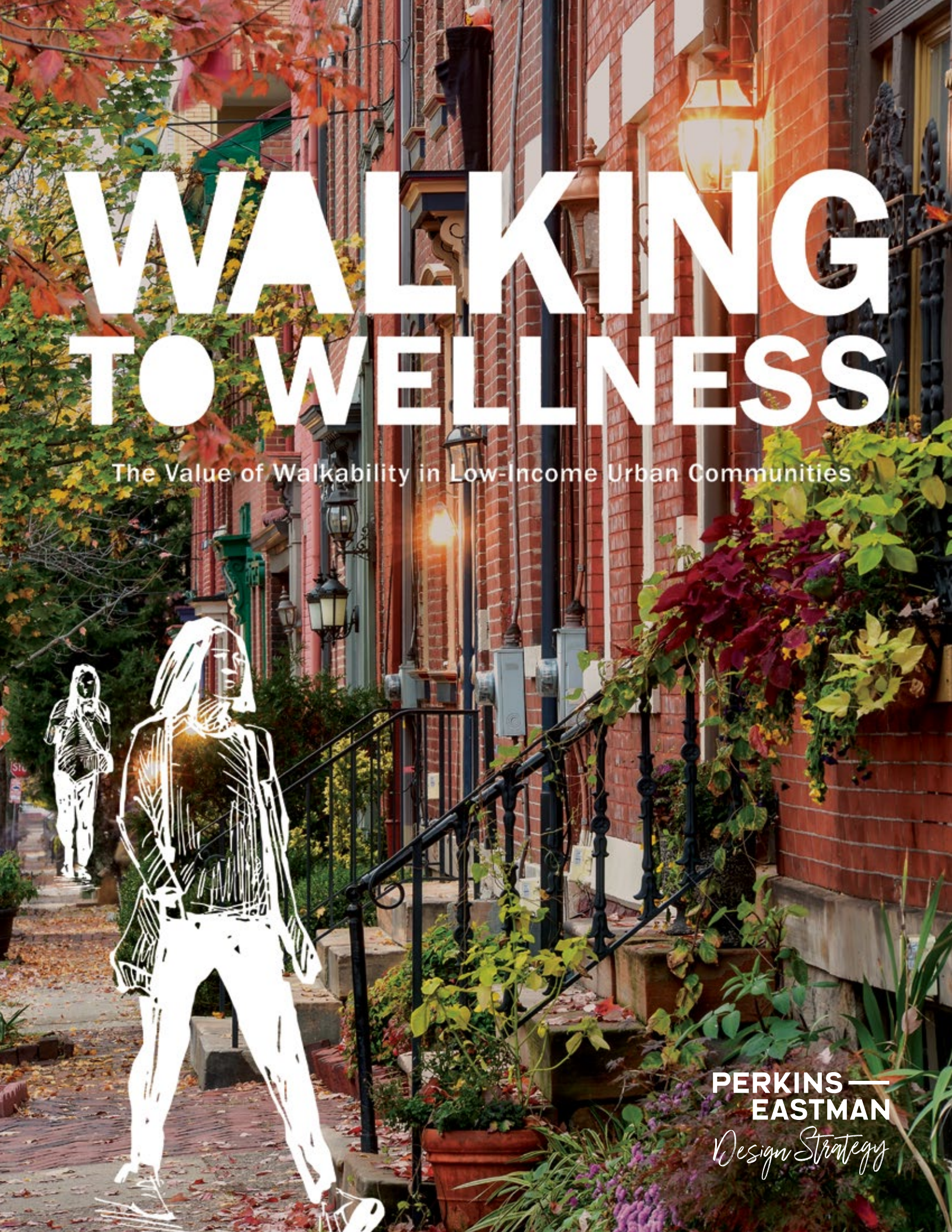

WALKING TO WELLNESS

The Value of Walkability in Low-Income Urban Communities

PERKINS — EASTMAN

Design Strategy

FOREWORD

For many urbanists working in North America today, walkability is gospel. Since Jane Jacobs's 1961 rallying cry to choreograph the "ballet of the sidewalk," generations of urban designers, city planners, and placemakers have tried to reclaim the pedestrian scale in cities still reeling from half a century of destructive modernist planning principles, as well as racist urban renewal schemes, highway construction, and neighborhood disinvestment.

Yet many open questions remain about how to mend urban places and achieve more walkable cities and towns. Given the massive scale of the challenge and limited budgets, what design details and land use decisions genuinely lead to improved wellness? Are the supposed benefits of walkability simply a mirage caused by socioeconomic factors, or does a great public realm make a difference for low-income communities as well?

Part leading-edge research and part hopeful recipe book, "Walking to Wellness" tackles these thorny questions head on.

The Perkins Eastman team dives below the surface of boosterism and blind faith that too often defines the discourse about walkability. By zooming in on 10 neighborhoods in Pittsburgh, PA, they find the kinds of nuances and conflicts that define real-world placemaking practice. Some well-known metrics fail to connect the dots between physical environmental conditions and health outcomes. Some design interventions help as well as hinder wellness. Far from undercutting the value of walkability, I believe that such honest observations build the credibility of urban design research and suggest new avenues for investigation and practice.

As a placemaker, "Walking to Wellness" fills me with curiosity and resolve. While the problem of health inequity may feel impossibly large and complex, this report reminds us that some of the best solutions start small and can be found just beyond our doorsteps.

Nate Storring

Co-Executive Director

Project for Public Spaces

PREFACE

When I was a Perkins Eastman Design and Wellness Fellow in the summer of 2021, I was completing my Master of Public Policy and Management degree at Carnegie Mellon University, where I am currently pursuing my PhD in Architecture (with a focus in spatial analysis). Through a design course in my master's program, I was introduced to the topic of design in the built environment and the essential role it plays in the lives and social outcomes of communities. Learning more about the power of walkability to be an agent of change in communities became particularly interesting to me. This led me to apply for this fellowship at Perkins Eastman and direct my research around how walkability can help create better social outcomes for low-income urban communities.

I hope you find something useful in this paper that you can bring into your own practice. While many who read this paper might not be policymakers, community activists, or politicians, everyone holds the power to help create a more just and equitable world!

Morgan Newman

Primary Co-author

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INTRODUCTION

What Does "Walkability" Mean for Individual and Community Wellness in Low-Income Neighborhoods?

Research has long shown that walkable neighborhoods benefit residents. Walkability is associated with lower levels of obesity and diabetes, enhanced social cohesion, and higher real estate values.[1] Studies have also established links between the urban built environment and mental health for several decades,[2] but this research has focused on middle-income and high-income neighborhoods. In contrast, the physical and mental benefits of walkability in low-income neighborhoods have been under studied. This white paper seeks to bridge that gap by exploring the relationship between neighborhood wellness and walkability in low-income communities, using both established indexes and additional walkability characteristics. We completed a case study in Pittsburgh, comparing selected neighborhoods on walkability and wellness variables and highlighting mental and social wellness, as well as physical health. By identifying the metrics that are most strongly associated with specific wellness outcomes, the study informs design strategies for community-based planning. More generally, we hope our findings broaden the understanding of walkability and its associated benefits to offer a more holistic picture of the neighborhood environment, its community members, and their wellness.


