

PEDESTRIAN DISCONNECT ACROSS DOWNTOWN HIGHWAYS

by

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## **Abstract**

This study seeks to investigate the impact of inner-city highways on walkability in urban downtowns in the United States, using Greater Downtown Kansas City as a case study. This study used the web-based online survey method to assess if inner-city highways impede the flow of pedestrians among residents and visitor of the Greater Downtown Kansas City, Missouri. The results showed that there were differences in the perception of the pedestrian environment between residents and visitors of the downtown area. Downtown residents generally had a more favorable view of the pedestrian environment than visitors of Greater Downtown. Additionally, the inner-city highways did not appear to be barriers to pedestrian mobility, which differs from the hypothesis of this study. However, although the pedestrian overpasses over the highways did have an impact on pedestrians' perceptions and walking behaviors, newer overpasses with wider sidewalks mitigated barrier effects of highways more than older overpasses with narrow sidewalks. The study also found that walking was the most common travel mode for all trips in Greater Downtown Kansas City, despite potential barriers.

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# **Chapter 1 - Introduction**

## **1.1 Background**

### **Downtown and Inner-city Highways**

Throughout the 1950s and 1960s, American cities experienced a radical transformation through urban renewal policies that were seen as a progressive form of urban planning, such as the Housing Act of 1949 and 1954 and the Federal Highway Act of 1956. These policies razed hundreds of downtown buildings across the United States, and replaced them with large surface parking lots and inner-city highways at the expense of the demolition and division of urban neighborhoods. Additionally, phenomena such as “white flight” contributed to urban decay, as middle-class residents fled inner cities for the suburbs and left behind a dwindling population and a weakened tax base. These policies often resulted in disrupted street grids, even in downtowns and central business districts which are often considered the most walkable part of town (Brown, Morris, & Taylor, 2009).

The Central Business District (CBD) of Kansas City is often referred to as the “Downtown Loop” as it is completely encircled by the interstates. This layout is typical of cities across the United States that have been retrofitted for highways to make access to the center city from the suburbs by automobile quicker and more convenient. Due to the frequency of inner-city highways in American cities, the results of this study are relevant to cities across the United States and can be applied to any number of cities that have had highways and other forms of infrastructure and decay that may cause disruptions in the pedestrian network.

## **Pedestrian Mobility in Downtown**

Increasing numbers of people are moving to environments that are “walkable” – areas in which services and attractions are easily accessible by foot. Walkable areas are usually urban neighborhoods with a level of density that allows for quick and convenient travel (Rodríguez, Evenson, Roux, & Brines, 2009). If inner-city highways impede pedestrian travel, as is hypothesized in this study, then areas that are isolated by these highways could see a lower rate of redevelopment than areas that are more connected in terms of the pedestrian network.

Despite decades of population loss and decay, in the last decade, Greater Downtown Kansas City has experienced a renaissance and a building boom. Over \$5.5 billion of private and public funds have been invested into the redevelopment of the area (Gose, 2014). However, aside from the returned attention to the urban core of Kansas City, many problems still plague the Greater Downtown Kansas City pedestrian networks. For example, certain environments and infrastructure elements can create a potential barrier to pedestrians, such as large areas that seem devoid of street life and lack a continuous street wall such as parking lots and vacant parcels, as well as seemingly abandoned streetscapes, and inner city highways. These environments could potentially create a sense of unease and discomfort in pedestrians, and prevent them from walking.

Connected pedestrian networks create unified neighborhoods, increase density, and provide for the free flow of pedestrian traffic. Pedestrianism is the most basic form of transportation, and policy makers and planners have nearly ignored it in the second half of the twentieth century, deciding instead to focus their attention on planning for automobiles. That trend has begun to reverse, but many cities and neighborhoods still suffer from suburbanization, urban decay, and the reliance on the personal automobile as the primary form of transportation.

To address the problems associated with pedestrian mobility identified above, using Greater Downtown Kansas City as a case study, this study examines the following research question:

*Do the inner-city highways impede pedestrian mobility in Greater Downtown Kansas City?*

## **1.2 Research Objectives**

This study breaks the above research question down further into two specific sub-questions. To answer these research questions, the following study objectives were established:

### Research Question 1

*What are the differences pedestrian's perceptions and mobility between residents and visitors of Greater Downtown Kansas City; and those who do and do not cross the downtown inner-city highways?*

- Objective 1-1: To compare perceptions and mobility of pedestrians between downtown residents and visitors
- Objective 1-2: To compare perceptions of highway overpasses between those who cross the highways and those who do not
- Objective 1-2: To explore the environmental and perceptual factors differ among those who do and do not cross the inner-city highways in their daily trips.

### Research Question 2

*Are the inner-city highways perceived as barriers to pedestrians in Greater Downtown Kansas City? If so, how the current highway crossing facility affect their mobility and perception?*

- Objective 2-1. To assess how inner-city highways influence pedestrian's perception and mobility.

- Objective 2-2. To explore how different types of highway crossing affect pedestrian's perception and behavior.

## **Chapter 2 - Background and Literature**

Walkability is a common theme in urban planning research and professional practice. As such, there is a wide range of literature analyzes walkability and mobility themes, although they differ from one another significantly (Frank, Sallis, Conway, Chapman, Saelens, & Bachman, 2006; Leslie, Saelens, Frank, Owen, Bauman, Coffee, & Hugo, 2005; Ewing, Handy, Brownson, Clemente, & Winston, 2006). In order for an urban environment to be “walkable”, it needs more than basic pedestrian infrastructure such as sidewalks and crosswalks. It needs a level of density that allows access to services and attractions in close proximity to one’s home. Americans will only walk, on average, a quarter mile before seeking other modes of transportation. On the other hand, pedestrian connectivity, or in the case of this study, mobility, is concerned with how well the pedestrian network is connected, i.e. the number of potential routes and the directness of routes. However, the majority of existing literature analyzes pedestrian environments in primarily suburban settings, as those environments tend to be less connected in terms of the pedestrian environment (Schlossberg & Brown, 2004).

This chapter beings with an overview of the literature concerning common barriers to pedestrian mobility, including low levels of street activity, perceptions of crime and danger, a separation of land uses, low-density development, and poor aesthetics. Secondly, this chapter covers various methods researchers have used in measuring pedestrian connectivity, such as measurements of block size, route-directness tests, intersection density, street density, link-node ratio, connected node ratio, and space syntax. Finally, this chapter concludes with a review of the literature written about space syntax, a common research tool used for analyzing pedestrian route choices and mobility.

## **2.1 Pedestrian Mobility and Barriers**

The pedestrian environment also plays a major role in whether or not people choose to walk (Dannenbergh, Jackson, Frumkin, Schieber, Pratt, Kochtitzky, & Tilson, 2003). If they do choose to walk, the quality of the urban design can dictate routes. Studies have shown that environments that boast an inviting streetscape tend to draw more people than streetscapes devoid of activity and an aesthetically pleasing design. Basic pedestrian infrastructure is often not enough. For instance, a streetscape that is furnished with benches, pedestrian scale lighting, and has an abundance of pedestrian activity will draw more pedestrians than a streetscape that appears to be empty and forgotten (Samarasekara, Fukahori, & Kubota, 2011). People, whether consciously or subconsciously, will avoid certain environments, such as streetscapes that appear deserted. Jane Jacobs (1961) is famous for introducing a concept called “eyes on the street”. This theory suggests people will generally feel safer in environments that have higher levels of pedestrian activity. People are naturally drawn to other people (Jacobs, 1961). Environments that are devoid of pedestrian activity and streets that are lined with blank walls, boarded up buildings, or large surface parking lots creates a feeling of unease and discomfort to pedestrians. This is because people often associate urban decay with crime. The vacant streetscape itself may not pose a threat to potential pedestrians. However, the crime that is often associated with urban decay does pose a threat to potential pedestrians. Pedestrians are more likely to walk in a certain environment if they feel a sense of security (Doyle, Schlossberg, & Stockard, 2006).

People’s pedestrian choices are highly dependent on their perceptions of safety (Foster, & Giles-Corti, 2008). An urban design principle known as Crime Prevention through Environmental Design (CPTED) plays a major role in the perceived safety of a pedestrian

environment. CPTED states that streetscapes cannot only make streets safer through specific urban design principles, but it can actually make pedestrians feel safer through environmental design that creates the sense of constant surveillance. (Cozens, Saville, Hillier, 2005).

Another factor that has an impact on pedestrianism is land use. Land use has a direct correlation with the amount of people that choose to walk as a form of transportation. For instance, a separation of land uses tends to result in a less walkable environment because this creates greater distances between residences and services and attractions. Similarly, urban form can impact pedestrianism as well. Policy makers, planners, and designers can account for pedestrians in the urban environment not only with adequate infrastructure such as sidewalks and cross walks, but also aesthetic considerations such as street trees, benches, and pedestrian scale lighting (Brown, et al., 2009; Frank, et al., 2006; Heath, et al., 2006). Aside from basic pedestrian infrastructure such as sidewalks and pedestrian crossings, aesthetics of the pedestrian environment can play a major role in pedestrianism (Cerin, et al., 2007; Vojnovic, et al., 2006). Density and mixed land use, which usually result in walkable neighborhoods, also have an impact on quality of life (Samarasekara, Fukahori, & Kubota, 2011).

Li, Chi, and Jackson (2015) suggest in their study performed in Starkville, Mississippi, that aesthetics of the pedestrian environment are a primary factor in determining whether a person would choose to walk. Their study was performed in three distinct neighborhood types: traditional neighborhoods constructed before World War II, suburban neighborhoods constructed in the 1970s, and suburban neighborhoods built in the 1990s. The researchers used a survey, which they administered to residents of these neighborhoods to determine their walking behaviors and preferences, as well as any perceived barriers in their neighborhoods. (Li, Chi, Jackson, 2015).

Finally, a major barrier to pedestrian mobility in urban planning research is the highway. The modern interstate system (highways) was largely installed as a result of the 1956 Highway Act during a time when high mobility was considered good planning, and the quicker and easier planners could move people from their homes in the suburbs to their jobs downtown, the more it was considered a success. Nevertheless, these highways have had detrimental impacts on the urban environment of downtown and other inner-city neighborhoods (Vojnovic, 2006). Mobility is a key component to walkability, and transportation infrastructure such as large arterials and highways lower mobility levels in urban areas. Inner city highways disrupt the fine-grained nature of pre-automobile American cities (Southworth, 2005). In one study, concerned with children walking to school in Austin, Texas, the presence of a highway that had to be crossed on the way to school decreased the likelihood of walking by as much as 52% (Zhu, Arch, & Lee, 2008).

## **2.2 Measuring Pedestrian Mobility, Connectivity, and Walkability**

One area of walkability research is focused on developing measures of connectivity. Pedestrian connectivity and mobility are complicated issues and present a challenge in terms of its measurement. Researchers have proposed various methods of measuring pedestrian mobility. Paul Stangl (2015) has written extensively on this topic. In his study, “Block size-based measurements of street mobility: A critical assessment and new approach” he analyzed a common measurement of mobility, which is measuring block size (Stangl, 2015). This measurement is often used in “connectivity ordinances” in urban planning, as part of minimum standards for developers in order to improve pedestrian connectivity and mobility. Block size measurements consist of perimeter, length, and area of a block.



Another method measuring pedestrian connectivity is based on route directness. This measurement is more accurate than the LEED method, which is another intersection density method, and is often used by municipalities to measure mobility. However, this measurement employs a one size fits all technique that does not yield the most accurate results. In the route directness test, measures the ease of flow of pedestrians as well as the effect of the subdivision on the flow of outside traffic (Stangl & Guinn, 2011).

Other approaches to measure mobility and connectivity have shown weaknesses. For example, some measurements such as Intersection Density and Link-Node ratio actually act as proxies for connectivity and measure cul-de-sacs and dead ends. Measuring block size to determine mobility also has flaws. For example, when measuring block perimeter to determine connectivity, blocks that are narrow but long may score well. In response to the flaws of these various measurements, Stangl also presented a modification of his previous method, the route directness test, (Stangl & Guinn, 2011), which measured route directness from a parcel to a series of points around the periphery of the study area. However, in Stangl's modified measurement system, elements such as study area size and parcel size. Increased study area size resulted in increased route directness.

