromised when crime is rampant. The importance of safe access to parks may be even more pronounced for mothers with children living in low-income neighborhoods.

Park proximity (i.e., having a park within a 10-minute walk) was associated with more frequent park use and physically active transportation to parks. However, living close to parks was associated with shorter park visits. When mothers with children live close to parks, they might be more inclined to visit them on a regular basis due to the minimal time and energy needed to travel there (Koohsari et al., 2013). In these circumstances, park use frequency and active transportation to parks may be better indicators of physical activity than park visit duration. All of these associations, when documented in a sample of racially diverse, low-income women (Lee et al., 2015), highlight the importance of park access in efforts to encourage and promote physical activity (Marquet et al., 2019b).

Neighborhood walkability was associated with longer park visits. Previous research has shown that walkability is linked to higher levels of park use and physical activity (Van Dyck et al., 2013), but these relationships often depend on local context and measurement strategies. For example, these patterns are often observed in cities where income and health disparities are less pronounced, highlighting the need to investigate walkability in high poverty (Chudyk et al. 2017) and high-minority neighborhoods (Adkins et al., 2019). Additionally, McCormack et al. (2020) found that although walkability was not associated with fitness outcomes, park perceptions and physical activity environment assessments (e.g., Physical Activity Neighborhood Environment Survey [PANES]) were correlated with these outcomes. The collective results suggest that, especially for low-income mothers, parks are a critical component of walkable neighborhoods that can help to facilitate more physically active lifestyles.

Our results indicated that mothers' use of active transportation to parks was not associated with perceived walkability, or perceptions of safety from crime and traffic. These findings are inconsistent with prior studies showing that parents visit parks less often with their children when they have to cross busy streets to reach the park (French et al., 2017). Such associations might be minimized in low-income samples like ours, where other factors such as cultural norms and social support have a substantial impact on park use and transportation decisions (Schultz et al., 2017). In any case, because active transportation infrastructure provides a unique opportunity for mothers and their children to engage in physical activity together, we should continue to emphasize active transportation opportunities as a valuable health promotion tool.

Although we observed positive associations between the built environment and park use variables in our model, the descriptive statistics tell a more nuanced story. Our findings show that many of the potential benefits linking built environment attributes and park use were rarely realized in our low-income sample of mothers with children. For example, respondents did not report feeling exceptionally safe from crime and traffic, and overall neighborhood walkability scores were somewhat low. Crime concerns are also contextual and may be more pronounced in low-income areas (Van Holle et al., 2012). Based on responses, it appears low-income, ethnoracial minority communities experience persistent issues with disparities in the built environment. It was particularly discouraging that only 40% of our sample lived within a 10-minute walk from a park.

Although we cannot speak to how park proximity, active transportation, and park use directly impact physical health, prior research suggests that these factors are related to multiple dimensions of health (Larson et al., 2016). Our findings indicate that when low-income mothers perceive a safe neighborhood and have access to a park, positive health outcomes linked to park use and active transportation are more likely to arise.

Our results also revealed a somewhat surprising trend: Some racial and ethnic minorities reported higher levels of neighborhood walkability, safety, and park access than their White counterparts. Prior research has revealed similar trends (Cutts et al., 2009), such as that high-minority neighborhoods might contain more parks (Vaughan et al., 2013). However, racial disparities in prior research are rarely separated from effects of income, given the close ties between income and race in the United States (Chetty et al., 2020). Because we only sampled low-income parents, we isolated the effects of race from income. As a result, racial differences in the built environment—often seen in previous studies—dissipated (Parsons et al., 2015). We should reiterate that, even if racial differences were minimal, our overall sample reported relatively poor access to nearby parks. Low levels of park use therefore remain prominent barriers to physical activity and active lifestyles in low-income communities and may limit opportunities for mother-child dyads to experience safe and accessible outdoor recreation opportunities (Penilla et al., 2017).

Despite these trends, previous research highlights opportunities for improving the physical activity levels of mothers with their children. For instance, studies have shown that co-participation in activities such as walking or cycling in leisure time can help, which underscores the importance of a safe built environment that encourages and enables physical activity among the mother-child dyad (Hnatiuk et al., 2017; Ogletree et al., 2020). Policies and practices that expand active transportation routes to parks may be critical. Increasing and revitalizing park-based programming, especially facilities and activities geared toward families, might alter activity patterns as well (Cohen et al. 2015). An intervention with mothers from disadvantaged urban and regional areas revealed that the women were favorable to receiving information about active play via communication technologies (Downing et al., 2016). Future interventions in parks could therefore increase direct access and messaging to mothers when trying to inform new programming and expand awareness of opportunities in areas of greatest need (Greer et al., 2017). Policies and interventions that target coactivity with parents and children should consider the priority parents place on activities outdoors and close to home but should also recognize the importance of park access, as indicated in this study (Rhodes & Lim, 2018). Regardless of strategy, our results demonstrate the growing need for more interventions to concurrently increase the physical activity levels of mothers and their young children (Hesketh et al., 2014).

