Evaluating Walkability in Fayetteville, Arkansas: Impacts of Attitudinal Preferences and Urban Form on Walking Trip Counts and Body Mass Index Scores

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A capstone thesis paper submitted to the Executive Director of the Urban & Regional Planning Program at Georgetown University’s School of Continuing Studies in partial fulfillment of the requirements for Masters of Professional Studies in Urban & Regional Planning.

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Abstract

Neighborhood form impacts health outcomes. Urban planning and public health researchers have partnered to understand the built and social variables associated with healthy places and populations. The dominant influence of passenger vehicles in American land use planning over the last century has sparked opposition planning movements led by iconic planners including Jane Jacobs, Peter Calthorpe, and Andres Duany of the New Urbanist movement, who argue for a built environment designed for walkability and the promotion of wellbeing, but the question remains: is simply changing the built environment enough to stifle rising obesity rates?

Examining two neighborhoods in Fayetteville, Arkansas, this study design incorporates a walkability index, survey, survey data and geospatial analysis to explore the relationship between population health and attitudinal, social, and built environment variables that influence obesity rates by census tract grouping. Results from survey data analysis suggest a combination of urban form and individual attitudinal favorability are both influential in the transportation mode decision process, but that urban form is slightly more predictive of walking trips over a seven day period. Over time, land use approaches, coupled with public promotional campaigns can promote and encourage healthy-lifestyle changes. This paper seeks to expand the literature on the relationship between urban form and social determinants of health, by broadening the sample of cities to include a mid-size metro in the American South. Adding appropriate infrastructure and implementing new urbanist approaches to land use can change the social fabric of a community in a way that promotes a healthy lifestyle leading to a reduction in obesity rates over time.

Keywords

Fayetteville, Arkansas, Transportation Planning, Land Use, Healthy Cities, Wellness, Walkable Urbanism, Obesity, Active Mobility
Research Questions

How does neighborhood-based research represent an opportunity to establish a nexus between attitudinal preferences, human health and variables associated with the built environment?

Can the urban design characteristics of a neighborhood increase the number of daily active minutes for individuals who do not prioritize or prefer not to walk?

How are health outcomes determined by lifestyle choices directly impacted by available neighborhood-based mobility networks?

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Introduction

Neighborhood design impacts public health outcomes. A significant body of public health and urban planning research demonstrates a correlate relationship between built and social variables.
associated with walkability and populations with healthy body mass index scores and physical activity levels.\textsuperscript{1} Research has also shown a statistically significant relationship between urban form variables associated with sprawling, post-war “suburbia” neighborhood design and low levels of physical activity. The key question emerging from this field of research is “whether the design of the built environment encourages more walking above and beyond individuals’ attitudes toward walking or their predisposition to walk.”\textsuperscript{2} This thesis grew as an exploration of the power of urban form to increase physical activity levels among population subsets with neutral or even negative attitudes towards walking as a transportation mode or recreational activity.

Fayetteville, Arkansas is selected as a case study because communities of its population and region are currently underrepresented in existing literature. Fayetteville is experiencing a high-growth in population, and has particularly poor health outcomes. In conjunction, these variables make Fayetteville an ideal, high-impact opportunity to build healthier populations. As an Arkansan myself, I wonder if it’s possible for Arkansas - for anyone - to build our way to health?

More is known about environments that do not support healthy physical activity levels than environments that do. Sprawling or “postwar” neighborhoods are considered “obesogenic.” In other words, obesogenic neighborhoods actively promote negative health outcomes in local populations. While an air of uncertainty remains, my hope for this thesis adds a new dataset to the global dialogue on building healthy places.

Today, over 40 percent of Americans classify as obese.\textsuperscript{3} Increasing levels of physical activity is associated with body mass index (BMI) scores that fall within the healthy range as defined by the Center for Disease Control and Prevention. Walkable neighborhoods can actively promote health

\begin{thebibliography}{9}
\bibitem{2} Joh, Kenneth, Mai Thi Nguyen, and Marlon Boarnet. "Can Built and Social Environmental Factors Encourage Walking among Individuals with Negative Walking Attitudes?" (October, 2012).
\bibitem{3} Centers for Disease Control and Prevention. "Nutrition, Physical Activity, and Obesity Data, Trends and Maps." \url{https://www.cdc.gov/nccdphp/dnpao/index.html}.
\end{thebibliography}
for residents. Walking is selected as the physical activity variable because of its multi-purpose quality; people engage in walking for leisure, recreation, exercise, and basic transportation to and from shopping, school, medical services, work, etc. Walking is also the most common form of exercise among American adults. Aside from the stated health benefits, walkable neighborhoods are desirable for their ability to “create a sense of place” among residents. Many cities are unintentionally reducing opportunities for residents to engage in physical activity by employing outdated land use patterns that create negative urban effects like sprawl.

This thesis explores the relationship between urban form, social/cultural variables and public health outcomes in two Fayetteville neighborhoods with varying degrees of walkability. The framework for approaching this thesis is presented in the study Can Built and Social Environmental Factors Encourage Walking among Individuals with Negative Walking Attitudes? by Joh et al.

Using Fayetteville, Arkansas as a case study, data measuring health outcomes, attitudinal favorability, walking trip counts and residential location was collected, observed, and analyzed to produce strategic insights for the City of Fayetteville and the broader research community. My intention for this thesis is to present compelling evidence that the built environment can complement and encourage healthier lifestyle choices ultimately increasing physical activity rates and alleviating obesity rates. This thesis will provide specific strategies for improving the health of the community through built environment and social/cultural interventions (see Discussion).

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Applying the framework published by Joh et. al., the following thesis quantifies walkable neighborhood form to identify two contrasting study neighborhoods that will become targeted study areas. The Georgetown University Internal Review Board approved a survey titled *How Do You Feel About Walking* which produced a unique dataset measuring the dependent variable (walking trip counts over a seven day period) and independent variables including attitudinal preferences, health data, sociodemographic variables and residence (the term “neighborhood” broadly applied). The health data collected by survey and presented in this thesis gives researchers access to health data that wouldn’t otherwise be available at that geographic location or scale.

The purpose of this thesis is to advance the global dialogue on building healthy neighborhoods by adding a unique dataset from an underrepresented group of mid-size metros in the American South. Fayetteville, Arkansas is a high-growth city with historically poor health outcomes, and as such is an ideal place for high-impact built and social environmental interventions and improvements. This thesis will provide a dataset from Fayetteville, Arkansas, and expand the healthy-places knowledge base. Research results will be shared with the Fayetteville Planning Department and the Fayetteville-Springdale-Rogers MSA to provide insightful data and strategic recommendations that will help Fayetteville, Arkansas identify high-impact built and social interventions to support more positive public health outcomes.
Literature and Professional Best Practice Review

_Sprawl is bad aesthetics; it is bad economics. This is bad for the farmers, it is bad for communities, it is bad for industry, it is bad for utilities, it is bad for the railroads, it is bad for the recreation groups, it is bad even for the developers._ - Mohlo

**Chapter Overview**

The literature review informs the research design and contextualizes the question at hand: can urban form increase physical activity levels among residents with neutral or negative attitudes towards walking? This literature review offers a summary of existing literature on topics including: 1) the link between public health outcomes and neighborhood form, 2) the status of obesity epidemic in American South, 3) residential self-selection bias, 4) known health-promotion variables, 5) evolution of car-oriented neighborhood design, and 6) American planning movements.

**Neighborhood Form and Health**

Throughout the body of research included in the subsequent literature review, the consistent finding is that “neighborhood type [is] associated with physical activity behavior including transportation-related, recreational, and non-specific walking. The findings of these studies together, albeit cross-sectional, suggest that neighborhoods with higher residential densities, more mixed land use, and that include highly connected street patterns are more supportive of pedestrian activity than neighborhoods that do not have these characteristics.”

It’s necessary to evaluate the role of personal preferences, social and cultural variables, as well as more specific and location-dependent built environment variables to design neighborhoods that promote health among all sociodemographic groups.

Research by Schilling and Linton find “a wide range of modern zoning, development, and transportation regulations and guidelines favor less walkable land use patterns.” These findings are “consistent with literature suggesting current laws and regulations are producing negative

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health outcomes.” The modern perspective is that “although genetic factors may underlie the propensity of individuals to become obese, the pace at which obesity prevalence has grown at population level during recent decades points to social and environmental causes.” Peer reviewed research on this topic exploded in the mid 2000s, and an interdisciplinary group of researchers have thoroughly documented “the health benefits of increase in physical activity for those living in pedestrian-oriented neighborhoods.” Research by Mackenbach et al finds physical activity levels may be influenced by access to recreational or sports facilities, green spaces or parks, as well as transport infrastructure and land use. Certain environments are ‘obesogenic,” and as such physical inactivity and unhealthy BMI scores.

Studies on this topic measure for a wide variety of built environment variables; from availability of pedestrian infrastructure to floor area ratios (FAR). Researchers typically select variables from a range of the 3Ds variable class (design, diversity, and density). These variables become measurements used to evaluate, compare, and contrast walkability. The majority of titles used in this thesis employ the use of a walkability index, and a mixture of influences informed the structure of the Fayetteville Walkability Index discussed further on page 26.

Neighborhoods can be generalized into one of two major classifications based on land use patterns, density and geographic location. The shorthand for the two neighborhood form distinctions are 1) Pre-War and, 2) Post-War. Prewar neighborhoods are older, more established neighborhoods typically located in the vintage city center. Prewar neighborhoods are characterized by “relatively compact development and grid street patterns.” Postwar neighborhoods are commonly referred to as suburbia. Postwar neighborhoods are commonly comprised of “strip mall developments [located] along a major arterial.”

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13 Ibid.

There have been important movements to return to building and preserving prewar-style, walkable neighborhoods. Defining and measuring walkability involves quantifying “one or more of three defining features of walkability known as the “3Ds:” population density, a diversity of destinations, and pedestrian friendly design.15 The 3Ds of transportation planning were introduced an important study researched by Cervero and Kockelman.16 Architects, engineers, planners and public health professionals recognize the attractiveness of these neighborhoods. Prominent voices such as Peter Calthorpe evangelize the ability of urban design to create a stronger “sense of community”17 and promote health for residents.

Residential Self-Selection Bias
According to research by Joh et al, “one of the key questions emerging from this literature is whether the design of the built environment encourages more walking above and beyond individuals’ attitudes toward walking or their predisposition to walk.”18 This thesis adds a new dataset for interdisciplinary evaluation that will hopefully produce a clear set of directions to build healthy neighborhoods. Answering this question clearly is difficult because of the residential self-selection bias.