Another measurement measures the number of linear streets per square mile. This measurement is similar to the more commonly used intersection density, which measures the number of intersections per square mile. In addition to block-size based measurements, block density measures the mean number of census blocks per square mile. An additional measurement is Connected Node Ratio, in contrast to Link-Node Ratio discussed earlier. Connected Node Ratio measures the number of intersections divided by the number of intersections plus the number of cul-de-sacs (Dill, 2004).

Urban policies that shape the pedestrian environment exert a great influence on pedestrian mobility. Some factors that affect walkability include land use, density, and street mobility. The higher the population density of an urban area, the more the neighborhood attracts pedestrians. There is an inverse relationship between density and vehicle miles traveled (Ewing, Pendall, & Chen, 2003). Additionally, land use patterns also affect walkability and pedestrian mobility. Development patterns that include mixed-use neighborhoods and buildings lead to more people walking (Ozbil, Peponis, & Stone, 2011).

Walkable neighborhoods contain certain characteristics such as smaller blocks and higher intersection density. Stangl's research on pedestrian connectivity is reflective of this.

Additionally, mixed-use neighborhoods create shorter distances to services such as restaurants and stores, which encourage more people to walk (Ozbil, Peponis, & Stone, 2011).

Pedestrian mobility can be divided into four different types of measures. The first type of measure analyzes the physical properties of the street network such as intersection density, block size, and type of street layout. Layout types include curvilinear, cul-de-sacs, and grid. The second type of measure analyzes street connectivity and its impact on walkability. This type of measure is similar to the first in that it measures elements such as number of intersections per area or number of cul-de-sacs per area. However, it also uses ratios to measure connectivity, such as the ratio of intersections to cul-de-sacs or the Link-to-Node ratio, which was also used by Stangl in his research. The third type of measure is known as a walking catchment area or "ped shed". This measure is similar to Stangl's route directness test. The fourth type of measure is known as space syntax, which measures the level of walkability from any given point to any other point in a given area. However, the weaknesses of this measure are that it does not take into account land use or ease of trip (Ozbil, Peponis, & Stone, 2011). After analyzing these various

methods of mobility, measuring street connectivity and its impact on walkability was deemed the most appropriate and feasible for this study. Additionally, this method targets the root of the research question, which seeks to identify whether or not the downtown highways limit mobility.

Space Syntax is a somewhat common method used for determining connectivity of networks in urban areas. This system of determining mobility is often used in urban areas that have a regular street grid. However, there is some criticism that space syntax is not as reliable in determining connectivity in areas that have irregular street patterns (Ratti, 2004). While Greater Downtown Kansas City does feature a street grid, that grid has been disrupted by the highways and other infrastructure projects. Similar to space syntax, network analyst in ArcGIS was utilized for analyzing mobility in Greater Downtown Kansas City.

### **2.3 Recent Studies on Walkability of Downtown Kansas City**

Among the efforts to increase pedestrian mobility within Greater Downtown Kansas City, the Greater Downtown Area Plan (2010), created by a group of consultants for the City of Kansas City, recognizes that the urban fabric has been substantially disrupted over the past half century and recommends that the street grid be preserved and restored “where possible”. This plan also created a measurement of connectivity, called ‘permeability’, or the number of pedestrian crossings per mile. The plan also identifies natural and man-made barriers to pedestrian travel, such as steep slopes, rivers, interstates, and railroads.

The Kansas City Walkability Plan (2003), prepared by LSA Associates for the City of Kansas City, identified nine barriers to walkability: the condition of the sidewalks; physical obstacles such as steep terrain, vegetation covering the sidewalks, or telephone poles blocking the sidewalks; low density and sprawling development; separation of land uses; site planning that

results in curvilinear street patterns and cul-de-sacs; a lack of intersections and crosswalks; a person's personal preference to not walk; and temporary barriers such as construction and sidewalk closures. In addition to these barriers, large surface parking lots and vacant lots riddle Greater Downtown Kansas City, which disrupt the urban fabric, and can create the perception of a barrier to mobility.

Finally, The HNTB Corporation created the South Loop Link (2009) study for the city of Kansas City and Missouri Department of Transportation, with the intent of finding planning solutions to unify the Central Business District with the Crossroads district to the south. The plan states that the construction of Interstate 670 (the southern portion of the freeway loop), "created adverse impacts to the socio, environmental, and economic viability of Downtown Kansas City". The plan also states that the 300-foot gap created by the below-grade highway creates a significant barrier to pedestrians.

## **2.5 Summary**

The literature summarized in this chapter displays a clear gap in which few studies have been performed on the topic of pedestrian mobility in an urban downtown environment. The results of this study fit in well with extant literature about pedestrian mobility. Additionally, the many methods of measuring pedestrian mobility outlined above gave this study a foundation to expand upon. While many of these methods were not practical for this study due to time and resource constraints, gaining an understanding of the various measurements of mobility and walkability were valuable to the execution of this study, and gave insight into the design of this study.

The literature about pedestrian mobility and barriers to walkability frequently focuses on the pedestrian environment as it was intended when constructed. For example, many studies regarding pedestrian mobility and walkability focus on suburban environments. These are environments that feature low rates of pedestrian mobility, which is how they were originally designed. Additionally, other studies analyze pedestrians' perceptions of their environment, such as perceptions of crime, safety, and aesthetics, and how those perceptions influence their walking decisions.

Few studies have been performed on evaluating the walkability and pedestrian mobility in urban environments that were originally designed for the pedestrian, but at some point, experienced decay or retrofitting that resulted in a fragmented street network and urban fabric. Additionally, surprisingly few studies have been performed on the effect of inner-city highways on the flow of pedestrians in a downtown environment, which is a common condition in American cities. This study intends to fill this gap.

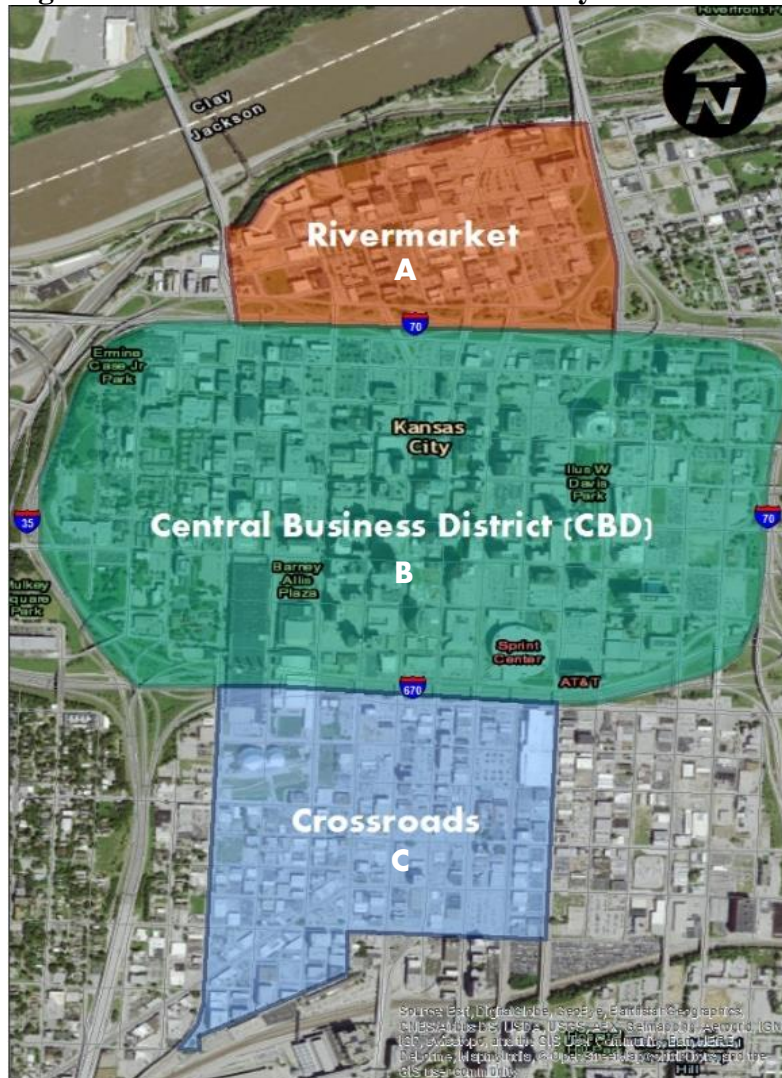
## Chapter 3 - Methodology

### 3.1 Study Setting

The Greater Downtown Kansas City area is a representative case of American inner cities, which are often plagued with disconnected neighborhoods and pedestrian networks, which are the result of urban highways, surface parking lots, urban decay, and a litany of other issues. Four interstate highways divide the downtown area of Kansas City into three distinct districts: Rivermarket, the Central Business District (CBD), and Crossroads.

Kansas City was chosen as the focus city due to its representative geographic and historical layout of a commercial center bisected by interstates installed during the urban renewal era of the 1950s and 1960s (Missouri's Interstate System, 2013). What can be learned in Kansas City can easily be applied to a number of other cities across the United States, especially in the Midwest, such as St. Louis, Minneapolis, Cincinnati, and Cleveland. Inner city highways and large surface parking lots disrupted the urban fabric and created divides amongst Downtown Kansas City neighborhoods. These infrastructure elements destroyed the historic street grid. The goal of this study was to apply what is known about pedestrian mobility to the Greater Downtown Kansas City area in order to identify elements that impede pedestrian mobility. The study took place in the Greater Downtown area of Kansas City, Missouri, and specifically focuses on the Central Business District (CBD) area, the Crossroads district (to the south of the CBD), and the Rivermarket Neighborhood (to the north of the CBD) in the Greater Downtown area (see Figure 3.1).

**Figure 3.1 Greater Downtown Kansas City**



**Note : Downtown districts outlined below**

**A. Rivermarket District**

The Rivermarket District lies directly to the north of the Central Business District. Interstate 70, which forms the top part of the Downtown Interstate Loop, separates the two districts. This district is home to City Market, which is the largest farmer’s market in Kansas City. Today, the district has become a popular area for shops, cafes, and apartments.

## **B. Central Business District**

The Central Business District (CBD) is the largest of the three districts, and contains the primary financial district of Kansas City. The Central Business District has received the majority of the \$5.5 billion of public and private investment, including the somewhat controversial Power and Light District, a shopping and bar district built from the ground up. The CBD also contains the Sprint Center, a multi-purpose arena. This district is home to many renovated buildings converted into loft apartments, especially in the Garment District, which is located in the northwestern quadrant of the CBD.

## **C. Crossroads District**

The Crossroads District lies directly to the south of the CBD, divided by Interstate 670, the southern part of the Downtown Interstate Loop. This neighborhood was formerly semi-industrial, but has seen a revival in the past decade, as art galleries, shops, restaurants, bars, and apartments have moved in. This district is home to ‘First Fridays’, a very popular street and art festival held on the first Friday of each month.

## **3.2 Target Population**

The target population for this study was residents and visitors of downtown Kansas City. This study attempted to analyze the pedestrian habits of those that live in work in Greater Downtown Kansas City. According to the Downtown Council Housing Report (2015), the total population of Greater Downtown Kansas City, as of 2015, is 21,197 (11,290 households, with 1.9 people per household). In this area, 51% of the population is male, and the average age is 36.



51% of the population holds a Bachelor's degree or higher. Based on these figures, it seems that the Downtown Kansas City population is young, educated, and upwardly mobile.

### **3.3 Survey**

The purpose of the survey was to determine to what extent the Interstates 70 and 670 impede the flow of pedestrians, as well as to determine which other factors contribute to a lack of mobility in the pedestrian environment of Greater Downtown Kansas City.