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FOCUSING ON PITTSBURGH

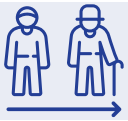
Selecting Neighborhoods for Study

Pittsburgh's economic conditions and urban landscape have radically changed over the past 25 years. Landscaped paths and gardens have revitalized the industrial riverfronts.[3] New galleries, theaters, restaurants, and apartment buildings have energized the city's formerly moribund cultural district.[4] Satellite business districts in the East Liberty, Lawrenceville, and South Side neighborhoods have seen vast amounts of public and private investment, spurring reinvigorated walkable nightlife and population growth for the first time in decades.[5] An internationally recognized focus on sustainability has transformed Pittsburgh from the "Steel City" to one of the nation's greenest and most technologically progressive cities.[6] Much of this reinvention has been fueled by an influx of technology research facilities for Google, Meta, Uber, and other AI, robotics, and biomedical entities, as well as by the continued growth of nationally ranked research universities like Carnegie Mellon University and the University of Pittsburgh, including the University of Pittsburgh Medical Center.

Due in part to this transformation, Pittsburgh is highly ranked among US cities on livability indexes,[7] which broadly reflect the quality of living conditions.* However, when examining livability from race and gender perspectives, Pittsburgh ranks among the worst cities for Black residents.[9] Despite its recent revitalization, Pittsburgh, like many other US cities, struggles with a legacy of discriminatory housing policies and disinvestment in low-income and majority-Black neighborhoods. This legacy is further compounded by gentrification-driven housing cost increases in these neighborhoods—pressures that have both exacerbated racial segregation among the patchwork of Pittsburgh neighborhoods and reinforced inequities in income, investment, and access to resources and amenities. Jerry Dickinson, a law professor at the University of Pittsburgh, former congressional candidate, and Western Pennsylvania native has recently stated his belief that Pittsburgh is "America's Apartheid City."[10]

Against this backdrop and given the city's unusually high number of distinct neighborhoods, each with trackable health and wellness data, Pittsburgh is an ideal testbed to understand the relationship between walkability characteristics and wellness in lower-income and minority neighborhoods. To initiate this study, we compiled a preliminary list of 15 Pittsburgh low-income neighborhoods, and we assessed each neighborhood based on the following eight variables:

Median income



Percentage of youth population remaining in the neighborhood into adulthood
(approximates the lack of change in neighborhood value/gentrification)

Population density
(number of people per square mile)

Percentage of Black, Asian, Latino, Biracial, and other minority populations

Job density
(number of jobs per square mile)

Percentage of population 25 years of age or older without a bacherlor's degree

Percentage of population between ages 25 and 44

Median rent

*The Economist's *annual Global Livability Index uses the categories of stability, healthcare, culture & environment, education, and infrastructure to create its rankings.[8]*

NEIGHBORHOODS SELECTED FOR STUDY

Once collected for each of the 15 neighborhoods, we trimmed the data by first determining its distribution through computing a sample mean for each variable and calculating two standard deviations above and below the mean. We categorized neighborhoods that fell outside of this range as outliers and eliminated them from our study. Our final list focuses on 10 neighborhoods, each one with at least seven of the eight variables inside the ± two standard deviation range.

The 10 selected neighborhoods represent a range of walkability values measured through the Walk Score® Index (see "Measuring Walkability," page 11 , for more details), though they have similar population densities, income levels, and quality of building stock. Minimizing confounding variables allows us to investigate the relationship between walkability and neighborhood wellness more accurately.

10 Neighborhoods

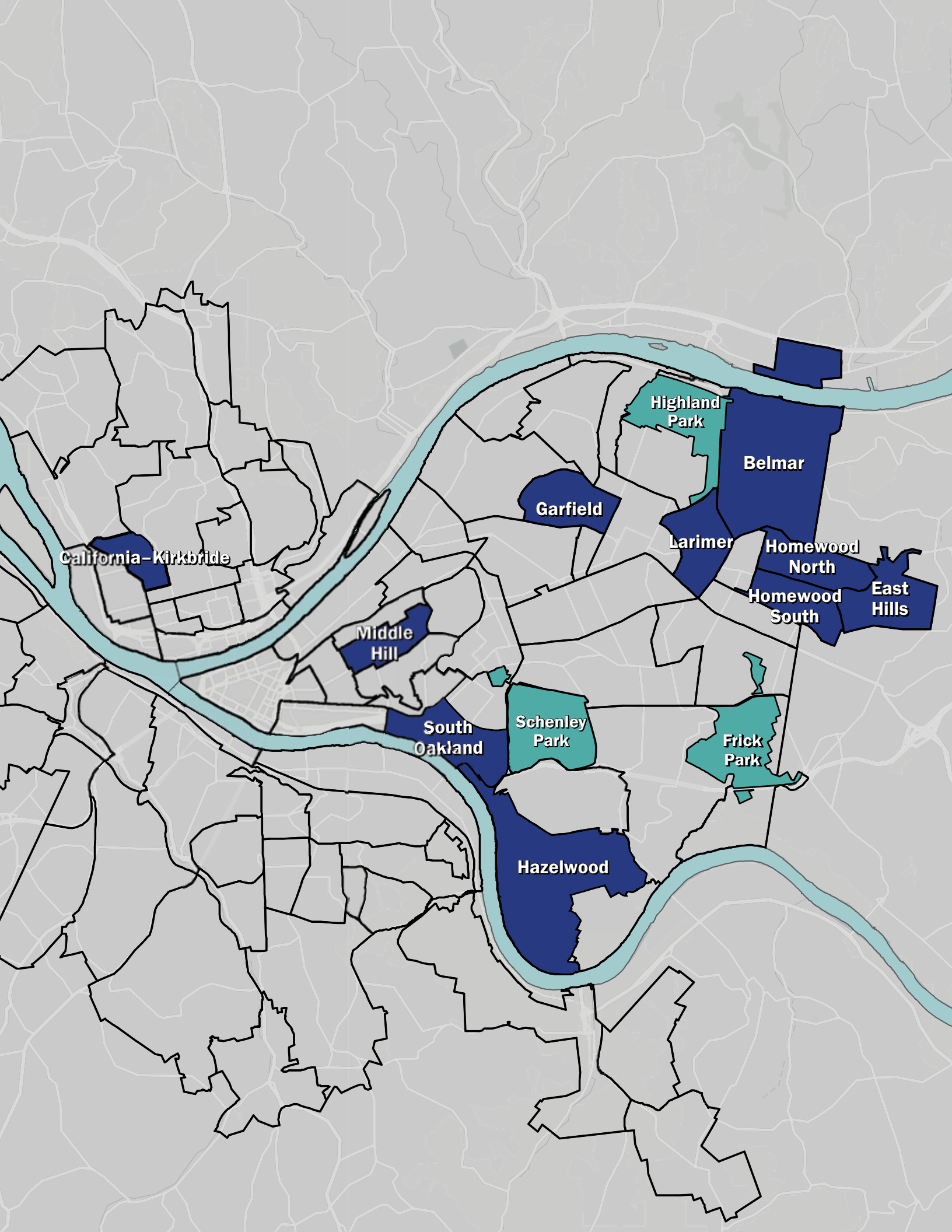
Belmar
California-Kirkbride
East Hills
Garfield
Hazelwood
Homewood North
Homewood South
Larimer
Middle Hill
South Oakland