The residential self-selection bias is the possibility that “active individuals may prefer to live in walkable environments,19 and therefore produce the false positive that residents in walkable neighborhoods have higher levels of physical activity levels and normal BMI scores because of urban form. In fact, this health-conscious subset would be healthy in spite of urban form. Researchers want to isolate urban form as an independent variable as much as social/behavioral research design allows. Research questions the strength of influence urban form has on individuals with a neutral or negative preference to walking. This thesis adds a new dataset from Fayetteville, Arkansas to the discussion of residential self-selection bias and urban form.

15 Ibid.
19 Ibid.
McCormack and Shiell define neighborhood selection variables as “the selection or choice of a neighborhood in which to live based on economic, social, lifestyle circumstances, and physical activity and transportation preferences.”\textsuperscript{20} Measuring public perception of walkability and examining it contextually with a walkability index allows planners to examine the elements of walkability that are resonating with locals. Public perception of neighborhood walkability should be considered in conjunction with built environment interventions that favor walkability.

The question of bias challenges the level of influence urban form has on physical activity levels. Does an active individual seek a neighborhood supporting their existing lifestyle, or is a person’s travel behavior fundamentally shifted by a more health-positive, walkable neighborhood design?\textsuperscript{21} Study designs are now collecting attitudinal data in an attempt to understand this relationship between personal preference, walking, and the built environment.

\textit{Related Study Designs}

Peer reviewed research on this topic exploded in the mid 2000s,\textsuperscript{22} creating a dynamic conversation around building neighborhoods that produce positive health outcomes for residents.

Joh et al note “the ideal research method would involve a study of individuals moving from an auto-oriented neighborhood to a pedestrian-oriented neighborhood and measuring the individual’s attitudes toward travel before and after the move. This methodology is designed to allow for a clearer understanding of the residential self-selection bias discussed at length in the literature review. “Most [studies] fail to account for either underlying neighborhood selection factors (reasons for choosing a neighborhood) or preferences (neighborhoods that are preferred) that impact neighborhood selection and behavior. Known as self-selection, this issue makes it difficult to evaluate causation among built form, behavior, and associated outcomes and to know how much more walking and less driving could occur through creating environments conducive


\textsuperscript{21} Ibid.

\textsuperscript{22} Ibid.
to active transport.”23 As with much social science research, it is rare that an experimental design of this nature is feasible with human subjects in the real world.”24 Longitudinal studies on this topic do exist, but this was not a feasible study design given the semester time constraint.

Existing studies have been primarily “cross-sectional [in nature], making the directionality of influence between place and behavior uncertain. Uncertainty also exists regarding whether observed differences in behavior across urban forms are due to individuals’ shared underlying preferences for travel activity and residential choices or an independent function of the environment.”25

The Obesity Epidemic
There is a substantial amount of public health and urban planning research documenting a correlate relationship between built environment variables, social/cultural variables and obesity. Research has reached a general consensus that the “physical environment has an important influence on individuals’ weight status.”26 It is helpful to consider the relationship between the built environment and body mass index scores in a simplified context -“in environments where there is no food, one cannot eat; in environments where there are no cars, public transport or machines, one cannot avoid being more physically active for transport, daily activities or work.”27

Public health research points to “obesity [as] the next major epidemiologic challenge” facing the American healthcare system.\textsuperscript{28} Healthcare costs relating to obesity reached a new ceiling = $147 billion in 2008 US dollars.\textsuperscript{29} The professional perspective is that “although genetic factors may underlie the propensity of individuals to become obese [3], the pace at which obesity prevalence has grown at population level during recent decades points to social and environmental causes.”\textsuperscript{30} Researchers describe the urban form in some neighborhoods as “obesogenic;” in other words, that land use, urban form, and pedestrian infrastructure can actually promote weight gain and obesity in individuals or populations.\textsuperscript{31} A growing body of research provides evidence of the relationship between poor walkability of the residential environment and greater obesity prevalence.\textsuperscript{32}

Forty-percent of Americans over age 20 are classified as obese by the Center for Disease Control and Prevention.\textsuperscript{33} The link between sprawl and undesirable health outcomes has created a moment requiring collaboration between public health and planning professionals. “Compared with other health promotion approaches, the creation of built environments that support physical activity is a sustainable strategy for encouraging people to adopt, or further increase levels of, physical activity.”\textsuperscript{34} Frank et al conducted a study that found “the walkability of neighborhoods around each participant’s home was significantly related to both minutes per week devoted to

\textsuperscript{31} Ibid.
active transportation and BMI. These relationships were in the expected directions, with walkability positively related to active transportation, but negatively related to body mass.”

Walking is selected as a high-potential physical activity intervention for its multi-purpose quality; people engage in walking for leisure, recreation, exercise, and basic transportation to and from shopping or work. Increased physical activity leads to healthier body mass index scores (BMI) over time. Understanding the factors that promote walking is important for long-term, targeted action to improve the public health of all Americans. The relationship between walkability and public health outcomes has led to a significant body of research and collaborative relationship between public health and planning professionals.

Variables Known to Promote Health

Mackenbach et al find that “although genetic factors may underlie the propensity of individuals to become obese, the pace at which obesity prevalence has grown at population level during recent decades points to social and environmental causes.” Research is now trying to understand and evaluate the variables that positively promote physical health. In a systematic review of published literature, Frank et al cite “several recent and comprehensive reviews which report the presence of a consistent positive association between built environment walkability and engagement in non-motorized travel.” Studies conclude that “residents of neighborhoods with higher population density, proximity to commercial destinations, and good public


transportation are more physically active than residents of less walkable neighborhoods often deemed “suburban.”

Research by Schilling and Linton find “a wide range of modern zoning, development, and transportation regulations and guidelines favor less walkable land use patterns.” These findings are “consistent with literature suggesting current laws and regulations are producing negative health outcomes.” A comprehensive analysis of peer-reviewed, published research identifies two built environment variables consistently associated with weight status - urban sprawl and land use mix.

Lawrence Douglas Frank is a thought-leader in this field of research. A study led by Frank found that “participants drove less when located in more walkable environments regardless of their demographic characteristics, the importance of the selection factors tested, and preferences for neighborhood type.” Another important study, conducted by Saelens et al, finds walkable environments “take into account that proximity and connectivity are two of the largest indicators someone will choose to walk.”

Transportation planners measure walkability using the “3Ds” framework authored by Cervero and Kockelman in the late 90s. The “3D” variables are: population density, a diversity of destinations, and pedestrian friendly design. Studies on this topic typically employ the help of

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A walkability indices which allow researchers to quantify urban form. A numeric justification allows more sophisticated understanding of the link between the built environment, physical activity levels, and health outcomes. Walkability indices typically measure built environment variables such as: 1) street and pedestrian connectivity, 2) land uses, 3) transit proximity and access, 4) population and employment density, 5) aesthetics and street design, 6) pedestrian infrastructure, 7) neighborhood parks and open space, 8) traffic-related characteristics, and 9) walkability, sprawl and neighborhood type. Among the most frequently measured variables, “land use mix, composite walkability indices and neighborhood type were nevertheless consistently associated with higher physical activity levels even after controlling for neighborhood self-selection.” These variables were measured in a walkability index for Fayetteville, explored further on page 26.

The majority of peer-reviewed research on this topic include a walkability index. Walkability indices typically measure some combination of 1) land-use mix, 2) street connectivity, and 3) residential density. Researchers Frank et al present a strong walkability index in an important study titled "The Impact of Neighborhood Walkability on Walking…” (below). The Frank et al walkability index was transformed for the Fayetteville study. The walkability index employed in this thesis can be found on page 26.

A Brief History of Urban Sprawl and Reactive Planning Movements

Since the invention of the automobile, the rate of American households that own one or more cars has continuously increased. As new travel behaviors emerged, planners responded with near-constant additions to highway infrastructure. In 1962, the Federal Aid Highway Act mandated the creation of Metropolitan Planning Organizations, which were pivotal in securing federal funding for large, expansive highway projects across America. The formalized funding process was a boon to highway dominance across America.

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Transportation planners shifted from designing for pedestrian-accessibility to designing for automobile-mobility. As a result, land use development patterns shifted dramatically. In modern planning theory, sprawl is a pejorative term used to describe any development that is hasty, single-use, low-density and deferential to automobiles instead of people. Research by McCormack et al finds sprawl to be negatively associated with physical activity and health. Essentially, sprawl makes it difficult for the majority of people to participate in the most common form of adult exercising, which is walking.

There have been significant movements against sprawl and for a return to environments that support the health of the population living there. These movements have been championed by professionals in the field of urban planning and passionate members of the general population. These movements were effective in shifting public and professional opinion, and groups like WELL building standard, Urban Land Institute, and Complete Streets are evidence.

Chapter Summary
Throughout the body of literature included in this review, the consistent finding is that “neighborhood type [is] associated with physical activity behavior including transportation-related, recreational, and non-specific walking. The findings of these studies together, albeit cross-sectional, suggest that neighborhoods with higher residential densities, more mixed land use, and that include highly connected street patterns are more supportive of pedestrian activity than neighborhoods that do not have these characteristics.” Evaluating the role of personal preferences, social and cultural variables, as well as more specific and location-dependent built


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environment variables is an exciting new frontier in the fight to understand how to build neighborhoods that yield healthier outcomes amongst residents.
Methodology

Chapter Overview

Using the framework set forth by the Joh et al study, “Can Built and Social Environmental Factors Encourage Walking among Individuals with Negative Walking Attitudes?” This paper uses GIS mapping, raw data from the United States Census Bureau, American Community Survey, and attitudinal survey data to analyze personal preferences, built environment variables and health outcomes. The purpose of this thesis is to provide site-specific data that will help Fayetteville, Arkansas design neighborhoods that support a healthy population.

Framework and Walkability Index for Fayetteville, Arkansas

The Joh et al framework design was selected as a framework approach to this study on Fayetteville, Arkansas. Based on existing research (see page 9) on walkability, I developed a place-appropriate walkability index measuring variables including 1) population density ($\frac{\text{population total}}{\text{square mile}}$), 2) street connectivity ($\text{count of four-way intersections}$), and 3) land use mix ($\text{sum of land uses represented}$). The walkability index is a tool to quantify contrasting neighborhood forms. It is necessary to compare contrasting neighborhood forms to illuminate the residential self-selection bias variable. The walkability index is discussed further in the following chapter titled Fayetteville, Arkansas: A Case Study on page 26.