#### **Participant Recruitment**

The respondents of the survey were primarily residents of Greater Downtown Kansas City, residing in the Rivermarket neighborhood, the Central Business District, and the Crossroads District. However, both residents of downtown and residents of the greater metropolitan area ultimately completed the survey. Residents of downtown were originally exclusively targeted, since they were likely to be the most frequent pedestrians in Greater Downtown Kansas City, they were most likely to know the pedestrian environment and infrastructure the best, and were therefore a good source of information and data. To find the sample, the neighborhood associations for the Central Business District and the Crossroads neighborhood agreed to post the survey on their websites and social media accounts such as Twitter. Additionally, the survey was posted on the Twitter account @kclightrial, which is a popular source of downtown Kansas City planning news and updates. Additionally, the survey was posted to Next Kansas City, a popular online message board that discusses topics pertaining to development in the Kansas City area. The survey was also posted to social media websites. Other demographic information regarding the sample was also taken into account in order to

create a representative sample. However, as the timeframe and resources available for this study were limited, the sample was an intentional sample, meaning certain groups were sought out not only because of convenience but also because of the relative representativeness of the population as a whole.

The survey was distributed on February 9, 2016 using several social media outlets, such as Next Kansas City, an online discussion board that covers topics that include planning and development in Downtown Kansas City. The survey was also posted to Reddit, a popular online message board that covers a wide range of topics, on the Kansas City “sub-Reddit”, which contains 14,517 users. Additionally, a Twitter user with 5,757 followers who tweets Kansas City themed material posted the survey as well. The Downtown Kansas City Neighborhood Association (DNA – KCMO) agreed to post the survey on their Twitter account as well. An employee of HNTB with a Facebook and Twitter following of approximately 3,500 people also posted the survey. Finally, several other Twitter users retweeted the survey upon seeing it posted to one of the above accounts. The survey was also shared with friends and acquaintances who live in downtown Kansas City who then exchanged the survey with their friends, co-workers, and neighbors.

### **Instrument Design**

The survey was designed to gain an understanding of where pedestrians are walking, how they perceive the environment of downtown Kansas City, what might prevent them from walking, and which modes of transportation they choose to use. Table 3.1 shows the variables that were tested in the survey. While not all these variables were ultimately relevant to the

primary research questions of this study, they were used to gain a broad understanding of what pedestrians perceived as barriers to pedestrian mobility, in addition to the highways.

The first series of questions were designed to determine geographic information. The survey asked participants to name the nearest street intersection to the respondent's home address. In order to protect participants' privacy and to ensure higher participation rates, participants were not asked to name their exact address. Questions in this series also asked participants to list all destinations they had traveled to over the past three days. Participants were asked what mode of transportation they used to get there and what time of the day it was (morning, afternoon, evening, night). The goal of this question was to geocode respondents' home locations as well as their destinations in order to determine logical routes, and identify areas of high pedestrian activity and areas of low pedestrian activity.

Participants were also asked about their travel habits within downtown Kansas City and what mode of transportation they used. For instance, the survey included a likert scale question asking participants to rate which mode of transportation they most likely use on a daily basis within Downtown Kansas City.

Using a series of likert scales, participants were asked about various aspects of the pedestrian environment. Questions also asked about safety concerns, both pertaining to crime and traffic safety. Finally, the survey asked participants how they feel about the highways within downtown, and how much the highways impede their walking habits. The survey asked detailed questions about specific elements of the highway overpasses, such as the height of the overpass, the height of the railing, the amount of traffic on both the overpass and the highway below, and the width of the sidewalk.

**Table 3.1 Variables of the Survey Instrument**

Concept	Variable	Description	
Pedestrian activity	Home location	Where respondents live within Greater Downtown Kansas City	
	Trips made in the past three days	Where participants walked within Greater Downtown Kansas City	
	Amount of services	If there is an adequate amount of services to walk to	
	Amount of attractions	If there is an adequate amount of attractions to walk to	
Mode of Transportation	Frequency of walking	How often participants walk as a form of transportation in Downtown Kansas City	
Condition of Sidewalks	Cleanliness of sidewalks	How clean sidewalks are	
	Maintenance of sidewalks	How well maintained the sidewalks are	
	Amount of obstruction on sidewalks	How free of obstruction sidewalks are	
	Separation of sidewalks from vehicle traffic	How well-separated pedestrians are from vehicle traffic	
	Adequate amount of crosswalks	Whether the amount of crosswalks makes walking convenient	
	Amount of time crosswalks allow to cross the street	Whether the crosswalks allow enough time to cross the street	
	Crime and Safety	Perception of safety at all times of the day	Whether participants feel at all times of the day
Perception of walking during the day		Whether participants feel safe only during the day	
Perception of vehicle traffic safety		Whether participants feel safe with current vehicle traffic	
Adequate amount of sidewalks		Whether there are enough sidewalks to make walking safe	
Vacant buildings		Whether participants feel comfortable walking near vacant buildings	
Parking lots		Whether participants feel comfortable walking near parking lots	
Abandoned streetscapes		Whether participants feel comfortable walking down abandoned streets	
Highways		Routes that cross highways	Whether participants avoid crossing the highways
		Safety crossing highways	Whether participants feel safe crossing the highways
		Sidewalk width	Whether sidewalks are wide enough on highway overpasses
	Adequate number of highway overpasses	Whether there are enough overpasses to make walking convenient	
	Amount of traffic on bridge	Whether participants are comfortable with amount of traffic on overpasses	
	Speed of traffic on bridge	Whether participants are comfortable with speed of traffic on overpasses	
	Amount of traffic on highway	Whether participants are comfortable with amount of traffic on highway	
	Height of bridge	Whether participants are comfortable with height of bridge	
Demographics	Height of railing	Whether participants are comfortable with height of railing	
	Gender	Participants' gender	
	Age	Participants' age	
	Race or ethnicity	Participants' race or ethnicity	
	Driver's license	Whether participants have a driver's license	
	Car ownership	Whether participants own a car	

The last series of questions asked about basic demographic information such as gender, age, and race or ethnicity. In addition the survey asked whether or not participants have a driver's license and own a car, in order to ascertain some socioeconomic knowledge without explicitly asking for income information.

### **3.4 Data Analysis**

The next segment of the study focused on the results of the survey and performing a series of analyses on them. This consisted of simple descriptive statistics to determine characteristics of the sample. Bi-variate analyses were performed to find relationships and correlations between sets of two variables. Finally, a geospatial analysis was performed to visually examine if and how often participants crossed the inner-city highways on foot, using Network Analysts supported by ArcGIS 10.3.

## **Chapter 4 - Results**

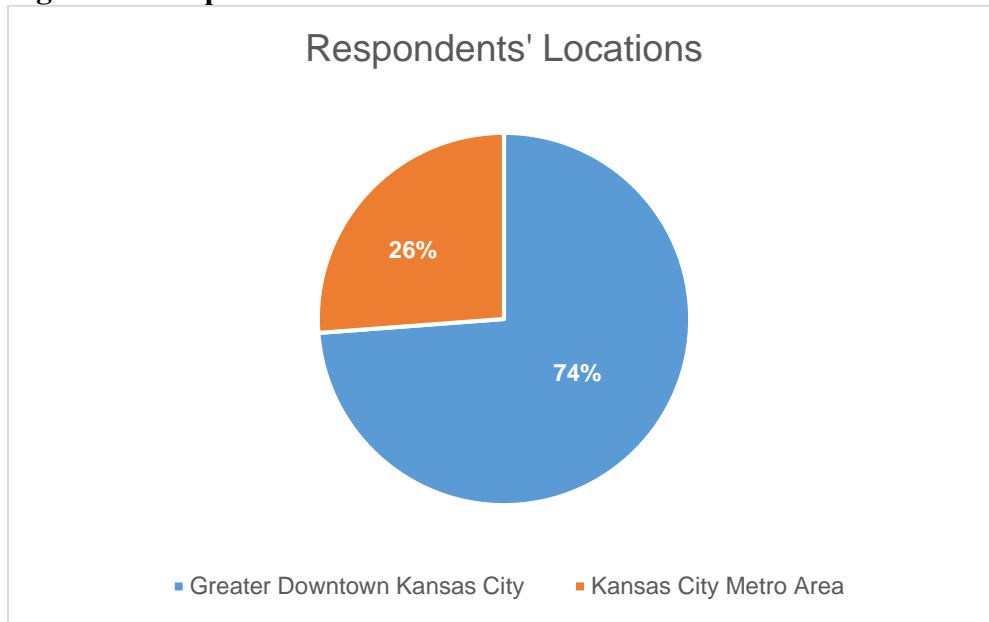
The results of the survey were analyzed in two parts. The first part was an overview of the results and identification of general trends using descriptive statistics. The second part was a more in-depth look at identifying common pedestrian routes in Greater Downtown Kansas City as well as analyzing how many routes involved crossing the highways at some point. This was done by performing network analyst using ArcGIS and bivariate analysis of the survey results.

Bi-variate analyses were performed to compare various subsets of the participants. For example, residents of Greater Downtown Kansas City were compared to those that live in the Kansas City metropolitan area, but not downtown (visitors). Additionally, respondents that indicated that they walk as their primary mode of transportation were compared to those that drive as their primary mode of transportation. Finally, respondents that had walked over each of the overpasses (Main Street crossing I-670 and Broadway crossing I-70) were compared to those that had not walked over the overpasses. Additionally, the perceptions of each over pass was compared to each other.

### **4.1. Participant Characteristics**

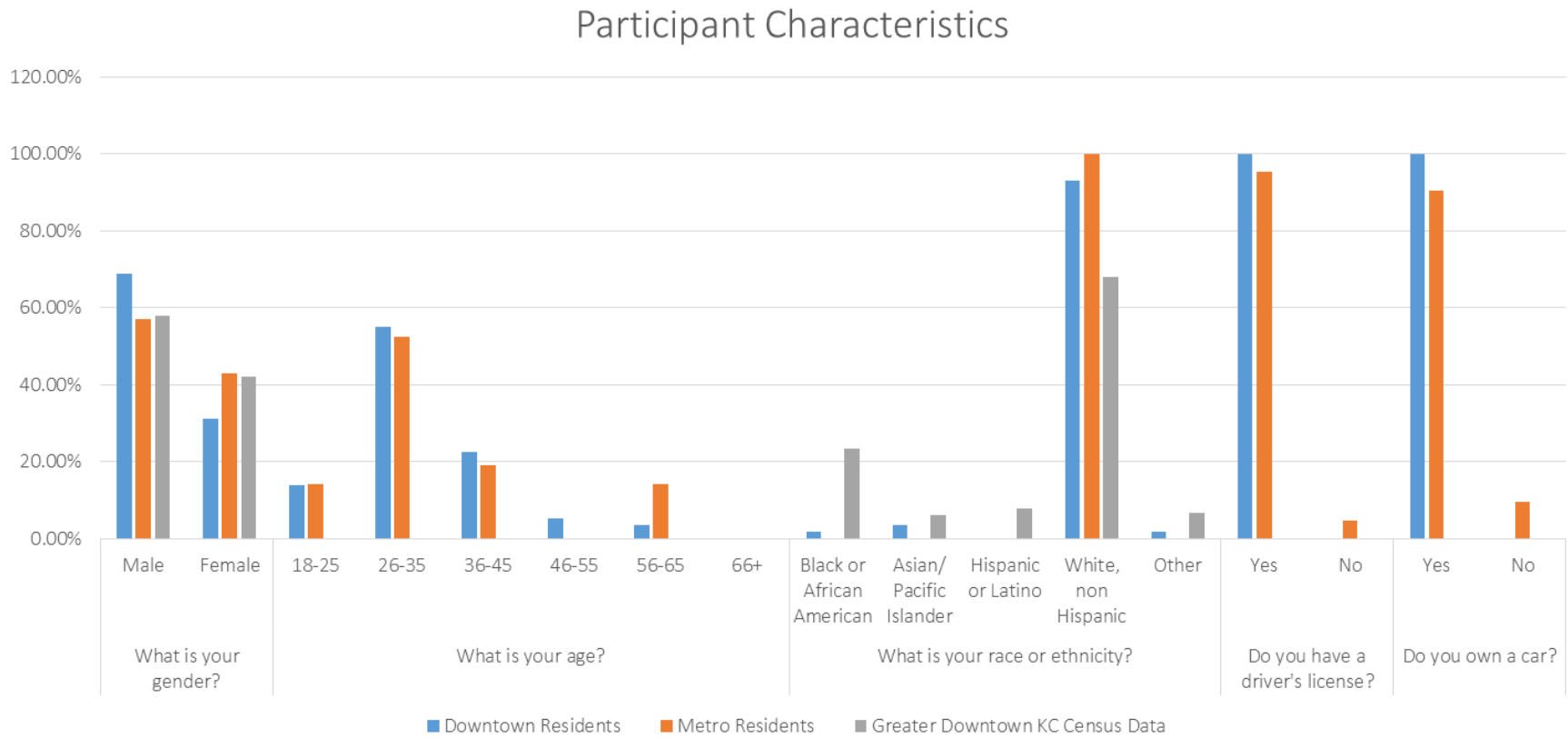
Participants of this study were divided into two categories: ‘residents’ and ‘visitors’ (Figure 4.1), depending on whether or not they live in the Greater Downtown study area. Participants that live downtown had a different pedestrian experience than those that simply visit the downtown area. In general, residents of the downtown area had a more positive perception of the pedestrian environment.