Example neighborhood statistics

S. OAKLAND
Median Income: $22,000
Population Density: 8.3k people/mi^2
% Staying in Neighborhood: 19%
% Age 25–44: 20%
Median Rent: $1,000/month
Walk Score®: 91

HOMEWOOD N.
Median Income: $16,000
Population Density: 6.4k people/mi^2
% Staying in Neighborhood: 17%
% Age 25–44: 20%
Median Rent: $455/month
Walk Score®: 60

EAST HILLS
Median Income: $22,000
Population Density: 5.8k people/mi^2
% Staying in Neighborhood: 16%
% Age 25–44: 22%
Median Rent: $522/month
Walk Score®: 37


Highland Park
Belmar
Garfield
Larimer
Homewood North
Homewood South
East Hills
California–Kirkbride
Middle Hill
South Oakland
Schenley Park
Frick Park
Hazelwood

NEIGHBORHOOD SPOTLIGHT: HOMEWOOD NORTH

Homewood North is a majority-Black neighborhood in Pittsburgh that has experienced various transformations since the 1950s, from "white flight" to urban displacement and disinvestment. However, Homewood North is also home to some of the city's most vibrant African American culture, seen in its arts and music scenes, food, and large community events.[11] This neighborhood showcases the complex history and current problems the city faces, making it an ideal community to highlight in our study.

- **Homewood North is a neighborhood on the north-eastern border of Pittsburgh.**
- **Urban renewal in the 1950s displaced Black residents in the downtown-adjacent Hill District, and many relocated to the Homewood area, including Homewood North.**
- **The neighborhood population has continued to decline since the "white flight" of the 1960s and '70s.**
- **The Homewood Community Plan—led by the Homewood Community Development Collaborative, the Department of City Planning, and the Urban Redevelopment Authority of Pittsburgh—aims to create a community of African American culture where people choose to "live, work, worship, and visit."**

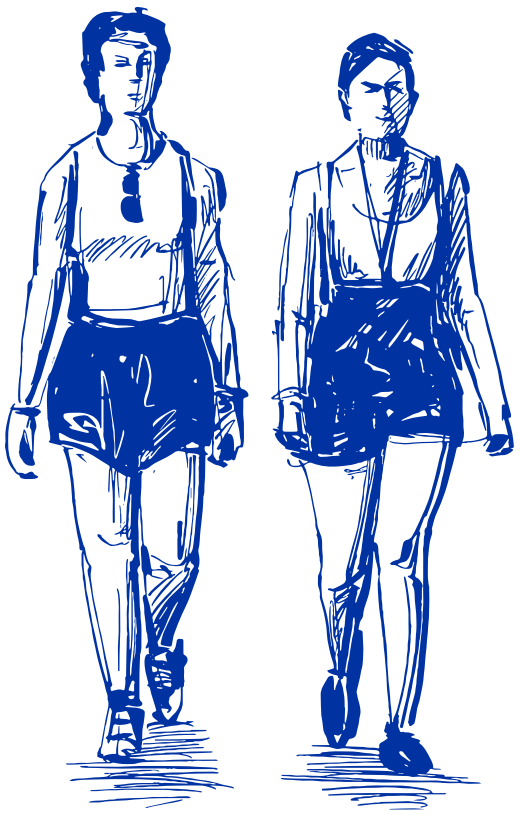
The chart below shows several critical aspects of the Homewood North neighborhood alongside combined statistics for the 10 neighborhoods in this study and the city of Pittsburgh as a whole (based on available data).

	HOMEWOOD NORTH	NEIGHBORHOOD AVERAGE	PITTSBURGH, PENNSYLVANIA
MEDIAN ANNUAL HOUSEHOLD INCOME	$16,000 (2012–16)	$19,800 (2012–16)	$48,711 (2015–19)
% OF BLACK AND OTHER MINORITY POPULATIONS	98%	83.6%	23.4%
VACANCY RATE (2014)	19.33 units/mi^2	11.45 units/mi^2	
POPULATION DENSITY (2010)	6.4k/mi^2	5.4k/mi^2	5.4k/mi^2
MEDIAN RENT	$455/month	$593/month	$1,378/month
HOMEWOOD NORTH: • Walk Score®: 60 • National Walkability Index: 16.67			


WELCOME
HOMEWOOD - BRUSHTON

DEFINING WALKABILITY

While scholars and researchers have yet to agree on a definitive description of "walkability," a review of the term's use in urban design literature identified three broad categories: the conditions that make up a pedestrian-friendly neighborhood, such as environments that are traversable and compact; the outcomes associated with walking, such as improved physical health and more lively environments; and the attributes of good urban design or placemaking, such as aesthetics and economic growth.[12] For the current study, we focus on the first and second categories: defining walkability through the **conditions** that produce pedestrian-friendly neighborhoods and looking to **outcomes** in order to better understand the benefits of walkability.



Conditions: Defining Walkability

Defining walkability through its conditions can be a difficult task due to the many different types of walkable environments, from pedestrian-only streets in cities to unpaved hiking trails in national parks. Moreover, walkability's meaning can depend on the purpose of walking, such as exercising, commuting, or socializing.[13] **For this study, we define walkability through the urban design elements—the conditions—that encourage walking.** Previous studies aiming to define walkability through its conditions have focused on various environmental attributes that make an environment pedestrian-friendly, including the width of sidewalks, land use, intersection density, proximity to amenities, and public transportation.[14] Prioritizing different aspects of the built environment leads to a wide range of analyses and interpretations of the relationship between walkability and its outcomes. For example, a study critically analyzing the conditions of walkability, authored by Alexandros Bartzokas-Tsiompras and Yorgos N. Photis in 2017, evaluated the characteristics of the built environment that most affect people's walking behavior.[15] The results indicated that more than half of the authors' calculated walkability score was related to land-use amenities like supermarkets, kiosks, and bus stops. The researchers also found that the physical makeup of sidewalks, including obstacles (such as garbage cans) and the poor quality of sidewalks, negatively influenced the walkability score up to 35.2 and 23.6 percent, respectively.[16] Based on our review of this previous work, we selected independent variables that have both positive and negative impacts on walkability, allowing us to identify possible relationships between wellness and walkability that go beyond predetermined walkability measures.