Limitations

Future research could address several limitations of our study. Limiting the sample to low-income households did not allow for income-based comparisons, potentially masking racial/ethnic disparities that are income-driven. Additionally, we acknowledge the relatively small portion of White respondents, against which other racial groups were compared, as a potential limitation of our comparative analyses. We also did not have more specific location data, and future studies could more effectively examine location's influence on park use behaviors beyond an urban/rural dichotomy. Our study did not account for other elements of the built environment, such as density, which has been linked to physical activity in prior studies (Johnson-Lawrence et al., 2015). Nor did the survey ask about specific behaviors or attributes within parks, limiting our ability to know if park behaviors are contributing to healthy lifestyles for parents and their children (Ogletree et al., 2020). Our survey also used shortened measures from the original instrument (Millstein et al., 2011); thus, additional research testing these scales would help affirm their validity across diverse populations. Because we were interested in co-participation, we only assessed park use when mothers and children were together (and not mothers using parks independently). We did not ask which parks were used most frequently, though some research suggests parents may be more likely to take

children to larger parks farther from home if higher quality amenities are available (Flowers et al., 2020). We could not assess the impact of park funding, park programming, or other measures of park quality, which may be important indicators of park use and subsequent health outcomes (Cohen et al., 2012), especially in low-income communities (Stark et al., 2014). Furthermore, our use of perceived built environment variables instead of direct measures means that respondents' experiences may not reflect actual conditions, in line with past research (Lackey & Kaczynski, 2009). Finally, we did not directly assess physical activity levels of mothers and children, instead using active transportation to parks, park use frequency, and visit duration as proxies for activity. In addition to physical health outcomes, future research might also account for mental health outcomes of mother-child dyads visiting parks. For example, emerging research suggests park visits can help to lower the stress levels of low-income parents (Razani et al. 2018).

Conclusions

Our results have significance for practitioners and policy-makers, since they derive from a unique sample of low-income, diverse mothers of young children. This study shows that built environment features such as perceived safety from crime, walkability, and park access can influence active use of parks. Low-income mothers who feel safe in their neighborhood use parks more often and for longer periods of time, and those who live near parks are more likely to use active transportation to get there. But our study also shows that many mothers from low-income communities continue to lack access to key infrastructure and critical resources, such as parks, needed to promote active lifestyles (French et al., 2017). Pathways to park-based physical activity may be particularly important to mothers—especially racial/ethnic minority mothers—who can model and support healthy living for their children (Hnatiuk et al., 2017). Additional investments in park maintenance, programs, and community outreach are therefore needed to close gaps in park access and quality across racial/ethnic and socioeconomic groups and encourage active lifestyles, especially for mothers and their children.

Author Contributions

Conceptualization, LEM, LRL, JAH. Data curation, MFF, OM, JHH, CA, JAH. Formal analysis, LEM, LRL, JAH. Funding acquisition, MFF, JAH. Investigation, All authors. Methodology, LEM, LRL, JAH. Writing—original draft, LEM. Writing, review & editing, all authors.

Funding:

This work was supported by the Robert Wood Johnson Foundation through the Physical Activity Research Center under grant #76627.

Conflict of interest statement:

We have no conflicts of interest to disclose.

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Appendix

Descriptive statistics for individual items in latent and measured variables

Item	**Mean**	**SD**
Walkability		
There are many alternative routes for getting from place to place. (I don't have to go the same way every time.)	2.9	0.9
The distance between intersections is usually short (100 yards or less; the length of a football field or less)	2.8	0.9
There are walkways that connect streets to other streets, trails, or cul-de-sacs	2.8	1.0
Crime safety		
I see and speak to other people when I am walking	2.8	0.9
Walkers and bikers can be easily seen by people in their homes	2.7	0.9
Streets are well lit at night	2.6	1.0
Traffic safety		
Most drivers exceed the posted speed limits	2.9	0.9
There is so much traffic that it makes it difficult or unpleasant to walk	2.4	1.0
When walking, there is a lot of exhaust fumes (such as from cars, buses)	2.4	1.0
Park proximity: Is there a park within a 10-minute walk of your residence?	***n***	**%**
Yes	533	39
No	817	60
Active transportation: What is the usual mode of transportation you and your child use to go to the park?		
Walk or Bike	294	21
Other (i.e., car, public transit, other)	1,085	79
Park visit frequency		
Daily or weekly	762	55
Monthly or occasionally	588	43
Never	24	2
Park visit duration		
Less than an hour	806	59
An hour or more	544	40

Prompts: Walkability: "How much do you agree with the following statements regarding streets in your neighborhood?" Crime safety: "How much do you agree with the following statements regarding safety from crime in your neighborhood?" Traffic safety: "How much do you agree with the following statements regarding safety from traffic in your neighborhood?" Percentages may not add up to 100 due to rounding.

Measurement model results

Variable	Predicted by	B	SE	Z	*p*	β
Walkability	Walkways connect streets together	1				.69
	Distance between intersections is short	.88	.05	17.99	<.001	.65
	Alternative routes are available	.77	.05	14.57	<.001	.58
Crime safety	Streets are well lit at night	1				.76
	Walkers and bikers can be easily seen	.96	.04	22.07	<.001	.76
	I see and speak to other people when walking	.65	.04	15.02	<.001	.50
Traffic safety	Traffic makes it difficult to walk	1				.72
	Drivers exceed the posted speed limit	.70	.06	10.86	<.001	.53
	There is a lot of exhaust fumes	.76	.07	11.24	<.001	.57

Note. Survey item wording has been shortened here for efficiency