Identifying Study Areas for the Survey

The walkability index informed the selection of two study areas. Downtown Fayetteville is selected to serve as Study Area 1, the classically walkable neighborhood. Wedington Drive and adjacent neighborhood developments will represent Study Area 2. The Wedington neighborhood developments are a classic example of postwar suburbia, situated helter-skelter along a major arterial. Reference maps from ArcGIS and the US Census Bureau were referenced to identify the most appropriate clustering of census tracts. As mentioned in the literature review, neighborhood boundaries are highly subjective and aren’t widely agreed upon. Ultimately, a combination of the reference maps and personal knowledge were used to identify corresponding census tracts for both neighborhoods. American Community Survey data was collected and analyzed to subsequently evaluate how representative the survey sample collected is. The census tracts used
for this study can be found on page 27, the sociodemographic variables of both study areas can be found on pages 28-31.

*The Survey: How Do You Feel About Walking?*

Georgetown University Internal Review Board (IRB) approved a twenty-eight question online survey titled *How Do You Feel About Walking?* designed to measure sociodemographic variables, walking trip counts, attitudinal preferences, and self-reported health data for the two study areas. Because this is a place-based study, a non-probability sampling technique (specifically a purposive sampling) was used. The survey design was informed by the Joh et. al. survey, and appropriately adjusted to the scale of this thesis and the demographics of the two study areas. The survey was submitted to Georgetown University’s Internal Review Board (IRB) and approved in April 2019. A complete copy of the survey, Informed Consent Forms, and Protocol begin on page 67.

On IRB approval, I published the online survey on the Google Forms platform and connected it to the URL [www.walkfay.com](http://www.walkfay.com). The survey was shared on city email listservs, social media channels, and in person among social networks.

*Results*

According to the protocol submitted for *How Do You Feel About Walking?*, the maximum sample size is 200 respondents. In total, 195 respondents participated in this survey. Their data was coded, analyzed, and visualized for this thesis. I used regression analysis to evaluate multiple relationships between walking-preferences, walking trip counts, neighborhood location, and other variables. The results of the survey and subsequent data analysis are visualized using charts, graphs, and tables presented in *Research Results* pages 42-45. The raw dataset is available on page 65.

*Chapter Summary*

My intention for this thesis is to present compelling evidence that the built environment can complement and encourage healthier lifestyle choices ultimately increasing the amount of physical activity of adult residents and decreasing BMI scores over time. This thesis will provide
specific strategies for improving the health of the community through built environment and social/cultural interventions (see Discussion).
Fayetteville, Arkansas As A Case Study

Why Fayetteville?

Metropolitans like Fayetteville are underrepresented in the existing literature on the topic, yet in many ways they stand the most to gain from insights made possible by unique, place-based datasets like the one advanced in this thesis. Fayetteville is a city in a high-demand; high-growth mindset, with particularly poor health outcomes. I selected Fayetteville, Arkansas for these reasons.

Fayetteville, Arkansas is nestled in the Boston Mountains found in the northwest corner of the state. Fayetteville is part of the larger Fayetteville-Springdale-Rogers (“Northwest Arkansas” by locals) metropolitan statistical area (MSA).\(^52\) The Northwest Arkansas metro is the forty-third fastest growing MSA in the United States according to 2018 Population Estimates. \(^53\) The percent increase in population was 15.9% from 2010-2017 (for reference, percent increase in American population was 5.5%).\(^54\) The median income in Fayetteville is $41,158, and almost a quarter of the population live beneath the poverty line.\(^55\) On average, Fayetteville residents travel 20 minutes from home to work on average.\(^56\) The University of Arkansas acts as an anchor institution for a population that is younger, and more educated than comparable MSAs.\(^57\)

According to one local historian, “Fayetteville was originally laid out on a compact, gridded street pattern centered first around the town square. The town grid appears in Washington County’s General Land Survey of 1831, with nine blocks at the crossroads of what are now Mount Comfort, Old Wire, Huntsville, and Cato Springs roads. Starting in the 1880s, Fayetteville also became the crossroads of several railroads, including the St. Louis & San Francisco and the Pacific & Great Eastern, which established depots at the edge of town at what is now Dickson Street. The city’s two crossroads – rail and highway – resulted in today’s pair of

\(^{53}\) Ibid.
\(^{54}\) Ibid.
\(^{55}\) Ibid.
\(^{56}\) Ibid.
\(^{57}\) Ibid.
commercial centers at Downtown Square and Dickson Street. As the town expanded, modern planning malpractice influenced new development. Fayetteville does have a healthy downtown as described above, but also has sprawling neighborhoods on the perimeter of town.

Figure 1: Fayetteville-Springdale-Rogers MSA Population and Housing Growth Over Time


Arkansas has the eighth highest rate of adult obesity in the United States. Built environment interventions such as investing in pedestrian infrastructure and modernizing land use approaches have seen modest, yet steady improvements in population health outcomes. Specific approaches most suitable for Fayetteville will be discussed further in Recommendations on page 49. Arkansas does not release health data on the census tract level, and does not have an open data repository like DC. Health data is the most exciting element of the collected survey data.

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58 City of Fayetteville, Arkansas. "Fayetteville Mobility Plan." [source]
Fayetteville is a unique dataset that will add to the existing knowledge on the connection between public health, urban form, and social / cultural variables.

Figure 2: Existing Health Data Graphed


**Identifying Study Areas within Fayetteville**

It is necessary to establish a quantifiable measure of “walkability” to properly identify Study Area 1 and 2. For the purpose of this study, Study Area 1 is the walkable, pedestrian-friendly neighborhood of Downtown Fayetteville including the Washington-Willow Historic District, the University of Arkansas campus and South Fayetteville. Study Area 2 is the auto-oriented, postwar example and is comprised of neighborhood developments adjacent to Wedington Drive in West Fayetteville.

A walkability index was adapted to measure differences in built environment variables including population density, street connectivity, and presence of mixed use zones.
Table 1: Walkability Index Measures for Fayetteville, Arkansas

<table>
<thead>
<tr>
<th>Measure</th>
<th>Definition</th>
<th>Data Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net Residential Density</td>
<td>$\frac{\text{population total}}{\text{square mile}}$</td>
<td>American Community Survey, 2017</td>
</tr>
<tr>
<td>Street Connectivity</td>
<td>$\text{count of four-way intersections}$</td>
<td>Google Images, 2019</td>
</tr>
<tr>
<td>Land Use Mix</td>
<td>$\text{sum of land uses represented}$</td>
<td>Fayetteville, Arkansas: “Zoning Code of Ordinances”</td>
</tr>
</tbody>
</table>

The variation of zoning among a census tract; presence of mixed use zoning application; average of all census tract neighborhood groupings ultimately applied


Data for the contrasting study areas in Fayetteville below.

Table 2: Walkability Data for Study Areas 1 and 2

<table>
<thead>
<tr>
<th>Measure</th>
<th>Historic Downtown [Walkable Study Area 1]</th>
<th>Wedington Corridor [Corridor-Bound Study Area 2]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net Residential Density</td>
<td>4,401 per sq mi</td>
<td>1,866 per sq mi</td>
</tr>
<tr>
<td>Street connectivity</td>
<td>See Map 1</td>
<td>See Map 1</td>
</tr>
<tr>
<td>Land use mix</td>
<td>See Map 1</td>
<td>See Map 1</td>
</tr>
</tbody>
</table>


Therefore Study Area 1, the classically walkable neighborhood, became the Historic downtown including the University of Arkansas Campus, South Fayetteville and the Washington-Willow Historic District. Study Area 2, the corridor-bound sample, is Wedington Corridor and the adjacent neighborhoods.
Defining neighborhood is challenging. Hooper et al state “there is no consensus on what defines a ‘neighborhood’ (e.g., shape or size). Distances of 200–1600 m around participants’ homes are typically used to represent the size of the ‘neighborhood’ because these typically represent ‘walkable’ distances to local destinations.” If a room full of people were asked to define their neighborhood, it’s possible every person would provide a different response. Therefore the data analysis process began with a wide range - starting with census tract and progressing to block group, and zip code area tabulation. This process was necessary to determine the best fit for the purpose of this survey. Ultimately, census tracts were clustered and calculated as “best fit” according to census tract reference maps and personal knowledge of cultural boundaries. Respondents were asked to provide their location of residence, but personal definitions of neighborhood were not explored further. Respondents were not asked to provide their census tract or address.

American Community Survey data was compiled and analyzed for Study Area 1 and 2. Data topics include population, number of households, household size, the percent of households with no access to a vehicle, population density, the breakdown of transportation mode share, race and ethnicity measures, and median income levels. The American Community Survey tables providing the data are B01003, B11001, B25044, B19013, B25010, B03002, and B08301.

When deciding how to define “neighborhood,” I used Census Reference Maps and a personal knowledge of the area. I felt a grouping of census tracts was most appropriate.

Table 3: Census Tracts Assigned to Study Areas 1 and 2

<table>
<thead>
<tr>
<th>Activity Center Name</th>
<th>Id</th>
<th>Id2</th>
<th>Geography</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study Area 1: Historic Downtown</td>
<td>1500000US051430101 042</td>
<td>514301001042</td>
<td>Block Group 2, Census Tract 101.04, Washington County, Arkansas</td>
</tr>
<tr>
<td></td>
<td>1500000US051430101 043</td>
<td>514301001043</td>
<td>Block Group 3, Census Tract 101.04, Washington County, Arkansas</td>
</tr>
<tr>
<td></td>
<td>1500000US051430107 012</td>
<td>514301007012</td>
<td>Block Group 2, Census Tract 107.01, Washington County, Arkansas</td>
</tr>
<tr>
<td></td>
<td>1500000US051430107 023</td>
<td>514301007023</td>
<td>Block Group 3, Census Tract 107.02, Washington County, Arkansas</td>
</tr>
<tr>
<td></td>
<td>1500000US051430113 001</td>
<td>51430110001</td>
<td>Block Group 1, Census Tract 113, Washington County, Arkansas</td>
</tr>
<tr>
<td></td>
<td>1500000US051430113 002</td>
<td>51430110002</td>
<td>Block Group 2, Census Tract 113, Washington County, Arkansas</td>
</tr>
<tr>
<td></td>
<td>1500000US051430113 003</td>
<td>51430110003</td>
<td>Block Group 3, Census Tract 113, Washington County, Arkansas</td>
</tr>
<tr>
<td></td>
<td>1500000US051430113 006</td>
<td>51430110006</td>
<td>Block Group 6, Census Tract 113, Washington County, Arkansas</td>
</tr>
<tr>
<td>Study Area 2: Wedington Corridor</td>
<td>1500000US051430105 061</td>
<td>514301005061</td>
<td>Block Group 1, Census Tract 105.06, Washington County, Arkansas</td>
</tr>
<tr>
<td></td>
<td>1500000US051430105 062</td>
<td>514301005062</td>
<td>Block Group 2, Census Tract 105.06, Washington County, Arkansas</td>
</tr>
<tr>
<td></td>
<td>1500000US051430105 073</td>
<td>514301005073</td>
<td>Block Group 3, Census Tract 105.07, Washington County, Arkansas</td>
</tr>
<tr>
<td></td>
<td>1500000US051430105 082</td>
<td>514301005082</td>
<td>Block Group 2, Census Tract 105.08, Washington County, Arkansas</td>
</tr>
<tr>
<td></td>
<td>1500000US051430105 083</td>
<td>514301005083</td>
<td>Block Group 3, Census Tract 105.08, Washington County, Arkansas</td>
</tr>
</tbody>
</table>
Table 4: Population Baseline Travel Behavior and Socioeconomic Overview