Outcomes: Understanding the Benefits of Walkability

Research focusing on the outcomes of walkability examines the physical, mental, and social wellness benefits associated with walkable environments.[17] The developers of the National Walkability Index have produced an excellent description of the beneficial ripple effects of walkability:

> "Walkable neighborhoods make it easier to walk to stores, jobs, and other places, which encourages people to be more active and helps them stay healthier. These individual benefits add up to more widespread public health benefits such as reduced obesity and diabetes rates. When people choose to walk, bike, or take transit, they drive less, which reduces pollution from vehicles and improves human and environmental health. . . *Walkable communities also encourage social interaction, which engenders a sense of community and improves people's mental health*—when people walk to the grocery store or movie theater, they might encounter neighbors or friends. Those types of interactions are far less common and less personal when people travel in automobiles [emphasis added]."[18]

More broadly, research on the outcomes related to walkability fits into a framework of human ecology, which argues that the environment is a determining factor in health.[19] For instance, studies have shown that walkability is protective against depression in older men,[20] associated with subjective well-being in cities,[21] and associated with greater social capital.[22] But with most walkability studies focused on middle- and high-income communities, a critical gap exists in the research. Our study is one of the first to focus on walkability's relationship to wellness in low-income communities. It is our assumption that increasing walkability in low-income communities will result in greater wellness benefits than in higher income areas. Our assumption is based on previous research that identified a walkability deficit in low-income communities: not only are low-income communities more likely to be dependent on low-cost forms of transportation, such as walking or biking,[23] but they are also more likely to have fewer sidewalks than high-income communities.[24] Although our data cannot demonstrate any causal relationships, our study offers recommendations for how designers can improve neighborhood wellness in low-income urban areas by creating more walkable environments.

MEASURING WALKABILITY

We reviewed existing literature and metrics to select walkability characteristics for our study. In addition to two widely used indices, Walk Score® and the National Walkability Index, we have examined less commonly used walkability measures to further define the relationship between walkability and neighborhood wellness.

The following data were applied to the 10 selected neighborhoods in our study:

A. Walk Score® Index

The Walk Score® index measures an overall level of "pedestrian friendliness" based on walking distance to amenities (a five-minute walk is given maximum points), intersection density (the walking distance between blocks), roadblocks that hamper neighborhood connectedness, and overall population density as a measure of social connectedness. Scores range from 0 to 100; the higher the score, the more pedestrian friendly the environment.

B. National Walkability Index (NWI):

The NWI collects data at a block-group scale and scores walkability based on intersection density, proximity to transit stops, diversity of land uses, employment mix, and occupied housing mix. Scores range from 1 to 20, with higher scores reflecting a more walkable environment.

Additional Walkability Measures

The following measures are also included in our study. Other researchers have studied these aspects of the built environment that affect people's propensity to walk but they have not been tracked in the Walk Score® or NWI.

C. Bike and Pedestrian Paths

The number of bike and pedestrian paths (feet) was calculated for each census tract.

D. Residential Vacancy Rates

The number of residential addresses per census tract has been vacant for over one year, according to USPS (from 2014).

E. Land Coverage: Green

The amount of land per person (m2) covered by green space (including lawns and gardens, trees, croplands, and wetlands).

F. Land Coverage: Impervious

The amount of land per person (m2) covered by impervious surfaces that do not absorb water (including sidewalks, roads, and buildings).

DEFINING NEIGHBORHOOD WELLNESS

Gathering data at the neighborhood level is critical to understanding wellness because of the direct impact of neighborhood context (especially the social context) on an individual's health that are unexplained by individual risk factors.[25] We acknowledge that a community can extend beyond neighborhood boundaries and research shows that the impact of a neighborhood on individual health can also be affected by adjacent neighborhoods.[26] However, for our study, we are looking at how neighborhood *walkability* is related to neighborhood *wellness*.

We define neighborhood wellness as the general physical and mental well-being and safety of the residents of a neighborhood. This definition assumes that neighborhood wellness is better when residents are physically and mentally healthy, less vulnerable to external stressors such as natural disasters, and safer from crime.

“We define neighborhood wellness as the general physical and mental well-being and safety of the residents of a neighborhood.”

MEASURING NEIGHBORHOOD WELLNESS

Building on existing research that highlights the correlation between walkability and physical wellness, we collected measurements on neighborhood wellness variables using available data that represent a holistic picture of neighborhood health, including environmental health, community resilience, and crime. We gathered these data from public databases, such as the United States Census Bureau and the Centers for Disease Control and Prevention, and we organized our measures of neighborhood wellness into individual and community levels.

INDIVIDUAL LEVEL

1. **Overall Physical Health:** This measure uses "Crude Prevalence–Physical Health Not Good" data collected by the Centers for Disease Control and Prevention. *A higher number indicates a greater prevalence of poor overall physical health within a community.*

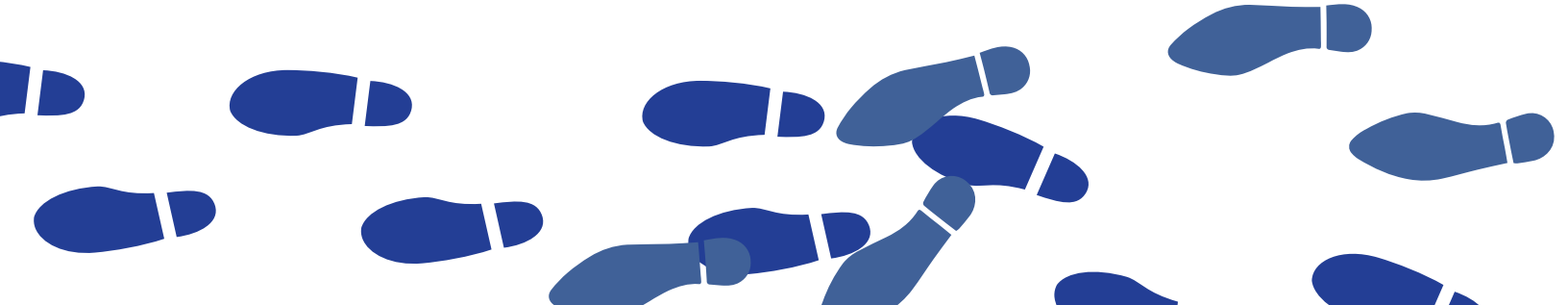
2. **Overall Mental Health:** This measure uses "Crude Prevalence–Mental Health Not Good" data collected by the Centers for Disease Control and Prevention. *A higher number indicates a greater prevalence of poor overall mental health within a community.*

3. **Diagnosed Diabetes in a Community:** This measure uses "Crude Prevalence of Diagnosed Diabetes" data collected by the Centers for Disease Control and Prevention. *A higher number indicates a higher prevalence of diagnosed diabetes.*

4. **Lack of Physical Activity for Leisure:** This measure uses "Crude Prevalence–No Leisure Physical Activity" data collected by the Center for Disease Control and Prevention. *A higher number indicates a higher prevalence of unhealthy inactivity.*

5. **Obesity:** This measure uses "Crude Prevalence–Obesity" data collected by the Center for Disease Control and Prevention. *A higher number indicates a higher prevalence of obesity.*