**Figure 4.1 Respondents' Locations**



Almost three quarters of respondents (74%) reside in Greater Downtown Kansas City. Nearly two-thirds (65%) percent of respondents are male and 35% are female (see Figure 4.2), compared to the Greater Downtown Kansas City overall, in which 51% of the total population is male and 49% is female. The majority of respondents are in the 26-35 age bracket with 54%, 21% of respondents are 36-45 years of age, 14% are ages 18-25, and just 11% of respondents are over the age of 46 (Downtown Council, 2015). The average age of the total population of Greater Downtown Kansas City is 36.

**Figure 4.2 Participant Characteristics**





These results are reflective of the demographic and socio-economic distribution of Greater Downtown Kansas City. However, white, non-Hispanics were dramatically over-represented at 95%. Only 1% identify as African American, and only 2% identify as Asian/Pacific Islander. The Central Business District is divided as such: 67.23% white, non-Hispanic, 25.31% African American, and 3.81% Asian/Pacific Islander. The respondents of the survey do not adequately represent the racial and ethnic makeup of Greater Downtown Kansas City. The vast majority of respondents (99%) have a driver’s license, and 98% actually own a car. However, walking proved to be the most common form of transportation within Greater Downtown Kansas City. In fact, 42% of respondents said they walk daily as a form of transportation and only 1% said they never walk. According to Table 4.1, the least used modes of transportation in Greater Downtown Kansas City are public transportation and biking (excluding ‘Other’). The most common modes of transportation are walking, followed by automobile. This illustrates that despite whatever issues may exist in the pedestrian environment, people are still choosing to walk. However, this also says that a large portion of the population insists on driving, even in a downtown setting.

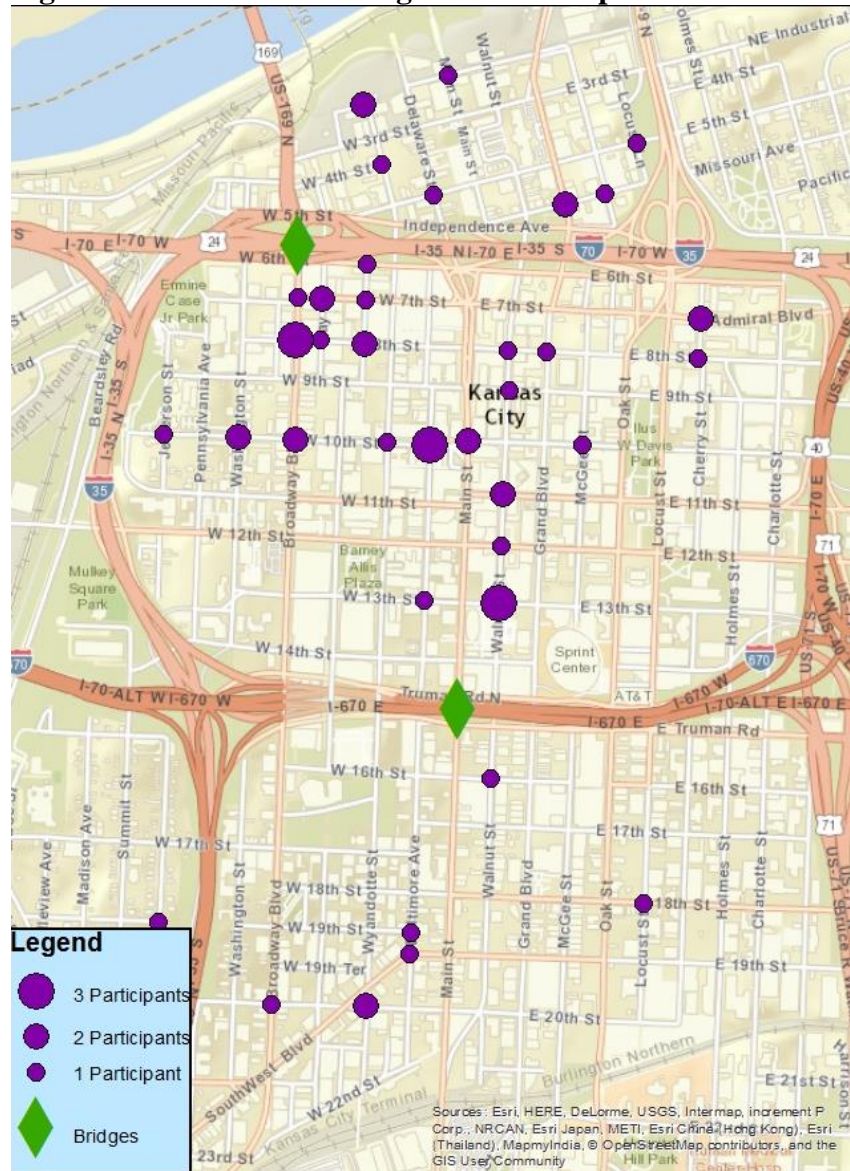
**Table 4.1. Transportation Mode and Frequency of Use**

Question	Transportation Mode and Frequency of Use					Mean	Variance	Standard Deviation	Total Responses
	Never	Not often	Sometimes	Often	All of the time				
Automobile	4.88%	20.73%	21.95%	36.59%	15.85%	3.38	1.28	1.13	82
Publictransit	56.94%	13.89%	16.67%	9.72%	2.78%	1.88	1.38	1.17	72
Bicycle	45.71%	25.71%	18.57%	10.00%	0.00%	1.93	1.05	1.03	70
Walk	2.44%	6.10%	25.61%	37.80%	28.05%	3.83	0.98	0.99	82
Other	46.67%	20.00%	20.00%	6.67%	0.00%	1.86	1.21	1.1	15

## **4.2. Home Locations of Residents**

The respondents that indicated that they lived downtown were also asked to provide the nearest street intersection to their home. These intersections were then geocoded as seen in Figure 4.3. Residents of Downtown Kansas City were spread over the three districts of Rivermarket, the CBD, and Crossroads. However, the majority reside in the CBD, particularly in the northwestern quadrant in an area called the Garment District, which is home to a number of warehouses and other multi-story brick buildings converted into loft apartments. The bridges that were used in the survey are indicated on the map with green diamonds. This map illustrates that not only are residents spread somewhat evenly across the Greater Downtown area, but if these residents walk as a form of transportation (which most do), then crossing of the highways becomes a daily necessity. Many residents live in the Crossroads and Rivermarket districts, but the majority of services and attractions lay within the CBD, meaning that pedestrians flow frequently from district to district across the highways.

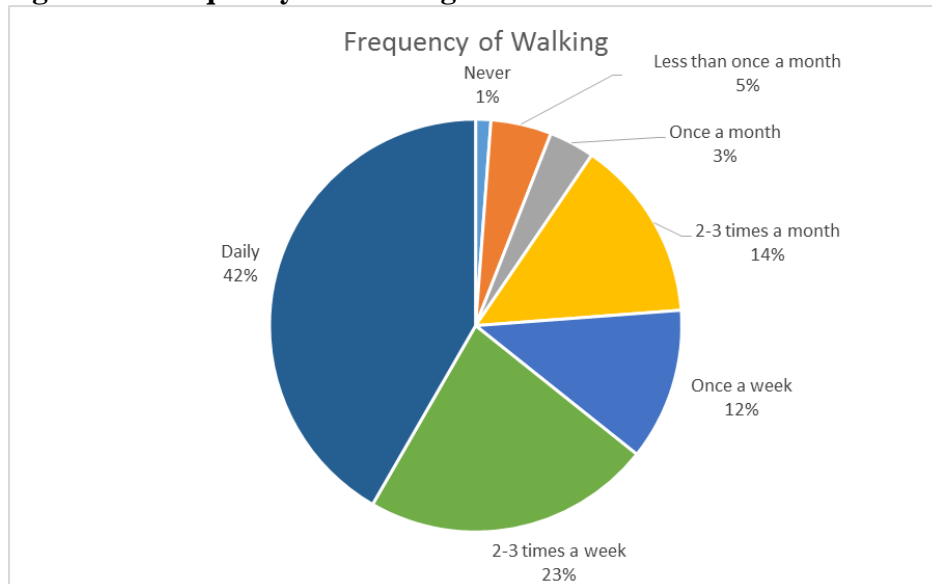
**Figure 4.3 Locations of Bridges and Participants' Homes**



### 4.3. Downtown Travel Behaviors

As seen in Figure 4.4, the largest share of respondents (42%) indicated that they walk on a daily basis. In fact, 67% of participants indicated that they walk at least once a week. Only 1% of respondents indicated that they never walk. These numbers illustrate that, in a sprawling urban area such as Kansas City, walking is still a viable form of transportation under certain circumstances, such as in this case, a downtown environment.

**Figure 4.4 Frequency of Walking**



#### **4.4 Perceived Physical Barriers to Walking in Downtown**

Survey participants were presented with two images of overpasses in Greater Downtown Kansas City. The first image was of Broadway crossing I-70 (Figure 4.5), on the north side of the CBD. The Broadway overpass connects the CBD with the Rivermarket district. This overpass was chosen because it is representative of the style and condition of overpasses that cross I-70 on the north side of the CBD. The second image was of Main Street crossing I-670 (Figure 4.6), on the south side of the CBD. The Main Street connects the CBD with the Crossroads district. This overpass was chosen as it is representative of the style and condition of overpasses that cross I-670 on the south side of the CBD. Respondents were asked if they had walked over each of the overpasses, and then were asked a series of questions about their perceptions of the overpasses. Regarding the Broadway Avenue bridge, 52% had not walked in this location (Figure 4.7), compared to the Main Street bridge, where 86% had walked in this location (Figure 4.8). The

locations of the bridges shown to participants can be seen in relation to residents' homes in Figure 4.3.

**Figure 4.5 Broadway Avenue and I-70**



(Source: Google Maps Street View, Retrieved January, 2016)

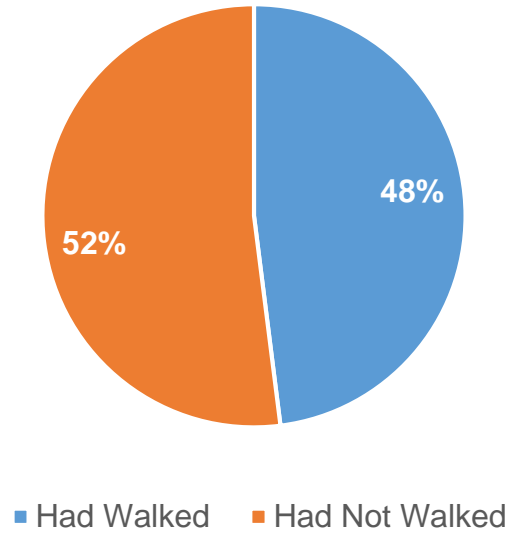
**Fig. 4.6 Main Street and I-670**



(Source: Google Maps Street View, Retrieved January, 2016)