<table>
<thead>
<tr>
<th>Demographic Variable</th>
<th>Historic Downtown [Walkable Study Area 1]</th>
<th>Wedington Corridor [Corridor-Bound Study Area 2]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population</td>
<td>8,648</td>
<td>14,797</td>
</tr>
<tr>
<td>Population per square mile</td>
<td>4,401</td>
<td>1,866</td>
</tr>
<tr>
<td>Median Household Income</td>
<td>$45,085</td>
<td>$62,562</td>
</tr>
</tbody>
</table>

**Transit**

| % Travelling via Car, Truck, Van | 69%  | 93% |
| % Walking                        | 16%  | 0%  |
| % Biking                         | 0.19%| 3.58%|
| % Transit                        | 0%   | 0%  |


Table 5: Population Total, Household Total and Average Household Size of Study Areas 1 and 2

<table>
<thead>
<tr>
<th>Study Area</th>
<th>Geography</th>
<th>Pop Total</th>
<th>HH Total*</th>
<th>Average HH Size*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study Area 1:</td>
<td>Block Group 2, Census Tract 101.04, Washington County, Arkansas</td>
<td>571</td>
<td>294</td>
<td>1.94</td>
</tr>
<tr>
<td>Downtown</td>
<td>Block Group 3, Census Tract 101.04, Washington County, Arkansas</td>
<td>978</td>
<td>470</td>
<td>2.08</td>
</tr>
<tr>
<td>Fayetteville</td>
<td>Block Group 2, Census Tract 107.01, Washington County, Arkansas</td>
<td>2,704</td>
<td>965</td>
<td>2.80</td>
</tr>
<tr>
<td></td>
<td>Block Group 3, Census Tract 107.02, Washington County, Arkansas</td>
<td>1,185</td>
<td>432</td>
<td>2.74</td>
</tr>
<tr>
<td></td>
<td>Block Group 1, Census Tract 113, Washington County, Arkansas</td>
<td>625</td>
<td>371</td>
<td>1.68</td>
</tr>
<tr>
<td></td>
<td>Block Group 2, Census Tract 113, Washington County, Arkansas</td>
<td>851</td>
<td>501</td>
<td>1.70</td>
</tr>
<tr>
<td>Study Area 1: Downtown Fayetteville</td>
<td>Geography</td>
<td>Total Vehicles by BG*</td>
<td>% Total HH No Car</td>
<td></td>
</tr>
<tr>
<td>----------------------------------</td>
<td>-----------------------------------------------------</td>
<td>-----------------------</td>
<td>-------------------</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Block Group 2, Census Tract 101.04, Washington County, Arkansas</td>
<td>294</td>
<td>0.00%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Block Group 3, Census Tract 101.04, Washington County, Arkansas</td>
<td>470</td>
<td>6.17%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Block Group 2, Census Tract 107.01, Washington County, Arkansas</td>
<td>965</td>
<td>11.19%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Block Group 3, Census Tract 107.02, Washington County, Arkansas</td>
<td>432</td>
<td>7.87%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Block Group 1, Census Tract 113, Washington County, Arkansas</td>
<td>371</td>
<td>27.76%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Block Group 2, Census Tract 113, Washington County, Arkansas</td>
<td>501</td>
<td>12.97%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Block Group 3, Census Tract 113, Washington County, Arkansas</td>
<td>551</td>
<td>4.72%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Block Group 6, Census Tract 113, Washington County, Arkansas</td>
<td>213</td>
<td>14.55%</td>
<td></td>
</tr>
<tr>
<td><strong>Totals:</strong></td>
<td></td>
<td><strong>3,797</strong></td>
<td><strong>10.65%</strong></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Study Area 2: Wedington Corridor</th>
<th>Geography</th>
<th>Total Vehicles by BG*</th>
<th>% Total HH No Car</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Block Group 1, Census Tract 105.06, Washington County, Arkansas</td>
<td>2,506</td>
<td>1.28%</td>
</tr>
<tr>
<td></td>
<td>Block Group 2, Census Tract 105.06, Washington County, Arkansas</td>
<td>1,191</td>
<td>0.00%</td>
</tr>
<tr>
<td></td>
<td>Block Group 3, Census Tract 105.07, Washington County, Arkansas</td>
<td>793</td>
<td>5.93%</td>
</tr>
<tr>
<td><strong>Totals:</strong></td>
<td></td>
<td><strong>14,797</strong></td>
<td><strong>2.39%</strong></td>
</tr>
</tbody>
</table>


*HH = Household

Table 6: Comparing Rates of Vehicle Ownership and Percent of Households Without A Car
### Table 7: Race and Ethnicity Comparison in Study Areas 1 and 2

<table>
<thead>
<tr>
<th>Study Area</th>
<th>Geography</th>
<th>% White</th>
<th>% Black</th>
<th>% Asian</th>
<th>% Hispanic</th>
<th>% Two+ Races</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Study Area 1:</strong> Downtown Fayetteville</td>
<td>Block Group 2, Census Tract 101.04, Washington County, Arkansas</td>
<td>95.00%</td>
<td>0%</td>
<td>5%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td></td>
<td>Block Group 3, Census Tract 101.04, Washington County, Arkansas</td>
<td>82%</td>
<td>2%</td>
<td>2%</td>
<td>12%</td>
<td>0%</td>
</tr>
<tr>
<td></td>
<td>Block Group 2, Census Tract 107.01, Washington County, Arkansas</td>
<td>75.00%</td>
<td>4%</td>
<td>8%</td>
<td>5%</td>
<td>6%</td>
</tr>
<tr>
<td></td>
<td>Block Group 3, Census Tract 107.02, Washington County, Arkansas</td>
<td>69.00%</td>
<td>1%</td>
<td>2%</td>
<td>2%</td>
<td>8%</td>
</tr>
<tr>
<td></td>
<td>Block Group 1, Census Tract 113, Washington County, Arkansas</td>
<td>97%</td>
<td>0%</td>
<td>0%</td>
<td>1%</td>
<td>2%</td>
</tr>
<tr>
<td></td>
<td>Block Group 2, Census Tract 113, Washington County, Arkansas</td>
<td>68.00%</td>
<td>12%</td>
<td>9%</td>
<td>8%</td>
<td>2%</td>
</tr>
<tr>
<td></td>
<td>Block Group 3, Census Tract 113, Washington County, Arkansas</td>
<td>92.00%</td>
<td>5%</td>
<td>0%</td>
<td>3%</td>
<td>0%</td>
</tr>
<tr>
<td></td>
<td>Block Group 6, Census Tract 113, Washington County, Arkansas</td>
<td>82.00%</td>
<td>9%</td>
<td>0%</td>
<td>2%</td>
<td>4%</td>
</tr>
<tr>
<td><strong>Totals:</strong></td>
<td></td>
<td>83%</td>
<td>4%</td>
<td>3%</td>
<td>4%</td>
<td>3%</td>
</tr>
<tr>
<td><strong>Study Area 2:</strong> Wedington Corridor</td>
<td>Block Group 1, Census Tract 105.06, Washington County, Arkansas</td>
<td>72%</td>
<td>6%</td>
<td>5%</td>
<td>12%</td>
<td>4%</td>
</tr>
<tr>
<td></td>
<td>Block Group 2, Census Tract 105.06, Washington County, Arkansas</td>
<td>80.00%</td>
<td>5%</td>
<td>10%</td>
<td>2%</td>
<td>3%</td>
</tr>
<tr>
<td></td>
<td>Block Group 3, Census Tract 105.07, Washington County, Arkansas</td>
<td>81.00%</td>
<td>0%</td>
<td>6%</td>
<td>8%</td>
<td>1%</td>
</tr>
</tbody>
</table>


*BG = Census Block Group*
Chapter Summary

Fayetteville, a high-growth city in a State with poor health outcomes, makes an idyllic case study to add to the body of existing literature. The two study areas identified by the walkability index are a rich example of contrasting urban forms. The subsequent chapter will explore how survey data was designed and collected.
How Do You Feel About Walking?: The Survey

Survey Overview
The Georgetown Internal Review Board approved a twenty-eight question survey authored by Anna Clark and advised by Dr. Kenneth Joh. The survey measures 1) residential location 2) self-reported health data, 2) the amount of days and minutes respondents engaged in walking as a form of recreation, leisure, or alternative transportation, and 3) sentiment towards the neighborhood.

The survey requires respondents to estimate the number of days and minutes in which the respondent engaged in walking as a form of recreation, leisure, or alternative transportation. This is modeled after the International Physical Activity Questionnaire.62

The sample will be representative of the general population of corresponding census tracts. Underreported subgroups will be weighted accordingly. The survey, informed consent form, and protocol is attached in its entirety at the end of this document. The survey was communicated to respondents via email listserv, social media, and by interacting with and speaking directly to the public. The raw data this survey produced is available in the appendix.

Contextualizing the Survey
It is difficult to study and appropriately measure for the many variables that influence a decision to make healthy lifestyle choices such as walking. Most research on this topic is empirical, experimental, or quasi-experimental in form. Studies and methodologies vary, but most are designed to isolate the effect of the built environment or socioeconomic patterns and walking trip counts using regression analysis.

The framework for this thesis, Can Built and Social Environmental Factors Encourage Walking among Individuals with Negative Walking Attitudes?, deployed a 155-question survey on appropriately-related sociodemographic variables and attitudinal preferences using The Likert

Scale. In addition to the sociodemographic and attitudinal survey, Joh et al respondents were individually assigned a date to record trips taken, and travel mode used in the given twenty-four hour period. Walking trip counts are typically the independent variable in regression analysis, and as such are very important. Unfortunately, trip journals are complicated, costly, and time-consuming. For the sake of practicality and feasibility, I used a different approach.