6. **Life Expectancy:** This data from the Neighborhood Life Expectancy Project, collected by the National Center for Health Statistics within the Centers for Disease Control and Prevention, gathers life expectancy information at the census tract level. *The number indicates the average estimated age a person can expect to live based on their location of residence.*



COMMUNITY LEVEL

1. **Crime Rate:** Crime rate was calculated from the City of Pittsburgh Department of Public Safety and Police Bureau and the Pittsburgh Neighborhood Project. *A higher crime rate indicates more crime in the neighborhood.*

2. **Environmental Health Hazard Index:** This data, collected by the US Department of Housing and Urban Development, summarizes exposure to harmful air toxins at a neighborhood level. *A higher number indicates less potential exposure to harmful toxins.*

3. **Community Resilience Estimates:** The Community Resilience Estimates are from the United States Census Bureau and estimate a community's vulnerability to natural disasters by measuring risk factors. *A higher community resilience estimate indicates less community resilience.*

4. **Social Vulnerability Index (SVI):** This data is collected from the Centers for Disease Control and Prevention and the Agency for Toxic Substances and Disease Registry, and tracks the "potential negative effects on communities caused by external stresses on human health, including natural or human-caused disasters or disease outbreaks" using 15 census variables such as poverty, lack of vehicle access, and crowded housing. *A high SVI indicates that a community is more vulnerable to these external pressures.*

METHODOLOGY FOR ANALYSIS

We organized the collected data for analysis to determine if a significant statistical correlation exists between individual walkability characteristics and neighborhood wellness outcomes. Due to the small sample size (10 neighborhoods/data points), regular linear regression would yield unreliable results. Instead, we conducted a nonparametric analysis using the statistical computing software R version 4.1.2 (https://www.r-project.org/). All correlations mentioned below are Spearman correlations that analyze the strength and direction of a relationship between two variables to account for the small sample size.

The table below notes all significant relationships between walkability and neighborhood wellness variables. While relationships with a *p*-value between .05 and .1 are not typically considered statistically significant, we identified these relationships as ones that might merit further study with larger sample sizes. (See Appendix for full results and graphs.)

Spearman correlations between neighborhood wellness and walkability measures

	Walk Score® Index	National Walkability Index	Bike and pedestrian paths	Residential vacancy rates	Land coverage (green)	Land coverage (impervious)
Overall physical health	-.70*	.02	-.28	-.41	.10	.36
Overall mental health	.08	-.07	-.16	-.21	.24	.89***
Diabetes	-.60^	.18	-.38	-.13	-.12	-.01
Lack of physical activity for leisure	-.74*	.01	-.33	-.33	-.03	.35
Obesity	-.11	.03	-.57^	-.01	.16	.50
Life expectancy	-.04	-.54	.64	-.54	.86*	.43
Crime rate	.28	.05	-.23	.58^	-.18	.22
Environmental Health Hazard Index	-.37	-.71*	-.11	.74*	-.17	-.35
Community resilience	-.52	-.14	-.43	.52	-.38	.33
Social Vulnerability Index	-.12	-.43	.01	-.20	.34	.56^

^$p < .1$ *$p < .05$ ***$p < .001$

FIVE KEY TAKEAWAYS

"Walking to Wellness" provides new insights into the walkability characteristics that have the strongest relationship to neighborhood wellness in low-income communities. Our findings will help urban designers, urban planners, architects, policy makers, and others to create healthier, more resilient communities by focusing on specific ways to promote walkability and neighborhood wellness.

In low-income neighborhoods, walkability is associated with better individual wellness but worse environmental health at the community level

This study finds that higher Walk Scores® are associated with better overall health ($p < .05$), lower rates of diabetes ($p < .1$), and greater rates of physical activity for leisure ($p < .05$). Residents in our study's least walkable neighborhood (Belmar) had more than twice the rate of diabetes and almost twice the rate of poor physical health than those in the most walkable neighborhood (South Oakland). The results also suggest that more bike and pedestrian paths in a community are marginally associated with lower rates of obesity ($p < .1$).

Past studies suggest that more walkable communities also have better environmental health.[27] However, our data shows the opposite relationship for low-income neighborhoods in Pittsburgh. We found that higher scores on the National Walkability Index are significantly associated with greater exposure to environmental toxins,* as measured through the Environmental Health Hazard Index (EHHI) ($p < .05$). In other words, when a neighborhood is more walkable, it has more exposure to harmful toxins. Therefore, urban designers and other stakeholders should note that increasing the number of sidewalks, especially if they are only near busy streets, will not necessarily increase health for residents in low-income neighborhoods.**

** This is likely due to the EHHI measuring outdoor toxins and the NWI measuring variables like road metrics and intersection density, which also measures the adjacency to roads and cars—a source of toxic fumes inhaled by pedestrians.*

***A 2020 study by Van Heyst and Shaw proposed pollution-reducing traffic barriers, emission-absorbing materials, and planted buffers, all of which may be beneficial for designers when creating more walkable communities.[28]*

Impervious surfaces are linked to poorer mental health

Few studies have examined the relationship between impervious surfaces and mental health. While only conducting a preliminary and nonparametric analysis, this study found that more impervious land coverage in a community is significantly associated with poorer mental health in low-income urban neighborhoods ($p < .001$). There was a 36% increase in mental health scores from the neighborhood with the most impervious surfaces per capita (Homewood South) to the one with the least (Homewood North). While walkability is essential to general physical health, this result suggests that the mere presence of roads, sidewalks, and other impervious surfaces most often used to increase walkability could negatively affect the mental health of low-income communities. This does not mean that urban planners must choose between positively impacting physical or mental health when creating more walkable communities. **Instead, it might be helpful to develop a more holistic understanding of walkability, thinking beyond the inclusion of more sidewalks next to busy streets and exploring more design-forward ideas like creating pedestrian paths that employ eco-friendly surface materials or are surrounded by more greenery.** While we did not study mixing impervious surfaces with greenery, it is possible that incorporating green space into impervious surfaces may mitigate negative effects on mental health.[29] Furthermore, because our measure of impervious surfaces does not distinguish between those that increase walkability (e.g., sidewalks) from those that primarily serve vehicles (e.g., paved parking areas), it is possible that this measure primarily reflects urban design devoted to cars rather than people in the low-income urban areas in our sample. **Accordingly, to support mental health, planners should prioritize people in urban design, increasing the pedestrian pathway experience while decreasing impervious surfaces devoted to the car.**

Residential vacancy is linked to better environmental health but higher crime rates

Greater residential vacancy is significantly linked to less exposure to environmental toxins as measured through the EHHI ($p < .05$). As suggested in Wang and Immergluck (2018), the relationship between vacancy rates and neighborhood health is informed by various contexts, including the economic and population growth of the metropolitan area, length of vacancy, and other physical and socioeconomic factors, including housing quality and affordability.[30] Since we measured a limited number of variables, it is not possible to concisely explain the relationship we found between residential vacancy and environmental health in low-income neighborhoods in Pittsburgh.