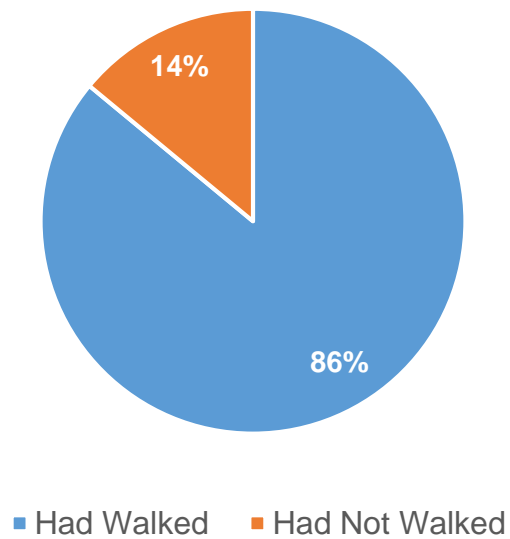
**Figure 4.7 Broadway Crossing I-70**

Broadway Crossing I-70



**Figure 4.8 Main Street Crossing I-670**

Main Street Crossing I-670

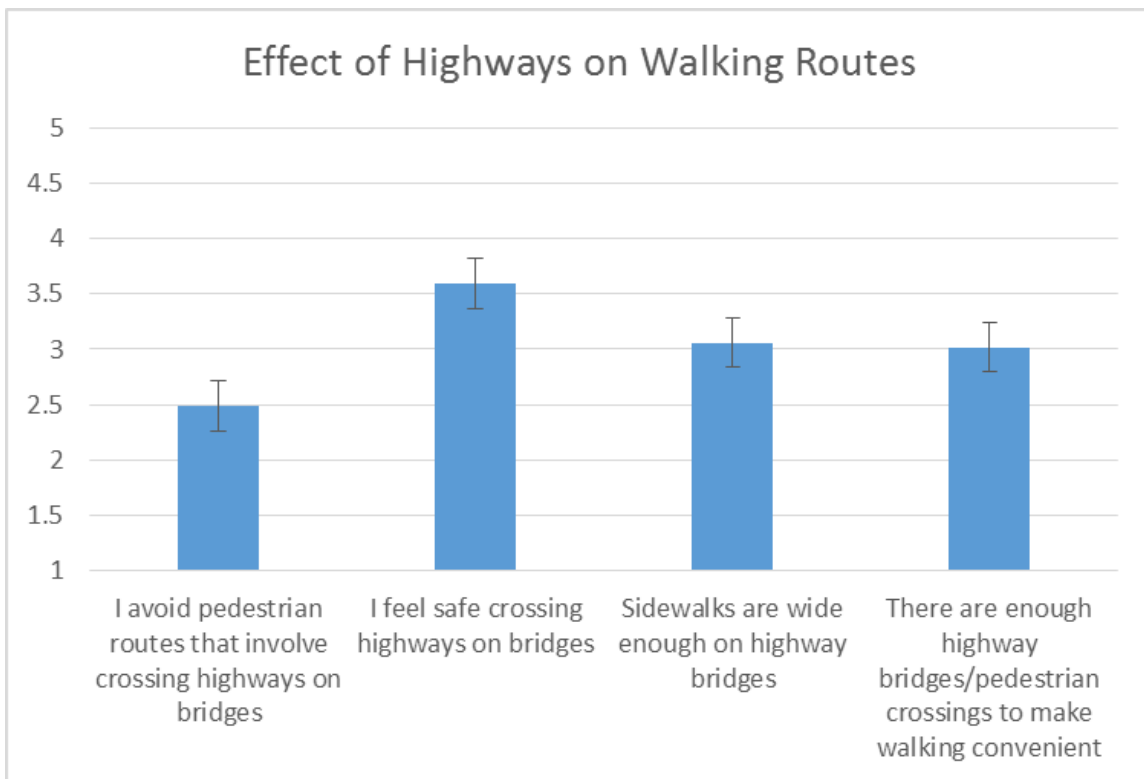


When determining pedestrian routes, most participants do not avoid routes that involve crossing the highways on overpasses (Table 4.2, Figure 4.9). In fact, most participants indicated that they feel safe when crossing highways.

**Table 4.2 Effect of Highways on Walking Routes**

Effect of Highways on Walking Routes									
Question	Strongly Disagree	Disagree	Neutral	Agree	Strongly agree	Mean	Variance	Standard Deviation	Total Responses
I avoid pedestrian routes that involve crossing highways on bridges	13.41%	47.56%	18.29%	18.29%	2.44%	2.49	1.04	1.02	82
I feel safe crossing highways on bridges	3.66%	15.85%	14.63%	50.00%	15.85%	3.59	1.11	1.05	82
Sidewalks are wide enough on highway bridges	9.76%	25.61%	23.17%	31.71%	9.76%	3.06	1.37	1.17	82
There are enough highway bridges/pedestrian crossings to make walking convenient	13.41%	18.29%	26.83%	35.37%	6.10%	3.02	1.33	1.15	82

**Figure 4.9 Highway Effect on Walking Routes Means (1 to 5)**



The respondents who had previously walked over the overpasses were generally more comfortable walking over the overpasses than those that had not, and the Main Street overpass scored higher than the Broadway overpass. Figures 4.10 and 4.11 show that more of the respondents who had walked over the overpass were comfortable with the pedestrian environment than those who had not. It is also apparent that the Main Street overpass scored better in every category, and more respondents would avoid walking over the Broadway overpass in the future than the Main Street overpass. One possible explanation for this better score is that the Main Street overpass is much newer than the Broadway overpass. The Main Street overpass fared better among respondents in terms of sidewalk width, especially amongst those who had previously walked over the overpasses in the past. In terms of traffic on the bridge, the respondents who had walked over the Main Street overpasses had the highest mean. While this is in keeping with the trend, it is somewhat surprising in that the Broadway overpass featured a concrete barrier between pedestrians and car traffic, while the Main Street overpass did not. The mean score for respondents that were comfortable with the amount of traffic on the highway were those who had walked in that location at some time in the past. However, the mean is higher for those respondents who had walked over the Main Street overpass than those that had walked over the Broadway overpass.

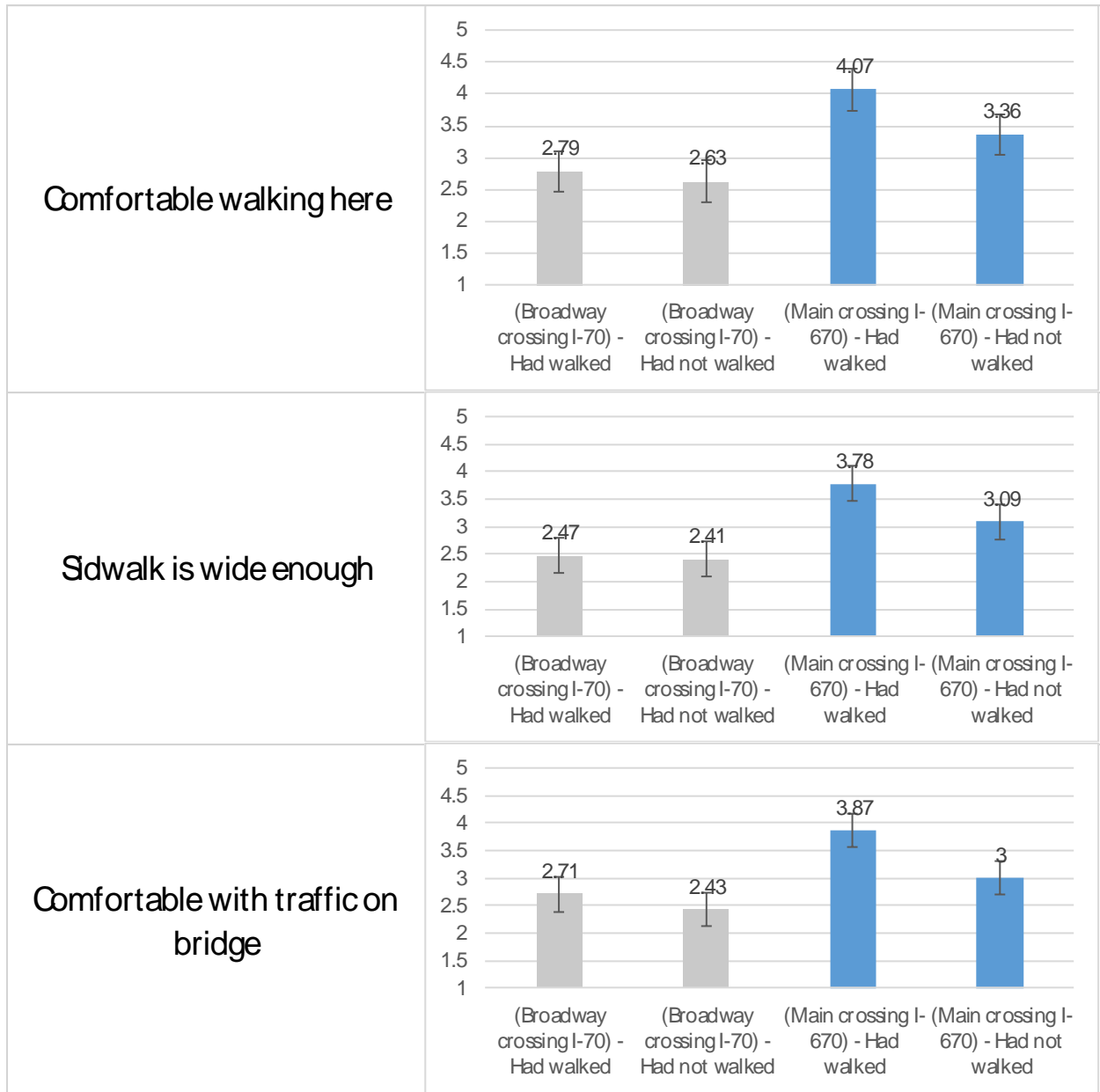
There is a stark difference between perceptions of the Main Street and the Broadway overpass when respondents were asked if they were comfortable with the height of the bridge. The mean for those who had walked over the Main Street overpass (4.01) is noticeably higher than for those who had walked over the Broadway overpass (3.61). One possible explanation for this is that there is a greater distance from the overpass to the highway below for the Broadway overpass than for the Main Street overpass. Regarding the Main Street overpass, 86% of



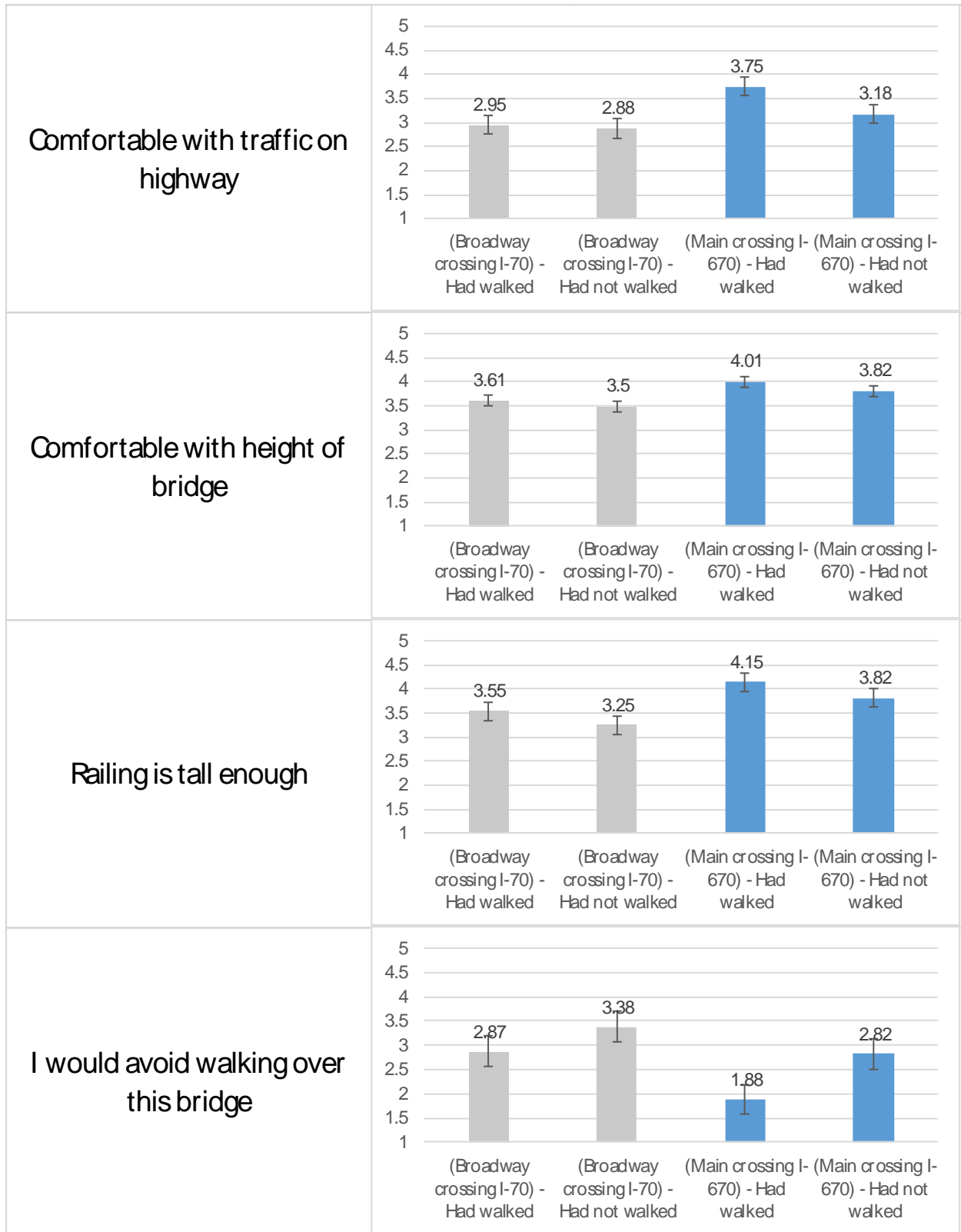
participants had walked over it and 14% had not. Regarding the Broadway overpass, 48% had walked over it and 52% had not. The respondents who had walked over the overpasses before had higher means in terms of feeling that the railing on the overpasses is tall enough, especially for Main Street. Respondents who had not walked in these locations were more likely to indicate that they would avoid walking over the overpass in question.