*How Do You Feel About Walking?* is inspired by questions from the survey deployed in Joh et al, *Can Built and Social Environmental Factors Encourage Walking Among Individuals with Negative Walking Attitude?*, and elements of the *International Physical Activity Questionnaire*.

**Survey Measures**

This survey employs measurements on residential location, socioeconomic demographics, walking trip counts, attitudinal preferences, and health status.

Using the two study areas (as explained in the previous chapter), this survey measures attitudinal preferences on neighborhood form, culture, perceptions of safety, and a gamut of value statements measured by The Likert Scale. Perhaps most importantly, this survey collects self-reported height and weight status to be calculated into body mass index scores (BMI). This data is unavailable otherwise.

Based on data from the study neighborhoods, sociodemographic variables were appropriately split into bracket ranges as opposed to short answer. For example, the median income in these neighborhoods is approximately $50,00064 so the Joh et al scale used for Los Angeles was appropriately adjusted down. For the attitudinal portion of the survey, respondents reacted to a series of value-based questions with The Likert Scale, a five-point scale (*5 = very important; 4 = important; 3 = neutral; 2 = rather unimportant; 1 = not at all important*)65 was employed to measure attitudinal preferences. Health data (self-reported height and weight) were the only two

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open-ended questions. The walking trip count report asks respondents to recall the amount of time they engaged in walking over the previous seven-day period, for what purpose they walked (as a mode of transportation or recreation activity), and the number of walking trips taken in the previous week. For a complete copy of the survey and relevant documents, please find How Do You Feel About Walking? beginning on page 67.

Respondents of this survey had to live in one of the target study areas. Because this is a place-based study, a non-probability sampling technique (specifically a purposive sampling) was used.

Survey Design
The online survey totals twenty-eight questions that record sociodemographic variables, attitudinal preference toward neighborhood, self-reported health data, and self-reported walking trip counts discussed in prior sections.

How Do You Feel About Walking? only recorded responses online. I did not record any paper copies, or solicit mail-in responses. I built the survey on Google Forms, which is a sophisticated, encrypted, data-storing platform. The Google Forms link isn’t easily recognizable because of its length - https://docs.google.com/forms/d/e/1FAIpQLSfEISd9SdRATLU37niGgJhrBjRaBXRhO_yEJw0o_StieJMcug/viewform. So for about $3, I purchased the domain www.walkfay.com and routed it to the Google Form link you see above. I felt walkfay.com would be easier for people to talk about and share with their networks both online and in-person communication. Since I didn’t have the benefit of being able to financially reward participation through gift cards or prize drawings, I wanted to make it as shareable as possible. I created bookmarks, flyers, and various other marketing materials to contextualize their participation and message the survey purpose.66

Deploying the Survey
Upon approval from Georgetown University IRB, I travelled to Fayetteville, Arkansas from Washington D.C. to lay the groundwork for public engagement. I garnered support from local activist groups already working in relative fields including tactical urbanists, public health

66 SEE APPENDIX
groups, placemaking groups, and well-known community groups. The Urban Land Institute (Northwest Arkansas chapter) the Fayetteville Chamber of Commerce, and the Fayetteville Parks and Rec Department shared marketing materials on social media and/or in listserv emails. Surprisingly, the most effective channel for soliciting responses was my personal social media networks. Ultimately, the survey reached over 2,000 people online.

Typically, lengthier surveys collect fewer responses, but ultimately produce a more robust dataset. Because the survey length was dramatically shortened, the dataset isn’t as robust as it could be.

Chapter Summary
A survey measuring residential location, socioeconomic demographics, walking trip counts, attitudinal preferences, and health status was built by the author and approved by Georgetown University’s IRB Process. How Do You Feel About Walking? was deployed as a twenty-eight question, online survey strategically marketed toward both study areas via online and public engagement strategies. The following chapter will explore the results of the survey.

Research Results
The following results are based on survey data from 195 respondents living in one of the two target study areas. This survey data explores attitudinal preference, urban form and reported walking trip counts. For additional survey information, please see the previous chapter. The raw dataset can be found in the appendix.
Calculating Health Data

The specific health measure related to this study is body mass index (BMI) scores falling within the overweight and obese range as defined by the Center for Disease Control. Relevant health data was collected in height (feet and inches) and weight (pounds). Center for Disease Control and Prevention classifies body mass index (BMI) scores that are $\geq 25.00$ as overweight, and $\geq 30$ as obese. According to the Center for Disease Control, BMI is calculated using the following formula:

\[
BMI = \frac{\text{weight (kg)}}{\text{height (m}^2\text{)}}
\]

Responses scoring $\geq 25.00$ were coded as 1, scores of $<25.00$ were coded as 0. This method was selected to establish overweight/obese population as a threshold, instead of viewing unique responses on a continuous sliding scale.

Table 8: Variable Coding

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Variable Coding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Walking Trips Over a Seven Day Period</td>
<td>Actual counts of walking trips reported by the respondent in a seven day travel period</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Independent Variables</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>BMI Scores</td>
<td>Height (in feet) and weight (in pounds) reported by respondent; data manipulated into BMI scores $&lt;25 = 0$; else = 1</td>
</tr>
<tr>
<td>Neighborhood</td>
<td>Historic District = 0; Wedington = 1</td>
</tr>
<tr>
<td>Personal Walking Favorability</td>
<td>Adding up value responses for walking-favorability questions. Values scoring below the median score (34)</td>
</tr>
</tbody>
</table>

https://www.cdc.gov/healthyweight/assessing/bmi/childrens_bmi/childrens_bmi_formula.html

https://www.cdc.gov/healthyweight/assessing/bmi/childrens_bmi/childrens_bmi_formula.html
Designating High-Preference and Low-Preference Walking Groups

I created a simple “walkability preference index” by totaling corresponding attitudinal value statements on walkability scores. Using questions specifically related to walkability prioritization (eg, “The neighborhood has sidewalks that make me and my family feel protected from cars when walking,” etc), the median walking preference score for the entire sample population is 34. The median walking preference score for Study Area 1 is 34, Study Area 2 is 32.

Table 9: Outcomes of Walking Favorability Score

<table>
<thead>
<tr>
<th>Measure</th>
<th>Historic Downtown [Walkable Study Area 1]</th>
<th>Wedington Corridor [Corridor-Bound Study Area 2]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medan Walking Preference Score</td>
<td>34</td>
<td>32</td>
</tr>
<tr>
<td>High-Preference Walking Individuals Residing in Study Area</td>
<td>64</td>
<td>22</td>
</tr>
<tr>
<td>% Responses scoring High-Preference Walking in Study Area Subset</td>
<td>49.61%</td>
<td>34.92%</td>
</tr>
<tr>
<td>Of high-preference group, % living in Study Area</td>
<td>74.42%</td>
<td>25.58%</td>
</tr>
<tr>
<td>Total Respondents</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Median walking preference score</td>
<td>34</td>
<td></td>
</tr>
<tr>
<td>Population count indicating high-Preference for walking</td>
<td>86/195</td>
<td></td>
</tr>
<tr>
<td>% total population scoring high-preference for walking</td>
<td>44.33%</td>
<td></td>
</tr>
</tbody>
</table>


Of the 195 respondents, 86 individuals (approximately 44.33% of total respondents indicated a high-preference for walking. Of the high-preference group, 74.42% resided in the walkable neighborhood, and 25.58% in the corridor bound neighborhood.69

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On a weekly average, the days respondents reported engaging in walking as an alternative form of transportation were higher (3 days) than the days they walked for recreation (2 days). This supports the theory that attractions (eg school, work, shopping, etc) in close proximity to the neighborhood are correlated to higher levels of walking trips.

Evaluating the study areas independently, the residents in the walkable neighborhood (Downtown Fayetteville) reported double the amount of active-walking days than the Wedington Corridor neighborhoods.

*Contextualizing Results in the Residential Self-Selection Bias*

As you’ll recall from the literature review, the residential self-selection bias considers the possibility that those preferring walkable spaces might self-select into walkable neighborhoods. In the Fayetteville sample, respondents who exceeded the median score of walking favorability were sorted into the high-preference for walking group. Of the high preference walking group, 74.42% resided in the walkable neighborhood, and 25.58% in the corridor bound neighborhood. This only further reflects evidence of a residential self-selection bias, as those preferring walkable spaces do in fact reside in the walkable neighborhood.

The majority of high walking preference individuals live in the walkable neighborhood. However, only 86 respondents out of the total sample population of 195 responded with values that suggest they prefer to walk. To me, this is indicative of the built environment’s ability to incentivize “good” behavior. Sometimes, it’s just easier to walk. That doesn’t mean people necessarily prefer to engage in that form of transportation, but it is preferable over the alternative.

*Survey Results Graphed*
Figures 4 - 10: Socioeconomic Results Graphed

Figure 11 - 23: Attitudinal Preference Results Graphed

Figures 24 - 28: Walking Trips and Active Minutes Graphed


Results and Brief Reflections on Socioeconomic Results

Study Area 1, the walkable historic downtown, is overrepresented. In the total sample, non-hispanic whites and women are overrepresented. Non-hispanic whites make up 81% of total area demographics according to the United States Census Bureau,\(^\text{75}\) and are 91% of survey respondents.\(^\text{76}\) Women are overrepresented, likely due to the method for deploying the survey. Reported income is appropriately stratified, as is age.

The socioeconomic variables were recorded primarily to provide perspective on the representativeness of the survey sample. There are, however, some interesting takeaways from these variables outside of measures of representation. Men reported more weekly walking trips

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than women (6.1 trips for men; 4.6 trips for women). On average, men reported higher BMI scores (26.6 for men; 24.6 for women). The African American population reported the highest average of weekly walking trips (6.8), followed by Asian-Pacific Islander (5), Non-hispanic, white (4.6), Hispanic (3.6). Those identifying as “two or more races” averaged 2.75 walking trips a week. Respondents residing in Study Area 1 (walkable downtown) averaged 6.0 walking trips weekly, Study Area 2 (corridor-bound Wedington Drive) averaged 2.2 walking trips weekly. Residents of Study Area 1 averaged a slightly lower reported BMI (24.85 BMI) than Study Area 2 (25.92 BMI). Average walking trip count by income is also interesting, see below:

Table 10: Average Walking Trip Count by Income Group

<table>
<thead>
<tr>
<th>Income Bracket</th>
<th>Averaged Walking Trip Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;$19,000</td>
<td>7.03</td>
</tr>
<tr>
<td>$20 - 39,999</td>
<td>5.50</td>
</tr>
<tr>
<td>$60 - 99,999</td>
<td>3.64</td>
</tr>
<tr>
<td>$100,000+</td>
<td>2.93</td>
</tr>
</tbody>
</table>


Similar findings for variables of gender, income, race/ethnicity, and neighborhood form are reflected in similar studies. The Fayetteville sample corroborates elements of existing literature.