Residential vacancy is also marginally associated with higher crime rates ($p < .1$), mirroring previous work that has shown higher crime rates in areas with more housing foreclosures and resulting vacancies,[31] and reinforcing urbanist Jane Jacobs' observation that neighborhoods are safe when residents engage with community life and keep their "eyes on the street."[32] **Given this finding on crime rates, residential vacancies present opportunities for designers of walkability interventions to increase community safety by revitalizing vacancies or transforming them into community spaces, gardens, or other neighborhood assets.**

More green space means longer lives in low-income neighborhoods

Greener communities are associated with longer life expectancy in low-income urban neighborhoods in Pittsburgh ($p < .05$). The range in life expectancy across all low-income neighborhoods in this study was 10 years (66.9 to 76.5 years), with people living in neighborhoods with more green space having a longer average life expectancy. Our results are in line with other work showing that improved access to green space is associated with lower mortality in deprived areas in the United Kingdom.[33] Unfortunately, access to green space in urban areas is often limited. Previous research has shown that neighborhoods with higher percentages of Black residents are less likely to have access to green spaces.[34] **For urban designers, reframing what community spaces might look like, including more green space (parks, community gardens, playing fields, or other forms of common land), may help increase residents' health, well-being, and life expectancy in low-income urban neighborhoods.**

Walk Score® is a more useful measure than the National Walkability Index

There is little co-variability among Walk Score® and the National Walkability Index (NWI). Despite their common purpose of measuring walkability, they do not measure similar aspects of walkability. Our analysis shows that Walk Score® has a stronger relationship with more neighborhood wellness variables, having significant correlations with three neighborhood wellness variables (overall physical health, diabetes, and lack of physical activity for leisure, as visualized in the table that appears in "Methodology for Analysis" on page 17) compared to that of the NWI (Environmental Health Hazard Index). This distinction is important for urban designers who want to look at the impact of walkability on neighborhood wellness in low-income urban communities. **Using an index like Walk Score® that is better associated with neighborhood wellness would be more informative in understanding potentially complex relationships between walkability and wellness.**

CREATING ENRICHING COMMUNITIES: A PRELIMINARY TOOLKIT

Based on our findings, we have developed a preliminary toolkit to serve as a stepping stone to impactful interventions that increase neighborhood wellness through walkability. The following interventions exist at different scales and will allow designers to enrich communities, even in instances with limited funds or other resources. Because our study was exploratory, these tools are not fully developed design solutions. They are intended to serve as inspiration for designers and other stakeholders as well as a foundation for change that can be tailored to the needs of specific communities.

Baby Steps: Reframing Walkability

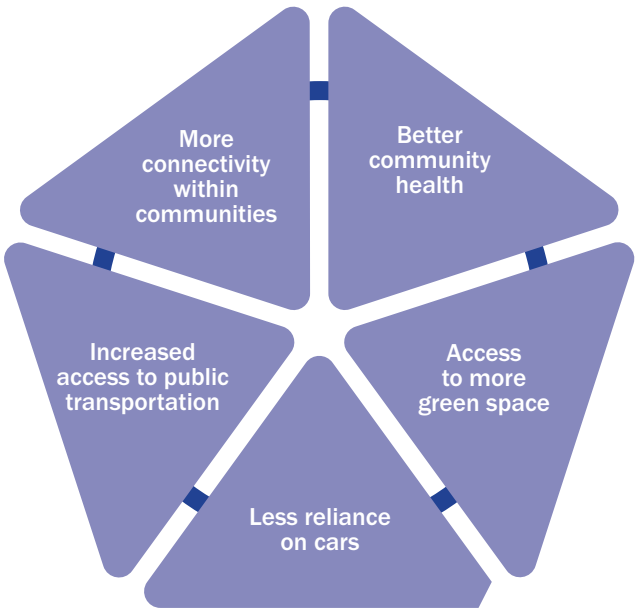
Reframing walkability engages designers interested in taking steps to increase the walkability of neighborhoods, as well as grassroots efforts of community-led organizations looking to improve neighborhood wellness.

Recommendations for Reframing Walkability:

This intervention focuses on creating a holistic approach to understanding walkability by expanding the definition of walkability and reframing goals to include neighborhood wellness. To begin reframing walkability for a specific neighborhood, we recommend the following three actions, all of which can be done at a community level (e.g., with community leaders):

- *Assess a specific community's walkability needs using a "bottom-up" engagement approach to determine whether basic walkability needs are met for its most vulnerable or marginalized members*
- *Ensure that marginalized voices and perspectives are at the forefront of designing for walkability to make the community better for everyone*
- *Find creative ways to improve walkability with small-scale community enrichment projects*

Potential Benefits of Reframing Walkability:



Making Strides: Creating Place-Based Communities

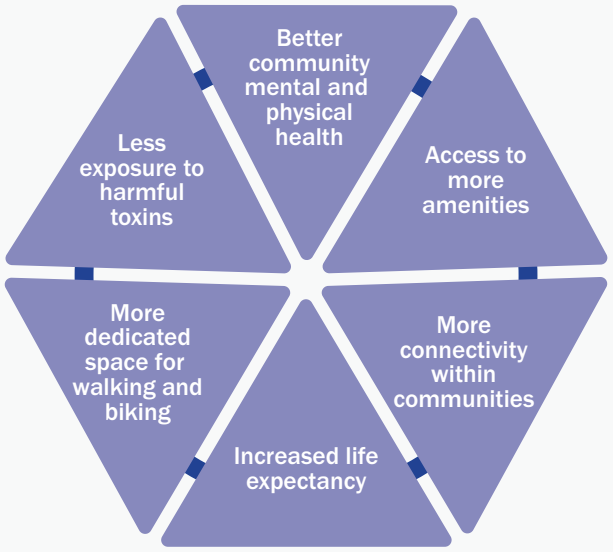
Creating place-based communities engages with city- or district-level stakeholders such as city planners, community organizations, and local architects who are committed to creating neighborhoods that are more walkable and healthier.

Recommendations for Creating Place-Based Communities:

Our findings show that neighborhood wellness is linked to built-environment elements (such as green space and bike/pedestrian paths) that extend beyond standard measures of walkability (such as Walk Score®). This intervention builds upon "reframing walkability" and includes the following:

- *Revitalize vacant lots by adding more green space or creating community centers*
- *Adding bike and pedestrian paths away from main roads and industrial land uses*
- *Scaling communities to the pedestrian level*

Potential Benefits of Creating Place-Based Communities:



Going the Distance: Increasing Walk Score®

Increasing a neighborhood's Walk Score® requires engaging with stakeholders at all decision levels (community, city, and state) and across several disciplines (architecture, urban design, public policy, and others). Therefore, this intervention will take extensive planning, possible policy action, and more resource-intensive actions.