Overall, the respondents who had walked over the overpasses had higher means than the ones who had not walked over the overpasses. Between the two overpasses, the Main Street overpass had higher means than the Broadway overpass. This could be because the Main Street overpass is much newer and was constructed as part of the Power and Light District redevelopment. The firm HDR designed the bridge and it incorporates pedestrian-scale art as part of a collaboration between El Dorado, Inc. and artist James Woodfill (Eldo, 2014).

**Figure 4.10 Highway Overpass Means (min: 1 to max: 5)**



**Figure 4.11 Highway Overpass Means (min: 1 to max: 5) (cont.)**



Most respondents agree that downtown sidewalks are clean and free of obstruction. According to Figure 4.11, nearly 47% of respondents, by far the largest percentage, indicated that downtown sidewalks are clean. Additionally, 39.76% of respondents felt that sidewalks are free of obstruction. Curiously however, the largest share of participants (36.14%) indicated that the sidewalks downtown are not well-maintained. Many respondents felt that there are an adequate amount of crosswalks (54.22%), and that the crosswalks allow pedestrians enough time to cross the street (61.45%). Perhaps most surprising of all is that the largest share of respondents agree that there is enough separation of pedestrians from vehicular traffic (42.17%). One might assume that vehicle traffic would be one of the largest deterrents from the choice to walk as a form of transportation, but the results of this survey say the opposite. Comparing the means shown in Table 4.5, it becomes clear that the issues that respondents felt most positively about were the timing of the crosswalks, followed by the cleanliness, and the separation of the sidewalks from vehicle traffic. The issues that respondents felt most negatively about were the maintenance of the sidewalks followed by sidewalks the lack of obstruction in sidewalks (Figure 4.8). However, when comparing these results with the rate of participants that indicate that they walk, it illustrates that despite sidewalks that may be in need of maintenance and may have too many obstructions, most people are still choosing to walk.

**Figure 4.11 Conditions of Sidewalks and Crosswalks Means (1 to 5)**



**Table 4.5 Condition of Sidewalks**

Question	Sidewalk Conditions					Mean	Variance	Standard Deviation	Total Responses
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree				
Sidewalks are clean	3.61%	20.48%	16.87%	46.99%	12.05%	3.43	1.13	1.06	83
Sidewalks are well maintained	10.84%	36.14%	20.48%	26.51%	6.02%	2.81	1.28	1.13	83
Sidewalks are free of obstruction	13.25%	24.10%	20.48%	39.76%	2.41%	2.94	1.28	1.13	83
There is enough separation of sidewalks from vehicle traffic	8.43%	26.51%	16.87%	42.17%	6.02%	3.11	1.27	1.13	83
There are enough crosswalks	8.43%	21.69%	10.84%	54.22%	4.82%	3.25	1.24	1.11	83
Crosswalks allow enough time to cross the street	7.23%	9.64%	8.43%	61.45%	13.25%	3.64	1.14	1.07	83

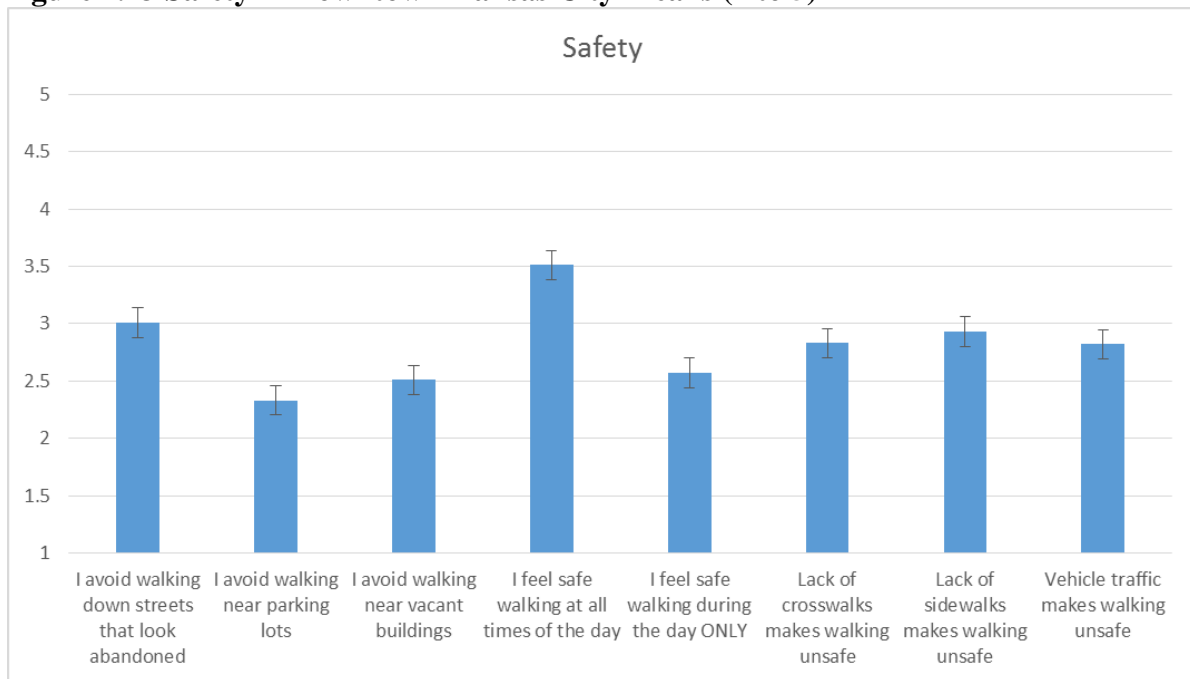
#### **4.5 Services and Attractions within Walking Distance**

When considering participants' perceptions of the general pedestrian environment, most participants indicated that there are an adequate amount of attractions within walking distance in Downtown Kansas City, but services within walking distance are somewhat lacking. Just over 36% of respondents indicated that there is not an adequate amount of services within walking distance, compared to almost 35% who think there are enough services within walking distance. This is perhaps a testament to the booming nature of Downtown Kansas City, and the economic expansion that is partially a result of the forthcoming streetcar.

#### **4.6 Safety**

Safety concerns were also not as much of a barrier as initially anticipated (Figure 4.13). The majority of respondents (53.36%) feel safe walking downtown at all times of the day. Only 17.7% said they feel safe walking only during the day, not at night. Most respondents indicated that there are an adequate amount of sidewalks and crosswalks downtown and that vehicle traffic does not have a negative impact on the safety of walking. Interestingly, a majority of respondents indicated that they do not avoid walking near abandoned buildings or surface parking lots. However, the largest share of respondents said they would avoid walking down an abandoned-looking street.

**Figure 4.13 Safety in Downtown Kansas City Means (1 to 5)**



Comparing the means for the safety questions exhibits some interesting results, as seen in Table 4.6. The highest mean is associated with the question that asked respondents if they feel comfortable walking at all times of the day. This means that the largest share of respondents indicate that the time of day will not necessarily stop them from walking. The second highest mean is associated with the question asking if respondents avoid walking down streets that look abandoned. This confirms what previous literature has said about inviting streetscapes being key to creating an environment with high pedestrian activity. The lowest means are associated with the question asking if respondents avoid walking near surface parking lots, meaning that surface parking lots do not have the negative impact on walking habits that was initially assumed. This is followed by the question asking if respondents avoid walking near abandoned buildings, as discussed earlier.

**Table 4.6 Safety in Downtown Kansas City**

Question	Safety					Mean	Variance	Standard Deviation	Total Responses
	Strongly Disagree	Disagree	Neutral	Agree	Strongly agree				
I avoid walking down streets that look abandoned	10.98%	25.61%	19.51%	39.02%	4.88%	3.51	0.99	1	82
I avoid walking near parking lots	15.85%	47.56%	25.61%	9.76%	1.22%	2.57	1.24	1.11	82
I avoid walking near vacant buildings	19.51%	36.59%	18.29%	24.39%	1.22%	2.13	0.66	0.81	82
I feel safe walking at all times of the day	1.22%	21.95%	12.20%	53.66%	10.98%	2.82	1.31	1.15	82
I feel safe walking during the day ONLY	13.41%	45.12%	18.29%	17.07%	6.10%	2.57	1.24	1.11	82
Lack of crosswalks makes walking unsafe	7.32%	40.24%	25.61%	15.85%	10.98%	2.51	1.22	1.1	82
Lack of sidewalks makes walking unsafe	6.10%	43.90%	15.85%	19.51%	14.63%	2.33	0.82	0.9	82
Vehicle traffic makes walking unsafe	8.54%	40.24%	21.95%	19.51%	9.76%	3.01	1.3	1.14	82

#### 4.7 Residents vs. Visitors

There are a number of differences in perceptions of residents of Downtown Kansas City vs. visitors (residents of Kansas City who do not reside downtown), as is clearly visible in Figure 4.14. In short, visitors have, overall, more negative perceptions of the pedestrian environment. A theoretical explanation for this may be that those that do not live downtown may perceive the pedestrian environment as more negative simply because people fear what they are unfamiliar with. Those that live downtown walk the streets on a fairly regular basis. The more one does something, the less intimidating it becomes.

When respondents were asked if there is enough separation of sidewalks from vehicle traffic, there was significant difference in the responses of residents vs. visitors. For example, 46.67% of residents ‘agree’ that there is enough separation (the largest share of residents), while only 28.57% of visitors ‘agree’. Similarly, 58.83% of residents ‘agree’ that there are an adequate amount of crosswalks, compared to only 42.86% of visitors. On this same note, a larger share of



residents (42.37%) compared to visitors (33.33%) ‘disagree’ that vehicle traffic makes walking unsafe, while a larger share of visitors (28.57%) compared to residents (16.95%) ‘agree’ that vehicle traffic makes walking unsafe.