**Results and Brief Reflections on Health Data and Walking Trip Counts**

Perhaps the most important thing accomplished by this survey is the provision of health data by neighborhood. This is not available in Arkansas otherwise. The average BMI scores for both neighborhood samples are in the “normal” range by Center for Disease Control standards. In

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2010, the CDC reported that 26.20% of Arkansans reported no physical activity (for perspective, DC reported 19.3%).\textsuperscript{84} Approximately 26% of respondents reported 0 walking trips weekly.\textsuperscript{85} Actually, zero was the most common response for walking trips.\textsuperscript{86} That doesn’t necessarily mean that a quarter of the population gets no physical activity whatsoever, they just aren’t getting it by walking.

\textit{Results and Brief Reflections on Attitudinal Data}

This thesis was written to question the influence urban form has on individuals with negative or neutral favorability toward walking. Attitudinal data allowed the identification of high-preference and low-preference for walking groups. Of the 195 respondents, 86 individuals (approximately 44.33\% of total respondents) indicated a high-preference for walking.\textsuperscript{87} Of the high-preference group, 74.42\% resided in the walkable neighborhood, and 25.58\% in the corridor bound neighborhood.\textsuperscript{88} Although initially the average favorability scores differed for Study Area 1 and 2, as respondents increased the median favorability score for both study areas equalized. The final favorability score calculated separately for both study areas is 33.\textsuperscript{89} I anticipated Study Area 1 would be more favorable, and have a slightly higher median than Study Area 2.

Responses varied most dramatically for three value statements: 1) “This neighborhood is less than a ten-minute drive from work;” 2) “The neighborhood makes it possible for me to choose between walking, biking or driving to destinations like work, school, and medical services;” and 3) “This neighborhood is in a good school district.”\textsuperscript{90} Results from question one and two suggest people expect to spend more time driving regardless of where they live in Fayetteville, and therefore don’t hold driving against their neighborhood choice. I believe results from question

\textsuperscript{86} Clark, Anna. How do You Feel about Walking?, 2019.
\textsuperscript{87} Clark, Anna. How do You Feel about Walking?, 2019.
\textsuperscript{88} Clark, Anna. How do You Feel about Walking?, 2019.
\textsuperscript{89} Clark, Anna. How do You Feel about Walking?, 2019.
\textsuperscript{90} Clark, Anna. How do You Feel about Walking?, 2019.
three are a reflection of current family status rather than future family status. Approximately 84% of the sample reported 0 children under 18 living at home.\textsuperscript{91}

\textit{Chapter Summary}

Results from survey data analysis echoed existing literature, concluding personal preferences, family status, gender, location, income status, and race/ethnicity have varying degrees of influence on reported walking trip counts among two study areas in Fayetteville, Arkansas.

\textsuperscript{91} Clark, Anna. \textit{How do You Feel about Walking?}, 2019.
Recommendations for Fayetteville, Arkansas

Throughout the survey process, three respondents contacted me to offer an interview unsolicited. These individuals wanted to provide clarity to the infrequent walking trip counts they reported, and/or contextualize why they moved from Study Area 1 to Study Area 2. Of course there is no wrong answer in academic research of this nature, and no positive or negative study area descriptors were used in survey communication (e.g., “residents living in the walkable downtown”). I interpreted their desire to explain their responses as an indication they felt as though their personal preferences were somehow wrong. To me, this highlighted a dissonance in the planning definition of “walkability” (i.e., FAR, residential density, block size, etc) and the needs and interpretation of pedestrians interacting in these neighborhoods. In simpler terms, they feel they should like walking, and yet they don’t.

The three respondents interviewed are all female. They all expressed feelings that their 1) personal safety is compromised by vehicles and/or other persons when walking, and/or 2) a more desirable school district corresponded with a less desirable, corridor-bound neighborhood form, so they moved. As a demographic, women seem to be particularly likely to express a combination of these concerns. These expressions lead me to believe that, like the Joh et al study, “following from their reasoning, it could be that walkability measures such as the one captured by our walkability index are at odds with other desirable features such as school quality and housing costs and thus influence the residential choices of mothers.”

One interviewee was struck by a car while out for a jog (Interview Available in the appendix). She will thankfully not experience long term physical repercussions, but it was certainly a traumatic event. Fayetteville should improve the safety of pedestrians through built environment interventions and cultural campaigns which promote safety and communicate the health benefits of incorporating walking as a travel mode and a recreational activity.

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The Fayetteville research results and the larger body of existing literature suggests built environment variables \textit{AND} social/cultural variables impact walking trip counts, physical activity rates, and BMI scores. Therefore, the appropriate response should include both built environment and social/cultural solutions for both study areas. The City of Fayetteville should launch 1) built environment interventions and 2) health and safety cultural campaigns through financial investment and strategic partnerships with local activist groups with the goal of increasing pedestrian safety (both real and perceived) as well as physical activity levels over time. All Arkansans, regardless of age, race, family status, or income range deserve a neighborhood that, at minimum, doesn’t worsen physical health.

\textit{Built Environment Interventions}

There is a distinction that is important to make when addressing pedestrian safety. Many studies find that the \textit{reality} of safety statistics and the \textit{perception} of safety are oftentimes dissonant. Fayetteville may have a safety perception problem, but they also have an actual pedestrian safety issue. As such, they need to address both through actually increasing safety through targeted traffic interventions, and introducing safety messaging via cultural campaign to the local population.

The City of Fayetteville could dramatically improve pedestrian safety through simple, cost-effective built environment interventions. Fayetteville should begin by lowering speed limits city-wide, but especially in Study Area 2. Wedington Drive is a major arterial with a speed limit of 55 miles per hour (MPH). Major and minor arterials should be lowered to 35 MPH maximum, especially in cases like Wedington with significant residential swaths. Access roads should be uniformly set to 25 MPH maximum.

Lowering the speed limit should be introduced in conjunction with more effective enforcement of speed limit laws. A World Health Organization report found that “behavioural change will occur when the public perceive there is a high risk of being detected speeding, and that detection will lead to a penalty.”93 Enforcing speed limits is most effectively accomplished through the use

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of traffic cameras, which are unfortunately illegal in the State of Arkansas. “Under state law, both speed enforcement and red-light cameras are prohibited, but there are exceptions to the law in school zones and railroad crossings. The exception requires that the police officer be present at the time and the violator is issued the citation at the time of the offense.”

So Arkansas traffic cameras are, in effect, worthless at enforcing speed limit laws. It is my professional opinion that this legislation should change in the name of pedestrian safety to allow the use of traffic cameras for speed limit enforcement. The risk of being caught, pulled over, and issued a traffic citation is far too low to improve pedestrian safety. In addition, the traffic cameras that are used for speed citations in places like DC are already installed in many Fayetteville intersections, but used for traffic demand management purposes only. Reversing existing legislation and using speed cameras to enforce speed limit would therefore be a cost-effective, impactful strategy for increasing pedestrian safety (both perceived safety and literal safety).

Fayetteville should consider add missing pedestrian infrastructure and upgrade existing bike lanes and sidewalks in accordance to the Complete Street guidelines published by the National Association of City Transportation Officials. It is my professional opinion that the City of Fayetteville in tandem with active urbanist groups should invest and use tactical urbanism approaches to improve pedestrian space throughout the city.

Fayetteville should take a critical look at current land use practices and focus on adding density and mixed-use zones wherever possible. Other land use practices to consider include the relief of parking minimums and road diets wherever applicable. Researchers on this topic agree that “compared with other health promotion approaches, the creation of built environments that support physical activity is a sustainable strategy for encouraging people to adopt, or further increase levels of, physical activity.”

The built environment variables most strongly associated with healthy BMI scores are represented in the walkability indices: land use, pedestrian infrastructure, and density. Specifically, the study by Joh et al found that 1) “having nearby


destinations to walk to (i.e., neighborhood businesses) generated increased walking trips among those with positive attitudes, but does not have a significant impact for those with negative attitudes.”

“Other neighborhood design factors that predict physical activity are population density and the availability of transit.”

“A growing body of research confirms the relationship between the built environment and physical activity. So for cities with very little strategic plan to improve pedestrian experience and accessibility throughout a city, this is a good place to start. Encourage or allow for more density and a mix of uses within a space, consider thoughtfully improving street networks, add pedestrian infrastructure, etc.”

However, it is important to note that Fayetteville does have such strategies to improve the pedestrian experience in place and has been executing on these strategies.

**Safety Campaigns: Influencing Walking Favorability**

Cultural campaigns and strategic efforts to change public favorability toward walking are being discussed more and more in research studies like this one. Influencing favorability is complex; there are so many factors at play, but cultural campaigns have an important role to play in creating spaces that promote walking and other forms of physical activity. The City of Fayetteville should engage in a number of cultural campaigns to 1) address safety concerns and 2) educate the population about the health benefits of walking. Addressing safety concerns, particularly traffic-pedestrian safety, should be the top priority. Even stronger than crime rate statistics, the **perception of personal safety** is extremely influential and predictive of walking trip counts. This is especially true for women and women with children. Statistically, women with children walk the least. The Fayetteville data is yet another study to confirm this. Perception of personal safety is affected by the threat of both criminal activity AND traffic-pedestrian interactions in shared space.

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97 Boarnet, Marlon. "Land use, Travel Behavior and Disaggregate Travel Data." In *Planning for Movement within Cities*, 164-188.

The social/cultural variables influencing walking trip counts are numerous and the strength of any one variable varies dramatically by individual. It seems women, more than any other demographic, are forced to make tradeoffs to protect their personal health and the health of their family. It’s unfortunate that a choice between living in a neighborhood that supports their physical health and the preservation of their safety must be made.
Conclusion

Future of Research & Next Steps

This dataset is a good place to start, but a more robust, longitudinal record of health data is necessary for urban planners and public health professionals to design, implement, and ultimately measure sophisticated built and social/cultural environment interventions tailored to place, specifically. Funding is needed to provide robust health datasets to community groups working within this sphere. Fayetteville is a high-impact investment opportunity to test strategies for increasing physical activity levels and ultimately normalizing BMI scores over time.

In Summary

Health-promoting, walkable neighborhoods are a hot topic of research for an interdisciplinary group of planning and public health academics. Urban planners have naturally focused on built environment solutions with the ultimate goal of building neighborhoods that support physical health. To date, the majority of these built environment interventions have yielded a “modest increase in walking trips, while not necessarily reducing automobile trips (Crane 2000 from Joh).”