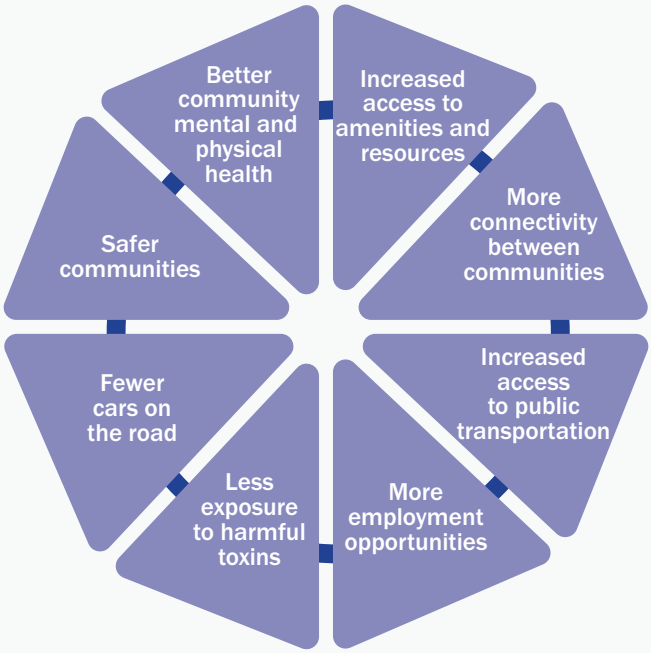
Recommendations for Increasing Walk Score®:

Based on our findings, Walk Score® had the greatest number of significant relationships with neighborhood wellness metrics. Though Walk Score® does not measure walkability comprehensively, we find it to be a valuable tool for urban designers and stakeholders to identify relevant characteristics related to neighborhood wellness in low-income urban areas.

Improving neighborhood infrastructure to increase the Walk Score® is a systems-level intervention. It builds upon "Reframing Walkability" and "Creating Place-Based Communities" by addressing more complex and structural issues in neighborhoods, such as:

- *Increasing the number of amenities (such as grocery stores, pharmacies, restaurants, and parks) within a 5- to 10-minute walk radius*
- *Increasing pedestrian-friendly and safe road metrics*
- *Adding more public transportation stops*

Potential Benefits of Increasing Walk Score®:



CONCLUSION

This study explores the relationship between walkability and neighborhood wellness in low-income neighborhoods, using communities in Pittsburgh as a case study. The focus on Pittsburgh made for a practical exploratory study given the city's history, its recent transformation from "Steel City" to tech hub, and its well-defined neighborhoods. While previous research has linked walkability with wellness, few (if any) have explicitly looked at the benefits of walkability—such as physical, mental, social, and environmental wellness—for low-income neighborhoods. Understanding the impact of walkability in low-income areas could provide much-needed insights into how urban designers and architects can help promote neighborhood wellness overall.

Our findings show significant relationships between measures of walkability and neighborhood wellness in low-income communities in Pittsburgh. Of particular importance is the relationship between walkability, the built environment, and individual and community-level wellness outcomes. **Our research suggests that, when examining low-income neighborhoods that are similar on a host of attributes such as median income, education levels, and population density, residents living in more walkable neighborhoods are more likely to have better wellness outcomes.**

This project sheds light on the important role urban designers, planners, and architects have in shaping meaningful aspects of people's personal lives. Walkability and characteristics of our built environment play a crucial role in overall neighborhood wellness, especially regarding **physical, mental, and environmental health**. Urban designers, planners, and architects should continue to observe and assess walkability as a tool to increase neighborhood wellness in low-income urban areas. Understanding the relationship between our built environment and neighborhood wellness is a necessary component in creating more **walkable, healthy, resource-rich, and connected communities**.

From longer life expectancy to lower rates of diabetes to better mental health, we have shown that neighborhood walkability in low-income communities is significantly associated with neighborhood wellness. We hope this study encourages designers and stakeholders to pursue further research on walkability and wellness. We hope it inspires them to explore how making small changes in the built environment can lead to positive social outcomes for the communities that need it the most.

Designing for all stakeholders

Look beyond the direct benefactors

Engage with those who have little power but the most at stake

Understand the implications of a job well done (or one done poorly)

Envision what equality looks like in our built environment

"The findings show **significant relationships** between measures of **walkability and neighborhood wellness** in low-income communities in **Pittsburgh, PA.**"

APPENDIX I: SUGGESTED ADDITIONAL RESEARCH

Study Location

This study looked at a variety of low-income neighborhoods in Pittsburgh. Expanding the study to include other US metropolitan areas would help confirm wider applicability of the findings.

Study Duration

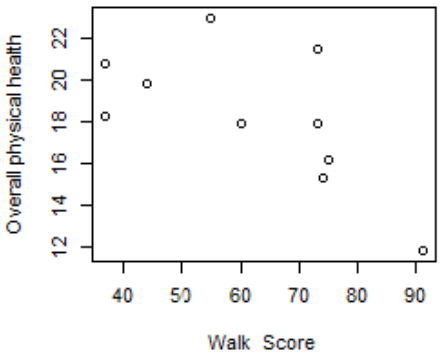
A longer study that examines the change in neighborhood wellness before and after walkability is increased in low-income neighborhoods would be especially beneficial for designers to note when and how possible interventions would impact local communities.

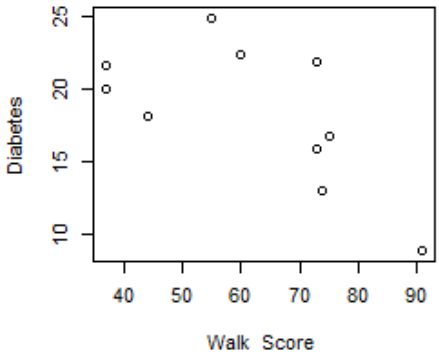
APPENDIX II: DATA

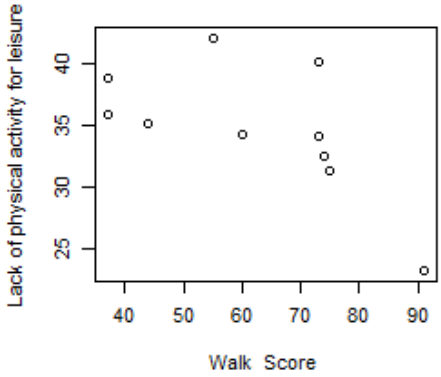
Raw values for each study variable per neighborhood with means and standard deviations