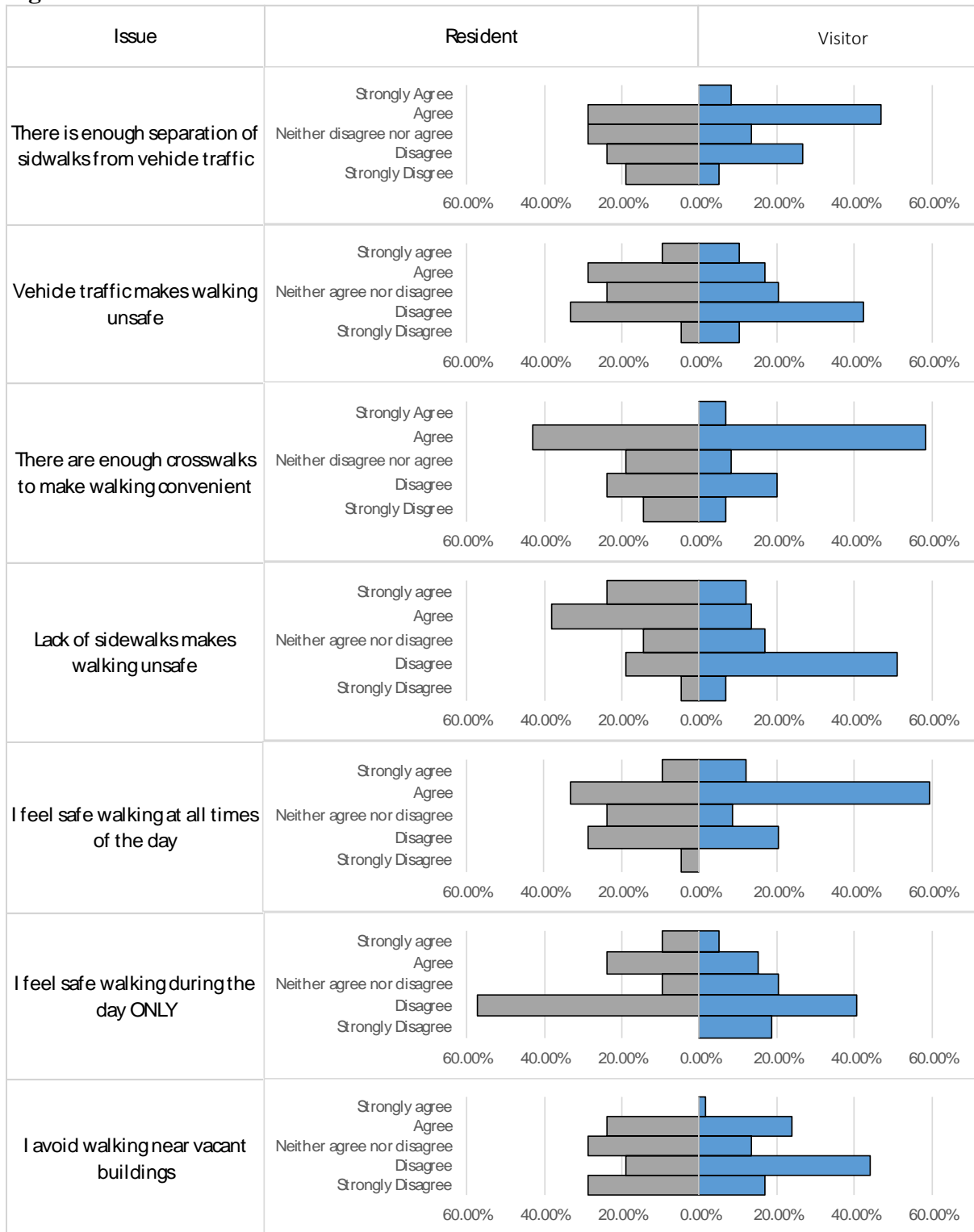
Visitors also tend to have a more negative perception of the pedestrian environment of Downtown Kansas City, when it relates to crime and safety. For example, 59.32% of residents indicated that they feel safe walking at all times of the day in Downtown Kansas City, compared to only 33.33% of visitors. In fact, a larger share of visitors (23.81%) indicated that they feel safe walking during the day only, compared to residents (15.25%). It is worth noting, however, that the largest shares for both groups indicated that they feel safe walking at all times of the day. When asked if they would walk by a vacant building, nearly the same percentage of residents and visitors ‘agree’ (23.73% and 23.81% respectively). However, a much larger share of residents (44.07% compared to 19.05% for visitors) ‘disagree’ that they avoid walking near abandoned buildings. Surprisingly, however, more residents than visitors indicated that they would avoid walking down a street that looks abandoned (40.68% vs 33.33% respectively). A significantly larger share of residents (30.51%) indicated they would not avoid abandoned looking streets than visitors (14.29%). Additionally, both residents and visitors indicated that parking lots would not affect their pedestrian routes. However, more visitors than residents indicated that they avoid walking near parking lots.

Regarding services and attractions, 47.62% of visitors agree that there are enough services that are within walking distance in Greater Downtown Kansas City, compared to 31.67% for residents. This contradicts the trend of residents having a more positive perspective on the downtown pedestrian environment than visitors. However, as residents are more likely to

walk in the greater downtown are on a regular basis, they are more likely to understand the true state of the downtown environment.

However, there are areas in which visitors have a more favorable view of the pedestrian environment of downtown. For instance, more visitors (58.33%) agree that there are enough crosswalks to making walking convenient, compared to 42.86% of residents. Additionally, more visitors (59.32%) than residents (33.33%) agree that they feel safe walking at all times of the day. This is a notable and surprising deviation from the trend of residents perceiving the pedestrian environment more favorably than visitors.

**Figure 4.14 Residents vs. Visitors**



#### **4.8 Pedestrian Trips Crossing the Highways**

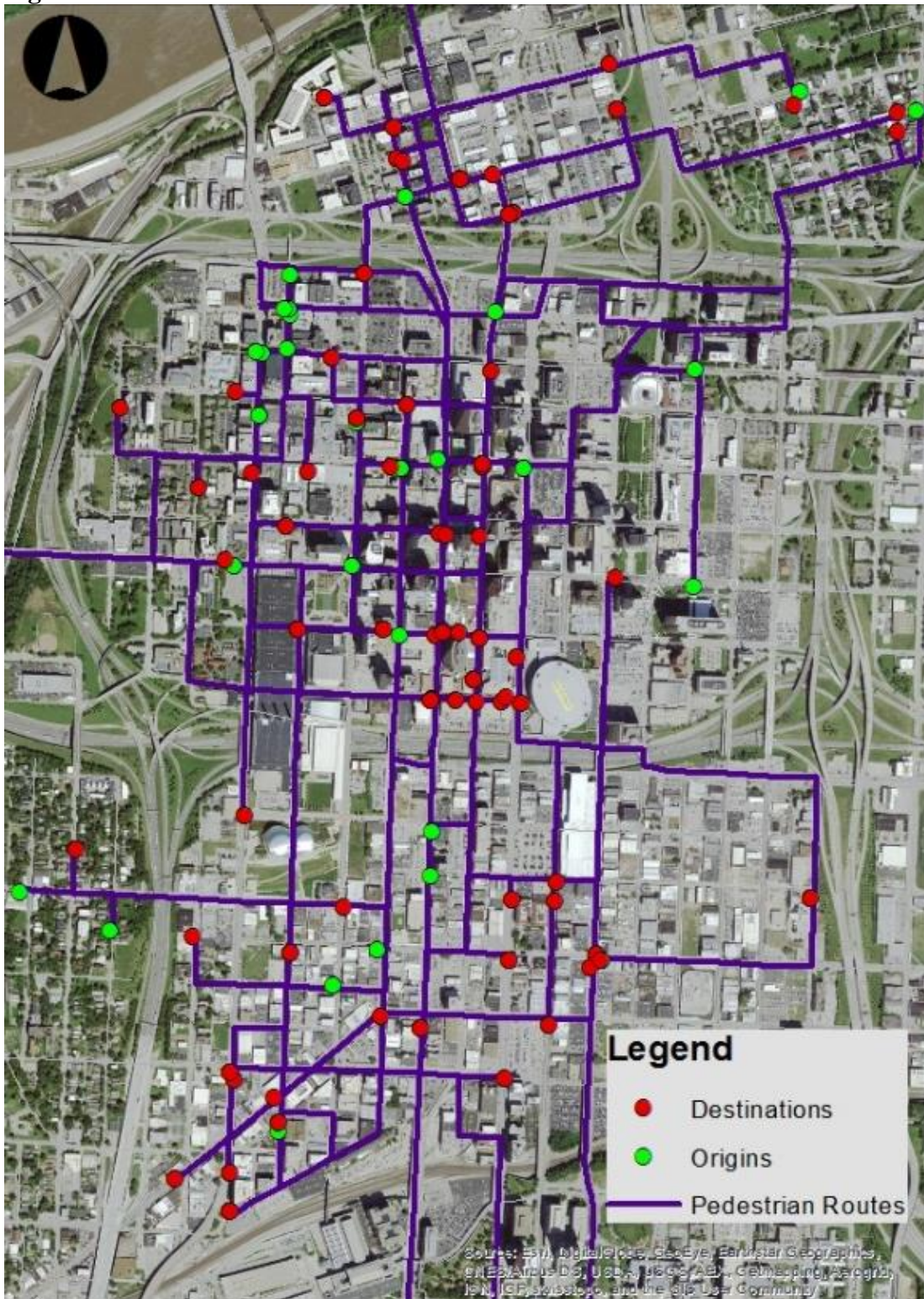
The survey included a trip diary question that asked respondents to list the 10 previous trips they had made within Greater Downtown Kansas City as well as the mode of transportation used. Using these results, all trips other than those done by foot were eliminated, in order to visually analyze how many pedestrian trips cross the highway loop of Downtown Kansas City. Once the trips made by any mode other than foot were eliminated, 202 trips remained. Using the network analyst function in ArcGIS, these trips were mapped from their origin to their destination. The majority of pedestrian trips were made in the Greater Downtown Kansas City study area. However, some pedestrian trips covered surprisingly long distances. For example, one trip originated just south of the Country Club Plaza, and ended at 10<sup>th</sup> and Main in the heart of the CBD, a distance of approximately 4.5 miles. Another trip originated at the UMKC campus and ended at Gillham and McGee Trafficway, a distance of approximately three miles. Additionally, there were five trips that terminated in the West Bottoms district, which sits just to the west of the CBD. This district suffers from very poor mobility from the rest of Greater Downtown as it sits at the bottom of a very steep slope. Additionally, there is only one overpass that connects the West Bottoms to the CBD.

There were 427 trips completed by 87 participants. Of those 427 trips, 202 were pedestrian trips, approximately 47%. The majority of the pedestrian trips were within the Greater Downtown Kansas City study area (see Figure 4.15). Participants in this study utilized eleven overpasses to walk from one district to another across the highways. Approximately 34% of the 202 pedestrian trips involved crossing at least one of the inner-city highways. A couple of these trips involved crossing highways that were not technically in the study area, but they were included anyway, as they either originated or terminated in the study area. Performing this

network analysis also shed light on areas of Greater Downtown Kansas City and adjacent districts that either have poor mobility with surrounding districts, low pedestrian activity, or both. For example, apart from two origins and one destination, the area east of Broadway in the Central Business District is devoid of pedestrian activity, using the results of this study. Additionally, the West Bottoms district is very disconnected from the rest of downtown, with only one overpass traversing the steep grade change. However, considering the limited access, there was still a fair amount of activity in this district, with six destinations. Another district that had relatively low pedestrian activity was the area just to the west of the Garment District, which is located in the northwestern portion of the CBD. This area is home to a number of loft apartments, so it is logical that this area would have a high level of activity. However, the area to the west, which contains a number of apartments and townhomes and Ermine Case Junior Park, has a low level of pedestrian activity with only one destination.

Overall, the area with the highest level of pedestrian mobility is the Central Business District, which contains the majority of origins and destinations. However, this also means that for those participants that live in Rivermarket or Crossroads, in order to perform some daily activities on foot, it would require crossing the highways, as this study confirms. All three districts within the study area show high levels of pedestrian activity. This is in keeping with the results of the survey in which participants indicated high levels of walking on a daily basis.

Figure 4.15 Pedestrian Routes



## 4.9 Summary

This study assumed that that the inner-city highways would cause a disruption to the pedestrian mobility from neighborhood to neighborhood in Greater Downtown Kansas City. However, the results of this survey, as seen in Table 4.2, call that hypothesis into question. The greatest percentage (47.56%) of all respondents (residents of Downtown Kansas City and visitors) said they do not avoid pedestrian routes that involve crossing highways on overpasses. In fact, an even greater percentage (50.00%) indicated that they feel safe crossing highways on overpasses. The greatest percentage of respondents also indicated that sidewalks are wide enough on highway overpasses (37.71%) and that there are enough highway overpasses to make walking convenient (35.37%).