It’s time to add missing pedestrian infrastructure, but consider cultural campaigns to influence public perception on walking.

This research study published a Georgetown University IRB approved survey to record health data, attitudinal preferences, walking trip counts, and sociodemographic variables for 195 respondents living in one of two study areas in Fayetteville, Arkansas. This produced a dataset that satisfies the need health data on the neighborhood scale in Arkansas, which is otherwise unavailable. This dataset advances the existing body of knowledge by sampling a small to midsize metro in the South; a subgroup currently underrepresented in existing literature.

Results from survey data analysis echo existing literature, concluding personal preferences, family status, gender, location, income status, and race/ethnicity have varying degrees of influence on reported walking trip counts among two study areas in Fayetteville, Arkansas.


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Acknowledgments

I would like to recognize the time, energy and encouragement given to me by the program
director, Uwe Brandes. Thank you for the many comments, revisions, and insights! I was
fortunate to participate in a course instructed by Doctor Kenneth Joh at Georgetown University.
Dr Joh is the primary researcher in a study on this topic titled “Can Built and Social
Environmental Factors Encourage Walking among Individuals with Negative Walking
Attitudes?,” His influence in my education inspired me to continue his study approach, this time
adding a unique dataset - Fayetteville, Arkansas.

The Urban Land Institute (Northwest Arkansas chapter) the Fayetteville Chamber of Commerce,
the Fayetteville Parks and Recreation Department, and the Fayetteville Flyer (a prominent local
newspaper) were happy to share the intention behind the survey with a link to www.walkfay.com
in listserv emails and on social media channels. Those groups specifically were essential
to the survey’s success. Of course, family and friends texted, emailed, called, and posted about the
survey.

Thank you to my husband, Nathan Watson, who is the greatest support system and editor.

Disclosures

Personal
I attended the University of Arkansas and lived in Fayetteville, Arkansas for seven years.
Fayetteville’s potential motivated me to further my education in urban planning at Georgetown
University. My experience moving to Washington, DC and being a student in the Urban and
Regional Planning program at Georgetown University has only further stoked my interest in
public health and planning collaborations to build healthier communities.

Financial
This research is not funded. The author has no financial interest in the outcome of this research.
Limitations in Data Reporting

Other limitations in data and survey design include the methods in which the survey was employed and the nature of the data collected. Researchers acknowledge a tendency for misrepresentation of height and weight status when respondents anonymously self-report. The time of year, the weather, and geographic location also impact the amount of physical activity reported. This survey was deployed in April, when the weather was very pleasant, but had this survey been conducted in December walking trip counts would likely decrease.
Bibliography

"Arkansans Confused Over Red-Light Cameras Vs. Traffic Cameras."

"International Physical Activity Questionnaire."
https://sites.google.com/site/theipaq/background.

"Obesity Rates for States, Metro Areas."

"Sidewalks."

https://www.stateofobesity.org/states/.

Boarnet, Marlon. "Land use, Travel Behavior and Disaggregate Travel Data." In Planning for Movement within Cities, 164-188.


http://ecopapers.repec.org/article/kaptransport/v_3a33_3ay_3a2006_3ai_3a1_3ap_3a1-20.htm.


Centers for Disease Control and Prevention.
"Calculating Body Mass Index."

Centers for Disease Control and Prevention.
"Arkansas State Nutrition, Physical Activity, and Obesity Profile."
(a).

Centers for Disease Control and Prevention.
"Obesity Rates for States, Metro Areas."

Centers for Disease Control and Prevention.


Health, Trust f. A. "New Report Finds 23 of 25 States with Highest Rates of Obesity are


https://search.proquest.com/docview/1716012279.


Tables & Appendices

Survey Documents

Document 1: Survey

How do you feel about walking?
A Georgetown University Research Study

The results from evaluating all survey responses will become findings in a thesis being written by Anna Clark for the Urban and Regional Planning Program at Georgetown University. You will not be contacted for future participation. You will not be identified in any reports or publications resulting from this study.

* = Required

Study Neighborhoods
This survey is for those living in 1) Downtown or South Fayetteville (including the University of Arkansas campus, Washington-Willow Historic District, and South Fayetteville) and 2) Wedington Drive neighborhoods in Fayetteville, Arkansas. For any questions and clarifications, please email sic300@georgetown.edu.

I live in *
  • Downtown Fayetteville, South Fayetteville, or Washington-Willow Historic District
  • Neighborhoods Adjacent to Wedington Drive

Gender *
  • Male
  • Female
  • Prefer not to say

Age *
  • <25
  • 25-40
  • 41-65
  • 65+

Race/Ethnicity *
  • Non-Hispanic White
  • Hispanic
  • African American
  • Asian/Pacific Islander
  • Decline to state
  • Two or More
  • Other:

Income Level *
  • <$19,000
  • $20 - 39,999
  • $40 - 59,999
  • $60 - 99,999
  • $100,000+
  • Decline to state

Height (example: 5'5") *

Your answer
PROTOCOL TITLE:
How Attitudinal, Social, and Environmental Variables Impact the Pedestrian Walking Experience

PRINCIPAL INVESTIGATOR:
Anna Clark
Georgetown School of Continuing Studies – Urban and Regional Planning
(479) 651-7237
alc300@georgetown.edu

VERSION NUMBER/DATE:
Version 1.0; February 22, 2019

REVISION HISTORY

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<th>Version Date</th>
<th>Summary of Changes</th>
<th>Consent Change?</th>
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<td>2/22/2019</td>
<td>Creation &amp; addition</td>
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<td>3</td>
<td>4/10/2019</td>
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1.0 Table of Contents
GHUCCTS Questions

GHUCCTS is the Georgetown-Howard Universities Center for Clinical and Translational Science.

Is this study a GHUCCTS Study?  ____Yes  _X_ No.

Is the project being sponsored or funded by GHUCCTS?  ____Yes  _X_ No.

Does the project utilize GHUCCTS services or facilities?  ____Yes  _X_ No.

2.0 Study Summary
3.0 Objectives*
4.0 Background*
5.0 Study Endpoints*
6.0 Procedures Involved*
7.0 Data and Specimen Banking*
8.0 Sharing of Results with Subjects*
9.0 Study Timelines*
10.0 Inclusion and Exclusion Criteria*
11.0 Vulnerable Populations*
12.0 Local Number of Subjects
13.0 Recruitment Methods
14.0 Withdrawal of Subjects*
15.0 Risks to Subjects*
16.0 Potential Benefits to Subjects*
17.0 Data Management* and Confidentiality
18.0 Provisions to Monitor the Data to Ensure the Safety of Subjects*
19.0 Provisions to Protect the Privacy Interests of Subjects
20.0 Setting
21.0 Resources Available
22.0 Multi-Site Research*

GHUCCTS Questions
GHUCCTS is the Georgetown-Howard Universities Center for Clinical and Translational Science.

Is this study a GHUCCTS Study?  ____Yes  _X___No

Is the project being sponsored or funded by GHUCCTS?  ____Yes  __ X __No

Does the project utilize GHUCCTS services or facilities?  ____Yes  _ X ___No

(e.g., is the study conducted on the Clinical Research Unit (CRU), is the study supported by a GHUCCTS biostatistician, etc.)

2.0 Study Summary

<table>
<thead>
<tr>
<th>Study Title</th>
<th>How Attitudinal, Social, and Environmental Variables Impact the Pedestrian Walking Experience</th>
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<tbody>
<tr>
<td>Study Design</td>
<td>Survey Data Collection / Correlational / Quantitative</td>
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<tr>
<td>Primary Objective</td>
<td>The primary objective is to explore the relationship between obesity rates and the pedestrian perception of the built and social environment in two specific neighborhoods. Ultimately, the data will be analyzed to determine the variables responsible for encouraging walking as a form of alternative transportation and/or leisure.</td>
</tr>
<tr>
<td>Secondary Objective(s)</td>
<td>The secondary objective is to explore the relationship between attitudinal preferences and a pedestrian’s likeliness to engage in walking as a form of alternative transportation and/or leisure.</td>
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<td>------------------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
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<tr>
<td>Research Intervention(s)/Investigational Agent(s)</td>
<td>Anna Clark</td>
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<tr>
<td>IND/IDE #</td>
<td>N/A</td>
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<tr>
<td>Study Population</td>
<td>Residents of Fayetteville, Arkansas residing in Study Areas 1 (Downtown Fayetteville) or 2 (Wedington Drive).</td>
</tr>
<tr>
<td>Sample Size</td>
<td>As many as possible; not to exceed 200 subjects</td>
</tr>
<tr>
<td>Study Duration for individual participants</td>
<td>Subjects will interact with the survey for approximately 6 minutes. Data collection for this survey will occur from date of survey approval by IRB until April 10, 2019.</td>
</tr>
</tbody>
</table>
3.0 Objectives*

3.1 The purpose of this study is to understand why pedestrians choose to engage in walking as a form of non-motorized transportation and/or leisurely activity, and how that impacts physical health outcomes. This survey is written to explore the relationship between attitudinal preferences, social and built environment factors, and public health outcomes (specifically obesity) in two contrasting neighborhood designs in Fayetteville, Arkansas.

3.2 There is a correlate relationship between neighborhood design and BMI scores. Respondents self-select into specific neighborhood designs based on altitudinal preference.

4.0 Background*

4.1 A significant body of research exists linking “neighborhood design and active and sedentary forms of travel” (Frank et al). A similar amount of research links walkability to a myriad of positive public health outcomes including populations with normal BMI ranges and healthy hearts. Research is just beginning to explore other variables that explain why pedestrians...
choose to engage in walking as an alternative transportation mode. Building upon a framework published by Dr. Joh et al in “Can Built and Social Environmental Factors Encourage Walking among Individuals with Negative Walking Attitudes? this paper provides an additional data source to the Joh et al framework, while factoring in a third variable; obesity. This paper asks the question - how do attitudinal preferences, neighborhood design, and personal health interact as variables? Is design enough to change travel patterns, or is there cultural or undiscovered factors that determine pedestrian willingness to engage in walking as an alternative means of transportation.

4.2 I have collected sociodemographic data from the United States Census Bureau /American Fact Finder and the National Household Travel Survey. This has informed target sample size, and will continue to inform how representative the sample is to corresponding zip code.

4.3 This paper builds upon a framework presented in research titled Can Built and Social Environmental Factors Encourage Walking among Individuals with Negative Walking Attitudes? (Joh et al). Joh et al surveyed neighborhoods in Los Angeles, California to determine “whether the design of the built environment encourages more walking above and beyond individuals’ attitudes toward walking or their predisposition to walk.”