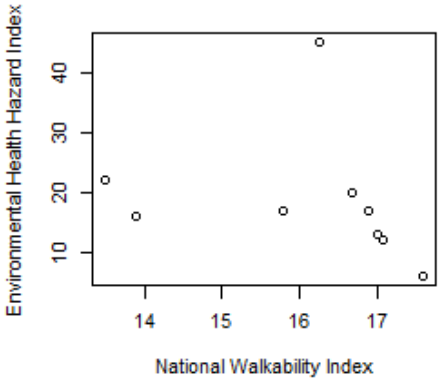
	Middle Hill	S. Oakland	Hazelwood	East Hills	California Kirkbride	Larimer	Homewood North	Homewood South	Garfield	Belmar	Mean	Standard deviation
Walk Score® Index	74	91	44	37	55	73	60	73	75	37	**61.90**	**18.33**
National Walkability Index	15.78	17.58	14.11	13.89	17.02	13.50	16.67	17.09	16.89	16.25	**15.88**	**1.50**
Bike and pedestrian paths	0.00	28231.00	6011.39	1712.87	0.00	6543.32	1166.80	1057.60	429.48	618.78	**4577.12**	**8643.70**
Residential vacancy rates	17.47	7.85	6.01	8.76	4.74	16.07	19.33	10.34	10.48	13.49	**11.45**	**4.95**
Land coverage (green)	277.00	164.00	646.50	354.33	364.00	361.50	152.00	227.50	447.50	139.00	**313.33**	**157.40**
Land coverage (impervious)	199.33	152.00	170.17	146.67	368.00	293.50	110.67	278.67	130.50	131.00	**198.05**	**86.11**
Overall physical health	15.30	11.80	19.80	18.30	23.00	17.90	17.90	21.50	16.20	20.80	**18.25**	**3.28**
Overall mental health	18.70	16.10	16.70	16.50	18.40	18.40	14.00	19.00	15.00	15.10	**16.79**	**1.77**
Diabetes	13.00	8.80	18.10	20.00	24.90	15.90	22.30	21.90	16.70	21.60	**18.32**	**4.86**
Lack of physical activity for leisure	32.50	23.10	35.20	35.90	42.20	34.20	34.30	40.20	31.30	38.90	**34.78**	**5.35**
Obesity	47.10	29.40	41.00	45.20	50.30	43.70	44.30	48.60	41.80	33.50	**42.49**	**6.55**
Life expectancy	67.60		71.70	69.30		76.50	66.90	68.00	71.10		**70.16**	**3.32**
Crime rate	195.66	69.92	121.94	41.97	136.66	314.15	281.15	501.30	238.91		**211.30**	**142.65**
Environmental Health Hazard Index	17	6		16	13	22	20	12	17	45	**18.67**	**10.93**
Community resilience	0.57	0.32	0.55	0.37		0.56		0.59	0.34	0.76	**0.51**	**0.15**
Social Vulnerability Index	0.97	0.86	0.95	0.86	0.94	0.89	0.85	0.73	0.56	0.85	**0.85**	**0.12**

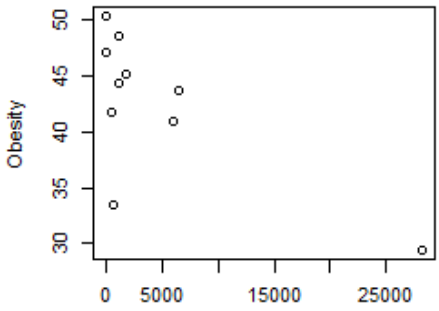
Scatterplots illustrating main results

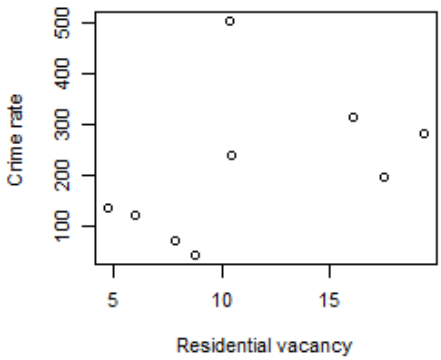


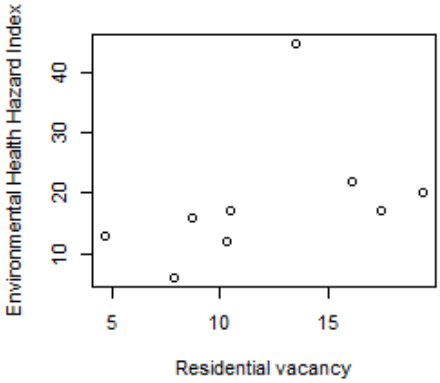


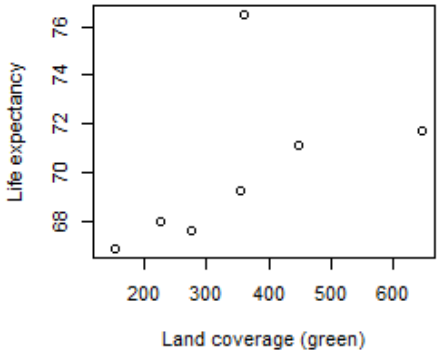


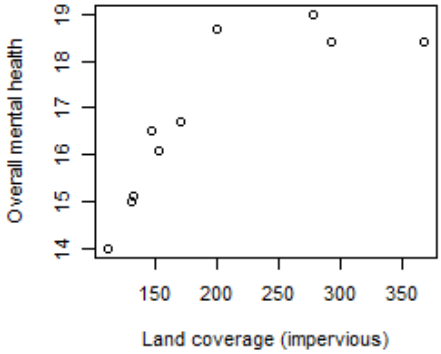












Spearman correlations between all pairs of study variables

	Walk Score® Index	National Walkability Index	Bike and pedestrian paths	Residential vacancy rates	Land coverage (green)	Land coverage (impervious)	Overall physical health
National Walkability Index	.48						
Bike and pedestrian paths	.05	-.19					
Residential vacancy rates	.18	-.30	-.13				
Land coverage (green)	.03	-.28	-.06	-.48			
Land coverage (impervious)	.07	-.03	-.07	-.38	.36		
Overall physical health	-.70*	.02	-.28	-.41	.10	.36	
Overall mental health	.08	-.07	-.16	-.21	.24	.89***	.30
Diabetes	-.60^	.18	-.38	-.13	-.12	-.01	.82**
Lack of physical activity for leisure	-.74*	.01	-.33	-.33	-.03	.35	.97***
Obesity	-.11	.03	-.57^	-.01	.16	.50	.44
Life expectancy	-.04	-.54	.64	-.54	.86*	.43	.18
Crime rate	.28	.05	-.23	.58^	-.18	.22	.13
Environmental Health Hazard Index	-.37	-.71*	-.11	.74*	-.17	-.35	.02
Community resilience	-.52	-.14	-.43	.52	-.38	.33	.67^
Social Vulnerability Index	-.12	-.43	.01	-.20	.34	.56^	-.06

^$p < .1$ *$p < .05$ **$p < .01$ **$p < .001$

	Overall mental health	Diabetes	Lack of physical activity for leisure	Obesity	Life expectancy	Crime rate	Environmental Health Hazard index	Community resilience
National Walkability Index								
Bike and pedestrian paths								
Residential vacancy rates								
Land coverage (green)								
Land coverage (impervious)								
Overall physical health								
Overall mental health								
Diabetes	-.06							
Lack of physical activity for leisure	.33	.84**						
Obesity	.60^	.52	.54					
Life expectancy	.11	-.43	-.11	-.64				
Crime rate	.30	.18	.07	.28	-.07			
Environmental Health Hazard Index	-.38	.07	.01	-.28	.17	.40		
Community resilience	.45	.57	.74*	.38	-.43	.64	.52	
Social Vulnerability Index	.48	-.27	-.01	.16	.11	-.36	-.04	.05

^$p < .1$ *$p < .05$ **$p < .01$ **$p < .001$

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