The paper proposed in this document adds to existing literature by providing a new, unique dataset for the question at hand. Los Angeles and Fayetteville differ in almost every way – in demographics, culture, land use, crime rates, climate, etc., making this dataset an opportunity to evaluate and compare/contrast the findings from the Joh et al Los Angeles sample set.

As the obesity crisis worsens, studies like this provide cities with new strategies to effectively encourage walking – the most common form of adult exercise (Saelens et al).

5.0 Study Endpoints*

5.1 The primary endpoint of this study is the evaluation of the relationship between walking minutes and trips (dependent variable), and attitudinal preferences and BMI scores (independent variables) using regression analysis.

Data collection will end when sample size is complete or end date is reached. The end date is planned for April 10, 2019.

5.2 N/A

6.0 Procedures Involved*
This is a twenty-seven-question survey designed to 1) gauge attitudinal preference on various social and built environmental factors using a Likert-scale, 2) count self-reported walking trips and minutes over a seven-day period, and 3) factor BMI scores. Respondents will interact voluntarily with a digital survey at www.walkfay.com. As the researcher, I will be the only person to monitor, access, and analyze the data. Respondents will interact with the survey on their own schedule, at the setting of their choosing, and by their own will and volition.

The primary research procedure is a digital survey respondents will interact with on a voluntarily basis at www.walkfay.com. The survey can be accessed and completed at any time from the date of approval until April 10, 2019. Google Forms was selected as a medium for delivering the study because of its known data security efforts and “compliance with the U.S. Health Insurance Portability and Accountability Act (HIPAA), which governs the safeguarding, use, and disclosure of protected health information (PHI)” (G Suite, 2019). Because respondents are self-reporting their experience and not actively participating in an, safety is not a concern. Data will be stored in Google Forms, a secure

Sociodemographic data including household size, income, age, and race, data on active walking minutes and walking trips over a seven-day period, BMI scores, and attitudinal preferences on various neighborhood sentiments will be collected.

All individual responses will remain confidential and anonymous in perpetuity. The results from regression analysis performed on the sample size responses will be included in my research, which I intend to share and publish via Georgetown.
· The subject will engage in a six-minute survey (approximation). No further contact with subject/researcher will occur.
· I anticipate enrolling all study subjects within one month.
· I anticipate completing primary analyses within two weeks.

10.0 Inclusion and Exclusion Criteria*

10.1 Individuals over 18 living within zip codes 72701 or 72704 in Fayetteville, Arkansas are eligible to participate. Respondents will self-report.

10.2 The sample size will reflect the demographics of the area as reported by the United States Census Bureau. Individuals over 18 living within zip codes 72701 or 72704 in Fayetteville, Arkansas are eligible to participate. Respondents will self-report. Individuals who do not live in zip codes 72701 or 72704 will be excluded from the final study sample.

10.3 Indicate specifically whether you will include or exclude each of the following special populations: (You may not include members of the above populations as subjects in your research unless you indicate this in your inclusion criteria.)

· EXCLUDE: Adults unable to consent
· EXCLUDE: Individuals who are not yet adults (infants, children, teenagers)
· EXCLUDE: Pregnant women
· EXCLUDE: Prisoners

11.0 Vulnerable Populations*

11.1 N/A

12.0 Local Number of Subjects

12.1 As many as possible; not exceeding 200 respondents

12.2 N/A

13.0 Recruitment Methods

13.1 Potential subjects will be recruited via 1) announcements and interactions with the principal researcher (in-person), as well as 2) digital communication on social media platforms (Facebook and Instagram) and listserv emails.

Having lived in Fayetteville for many years, I will be visiting target neighborhoods to ask respondents to complete the survey. I will contact the Fayetteville Planning Department to inquire about briefly speaking about the survey at upcoming public meetings. I will be posting on personal social media, and asking local groups to share the link on their pages as well.
Subjects will be recruited upon approval of survey until sample size is complete or no later than April 10, 2019.

13.2 Subjects living in Fayetteville, Arkansas in zip codes 72701 and 72704 are the source.

13.3 Subjects living in Fayetteville, Arkansas in zip codes 72701 and 72704 are the source.

Subjects will anonymously self-report.

13.4 N/A

14.0 Withdrawal of Subjects*

14.1 Responses including “other” on zip code question will be excluded from survey.

14.2 N/A

14.3 N/A

15.0 Risks to Subjects*

15.1 A data breach is the only perceived risk in which data privacy would be compromised. To ensure maximum privacy, G Suite’s Google Forms tool will be used to host the data. G Suite has resources and documentation of compliance with HIPAA regulations.

15.2 N/A

15.3 N/A

15.4 N/A

16.0 Potential Benefits to Subjects*

16.1 No direct benefit

17.0 Data Management* and Confidentiality

17.1 Data will be cleaned and used for regression analysis and data visualization.

17.2 No one besides the principal researcher will have access or be authorized to access the data. Data is password protected and linked to the primary researcher’s Georgetown Gmail account.

17.3 Responses to zip codes not matching 72701 or 72704 will be excluded from the sample. Incomplete responses will be excluded from analysis.

17.4 N/A

· What type of data is being collected, stored, transmitted and shared?

The survey collects self-reported height and weight data, as well as zip code. Zip code responses will be coded to protect identifiable information of respondents. This survey collects self-
reported demographic data, zip code. This survey will not record names, IP addresses, diagnoses, or other identifying factors.

18.0  Provisions to Monitor the Data to Ensure the Safety of Subjects*
This research imposes minimal risk to subjects.

19.0  Provisions to Protect the Privacy Interests of Subjects
19.1  A provision will be included at the beginning of the survey that informs subjects of the privacy protection mechanisms in place.
19.2  See above
19.3  N/A

20.0  Setting
20.1  Describe the sites or locations where your research team will conduct the research.
Research subjects will be recruited from zip codes 72701 and 72704 in Fayetteville, Arkansas.
·    Potential subjects will be recruited at public meetings, on social media, and through in-person conversation and interaction.
·    Potential subjects will be recruited at public meetings, on social media, and through in-person conversation and interaction.
·    Online.
·    Currently, no plans to form a community advisory board.

21.0  Resources Available
21.1  Collecting 200 respondents is feasible. I will have access to the population engaged in planning in Fayetteville, Arkansas and the reach of social media. I need to recruit less than 1% of the total population. I intend to make a trip to Fayetteville to proactively recruit participants and raise awareness for the study. I expect to spend two to three weeks of time cleaning data and performing regressions. I will be the only researcher engaging with the data.

22.0  Multi-Site Research*
22.1  Study will not exceed 200 respondents in totality. A 50/50 split between zip codes 72701 and 72704 will be analyzed.
22.2  Potential subjects will be recruited at public meetings, on social media, and through in-person conversation and interaction.
Bibliography


Permission to Take Part in a Human Research Study

Georgetown University

Location: Fayetteville, Arkansas

Why am I being invited to take part in a research study?
We invite you to take part in a research study because you live in one of two target neighborhoods.

What should I know about a research study?
- All responses are completely confidential and will not be shared.
- Identifiable markers will not be stored.
- Whether or not you take part is up to you.
- You can choose not to take part at any point during the survey.

Why is this research being done?
This study allows researchers to evaluate the relationship between how much people are walking, how they feel about the neighborhood and how a neighborhood’s design impacts public health. By responding to this survey, you’re helping cities understand how to build healthier, more pedestrian-friendly neighborhoods.

How can I learn more about this survey?
If you have questions, concerns, or complaints, or think the research has hurt you, talk to the research team at alc300@georgetown.edu. This research has been reviewed and approved by an Institutional Review Board (“IRB”). You may talk to them at (202) 687-1506 or irboard@georgetown.edu if:
- Your questions, concerns, or complaints are not being answered by the research team.
- You cannot reach the research team.
- You want to talk to someone besides the research team.
- You have questions about your rights as a research subject.
- You want to get information or provide input about this research.

What happens if I say yes, I want to be in this research?
If you participate in this research, you will take a brief, anonymous survey at www.walkfay.com. The responses collected through this survey will be used to evaluate the relationship between 1) how much people are walking, 2) the values and feelings about the two neighborhoods, and 3) if walkable neighborhoods noticeably impact public health outcomes. We want to understand what encourages people to walk both for exercise and as a means of transportation.

The results from evaluating all survey responses will become findings in a thesis being written by Anna Clark for the Urban and Regional Planning Program at Georgetown University. You will not be contacted for future participation.
Briefly explain the incident.

- I live right by the Mud Creek trail head, connecting to the Razorback Greenway. My husband and I bike/run/walk wherever we can. A little over three weeks ago, I left for a run around 5:15. The crosswalk by my house connecting to the trail has a speed bump, multiple neon crossing signs, and flashing lights. I looked both ways at the crosswalk, another car had already stopped, I crossed, and was struck on my left side and flung 15-20 yards. I landed in grass and people were immediately surrounding me. The driver initially drove off, but turned around a few minutes later. I was rushed to the hospital in an ambulance, where they diagnosed/discovered I had a severe concussion (multiple staples needed), fractured shoulder, lung contusion, fractured knee, torn ACL, and a few other minor injuries.

How has this experience changed how you feel about walking or running outdoors?

- I think it will forever change the way I approach a crosswalk, and become even more aware of my surroundings. While driving, I always try to be a "defensive driver", I'm sure that will translate to walking/running outdoors in the future. I will admit I struggle with anxiety, fear, etc. - and I'm sure that will play its part once I'm able to get outside again. All that said, I can't wait to get back outside and on the trails again. This accident has increased my anxiety, but I plan to use it and advocate for crosswalk safety, etc.

How has the experience impacted the amount of physical activity you engage in outdoors [or if you're still rehab-ing, how much you anticipate engaging in walking/running outdoors]?

- Right now my physical activity is limited to physical therapy. It will be a few more weeks/months till I'm able to get back outside. But I'm counting down the days!

From your perspective, is the incident a failure of the city to 1) provide a clear space for pedestrians to safely engage with the city, 2) a failure to educate drivers in proper interaction with pedestrians, 3) some combination of the two, or 4) something else entirely?

- The accident happened at one of the most prominent crosswalks in Fayetteville. As mentioned above there were multiple signals that I was crossing. In my opinion Fayetteville is taking huge strides to make our city "walkable", and I couldn't be more excited about it. I believe it was primarily due to an uneducated and distracted driver. In the police report, the driver is quoted stating that he didn't know what the flashing lights meant.