## **Chapter 5 - Conclusion and Discussion**

### **5.1 Key Findings**

Key findings from this study indicate that, perhaps most importantly, there are a substantial amount of pedestrians in Greater Downtown Kansas City, and a substantial number of Downtown residents walk as their primary mode of transportation. Additionally, downtown residents were scattered around the Greater Downtown area across the two highways and amongst the three districts. Not only does this imply a resurgence of residential growth in this area, but it also implies that these people who indicated that they walk daily or walk as their primary mode of transportation, must cross these highways frequently. In fact, the most surprising finding of this study was discovering that the highways did not act as much of a barrier as originally hypothesized, and that the residents of Greater Downtown Kansas City had a generally more favorable perception of the pedestrian environment than visitors to the area.

Ultimately, this study produced subtle results, such as the differences in perception between residents of Greater Downtown Kansas City and visitors to the area. The study did not uncover any significant trends regarding infrastructure acting as barriers to pedestrian travel. However, residents of downtown had a somewhat more positive perception of the pedestrian environment. This could be for several reasons. For example, downtown residents are likely more familiar with the pedestrian environment, and therefore, more comfortable with it. Additionally, this study uncovered differences in perceptions of two highway overpasses between participants who had walked across that particular overpass, and those that had not. The Main Street overpass, which is newer and designed at a more pedestrian scale, fared better than the older Broadway overpass, and in keeping with the resident vs. visitor trend, those participants who had walked across the overpasses scored them higher than those who had not.



## 5.2 Limitations and Discussion

The biggest obstacle facing the survey was finding an adequate number of participants. The idea of obtaining a list of all downtown Kansas City residents was quickly dismissed, as finding such a list would have proven exceedingly difficult given the time and resource constraints of this study. As a result, purposive sampling was implemented to specifically target pedestrians of Greater Downtown Kansas City. Greater Downtown Kansas City has a population of approximately 21,197 (Downtown Council of Kansas City). However, in the end the survey only received 88 respondents.

There seemed to be a lot of interest in this research topic on the various websites and social media used in distributing the survey and it was shared quite a bit on social media. However, a fewer number of participants completed the survey than anticipated. The survey had only a 1% dropout rate, meaning that nearly all the participants completed the survey. However, finding people with enough interest and motivating those who may not have that interest to take the survey was the primary challenge. Additionally, time and resource constraints prevented other measures from being taken, such as actually visiting downtown Kansas City to distribute the survey. Future researchers could increase the number of participants by obtaining a list of downtown Kansas City residents, offering incentives, and manually distributing surveys to pedestrians.

The study concluded with a lack of statistical significance. There are several possible explanations for this. For one, the sample may not have been representative enough. This could be due to the small size of the sample or the sample may have been biased. For instance, the sample did not accurately represent the racial and ethnic composition of Greater Downtown Kansas City. Additionally, the places where the survey was distributed may have targeted a

certain demographic and a certain mindset that was not representative of the area as a whole. In order to fully understand the implications of inner city highways on pedestrian travel, another survey should be completed with a more robust response rate.

### **5.3 Implications**

The results of this survey demonstrate that despite the fact that inner city pedestrian infrastructure is often in a state of deterioration, and despite the fact that highways may disrupt the urban fabric, people will still choose to walk. Walking is the most basic form of transportation, and in a downtown environment, it is often the most practical. Planning policies of the Urban Renewal era that put the automobile first and the pedestrian second tells pedestrians that their needs are not as important as those of motorists. Kansas City is typical of cities across the United States in its historic approach to pedestrian planning. While that trend has begun to reverse in recent decades, this study illustrates that there is still a lot more progress to make.

One conclusion from this study is that highway overpasses that are designed for the pedestrian, such as the Main Street overpass, help mitigate any barrier effect inner-city highways may present. In this study, the Main Street overpass scored better than the Broadway overpass. Cities that interested in remedying the barrier effects of inner-city highways should first look to redesign their highway overpasses, so that they are designed for the pedestrian first, and the automobile second. Sidewalk width, separation of traffic from pedestrians, and the maintenance of the overpasses are important to alleviating the barrier effects of the highway.

Many cities across the country have taken steps to retrofit their inner-city highways by either removing them completely, replacing them with grade level boulevards, or burying them

in tunnels or capping them with parks. For example, the city of Boston buried Interstate 93 under the downtown area in a process known as “The Big Dig” (Tajima, 2003). The City of Dallas capped a portion of the Woodall Rogers Freeway, which bisected downtown, with a park, which is today known as Klyde Warren Park (Payne, 2012). The City of St. Louis is currently in the process of capping a small portion Interstate 70, which separates the Gateway Arch from the rest of Downtown St. Louis, in a project called “CityArchRiver” (Shea, Sacks, Lian, & Richardson, 2015). The City of Portland, Oregon completely removed a large multi-lane thoroughfare called Harbor Drive and created Tom McCall Waterfront Park along the Willamette River (Cervero, 2006). In Downtown Milwaukee, a portion of Park East Freeway was removed and replaced with a grade-level boulevard, which also opened up new land for development (Cervero, 2006). All of these cases have resulted in economic development benefits associated with a more pedestrian-friendly environment (Cervero, Kang, Shively, 2009).

Since the results of this study indicate that inner-city highways do not have as much of an impact on Downtown Kansas City pedestrians as initially hypothesized, it may seem easy to dismiss the ideas listed above as superfluous. However, past cases of inner-city highway retrofitting have indicated dramatic economic development boosts (Cervero, Kang, Shively, 2009). As Greater Downtown Kansas City is currently experiencing a renaissance of sorts with the installation of the streetcar, which has already resulted in approximately \$5.5 billion of public and private investment, further enhancements to the alternative transportation system of this area could be beneficial to both the growing number of pedestrians and the economy (Gose, 2014).

Despite the indications that highways in Greater Downtown Kansas City do not impede pedestrianism as much as initially thought, studies have been conducted on the idea of capping the highways in Downtown Kansas City. One of the core missions of the Greater Downtown

Area Plan (2010) was to connect neighborhoods and activity centers and preserve the street grid. Additionally, the South Loop Link (2009) study, prepared for the city of Kansas City and Missouri Department of Transportation analyzed ideas of connecting the CBD with the Crossroads district. Both studies proposed capping a portion of I-670 with a park.

However, the results of this study are still noteworthy in that they indicate that inner-city highways may not have as much of an impact on the flow of pedestrians as previously thought, and that it is still possible to have a robust pedestrian environment even with inner-city highways.

#### **5.4 Future Studies**

Future studies should include an in-depth geospatial analysis conducted to more fully understand the extent that inner-city highways impact the flow of pedestrians. By mapping the flow of pedestrians and by performing an origin-destination study and a route-directness test and mapping where pedestrians walk. This way, it would become spatially clear which areas have high pedestrian activity and which areas are avoided by pedestrians. Additionally, conducting another survey to capture a greater share of the population would be helpful to more fully understand what pedestrians of Kansas City think about their environment. Furthermore, studies performed in other cities would contribute to the breadth of understanding of the extent to which inner-city highways have an impact upon the flow of and walking choices of pedestrians.

#### **5.5 Conclusion**

While this study experienced many limitations, it proves that people are perseverant, and that when walking is a logical mode of transportation, as is the case here in a relatively dense

urban environment, people will walk. Despite overpasses that may not be an ideal form of pedestrian infrastructure, people still walk over them. However, this does not mean that planners and policy makers should continue to ignore the pedestrian environment. The results of this study indicate that there is a demand for pedestrian infrastructure, and a demand for walkable urban environments. Residents of Downtown Kansas City want to walk and they want to have services and attractions within walking distance. As American cities continue to experience a renaissance in their urban cores, there will be increased pressure on pedestrian infrastructure, and increased pressure on planners and policy makers to fully embrace walking and alternative transportation as a viable way to get around. Cities such as Kansas City have already begun to think this way. The streetcar is due to debut in May of 2016. This could increase the number of people who abandon their cars in favor of walking, biking, and taking public transit.

Using a survey distributed to residents of Downtown Kansas City as well as the larger metropolitan area, people were able to weigh in on how they perceived the pedestrian environment of Downtown Kansas City. The results were both expected and unexpected. The survey results confirmed the assumption that pedestrianism is a common form of transportation. In fact, it is the most common in this particular case. The most surprising finding from this study is that the highway overpasses do not inhibit the flow of pedestrians, as much as hypothesized.

Historic photos of Downtown Kansas City show a truly urban environment, an environment that is thronged with pedestrians out for their daily shopping, walking to and from work, street vendors selling their goods, and people out for a leisurely stroll. At some point over the years, this type of life almost vanished. However, the urban core of Kansas City is experiencing a revival as scores of people rediscover what urban life has to offer. Greater Downtown Kansas City with its unique neighborhoods of Rivermarket, the Central Business

District, and Crossroads are experiencing new life as people move back to these dynamic districts. For instance, First Fridays is an art festival held on the first Friday of every month in the Crossroads district. This event attracts hundreds of people every month to the city streets as they peruse art galleries, sample wine, and simply enjoy the charm and excitement of the city. Because of this, more and more people are walking the sidewalks of Downtown Kansas City, and downtowns across the country.

At one time, planning for pedestrians was not a priority in American policymaking, and this decision making process has had detrimental effects to the urban fabric of cities across the United States. However, as people begin to move back to the areas that were once almost abandoned, and as urban decay begins to reverse, there is a greater need than ever to revisit urban planning policies and discover what is best for the pedestrian – the most basic and essential form of transportation.

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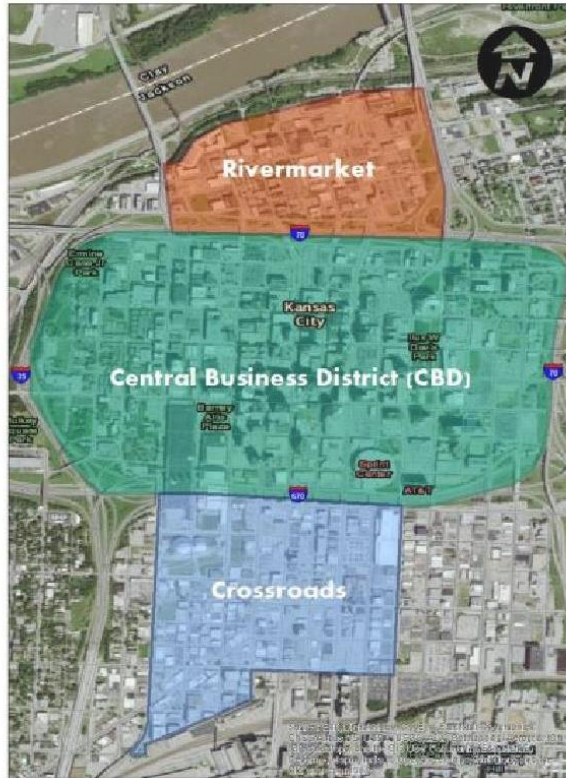
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# Appendix A - Survey

## Walking Habits

Do you live in Greater Downtown Kansas City? (Rivermarket district, Downtown Loop/Central Business District, or Crossroads district)



Yes

No

What is the nearest street intersection to your home address? Please name both streets.

1st Street Name (Ex. Broadway)

2nd Street Name (Ex. 8th)

On a normal weekday, which type of transportation do you use most often to get around Downtown Kansas City?

	Never	Not often	Sometimes	Often	All of the time
Automobile	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Public transit	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Bicycle	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Walk	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other <input type="text"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

How often do you walk as a mode of transportation within Greater Downtown Kansas City?

- Never
- Less than once a month
- Once a month
- 2-3 times a month
- Once a week
- 2-3 times a week
- Daily

In the past three days, list all the destinations you traveled to inside of Downtown Kansas City. Please include the time you left for the destination, the location of the destination, and the mode of transportation you used to get there. Example:

	From:	To:	Weekday or Weekend	Time of day (Morning, Afternoon, Evening, or Night)	Mode of transportation to get to the destination (car, walk, bike, or public transit)
Trip 1	Home	Cosentino's	Weekday	Morning	Walk
Trip 2	Cosentino's	Commerce Bank	Weekday	Morning	Walk
Trip 3	Commerce Bank	Chipotle	Weekday	Afternoon	Walk
Trip 4	Chipotle	Home	Weekday	Afternoon	Walk
Trip 5	Home	Farmer's Market	Weekend	Morning	Public transit
Trip 6	Farmer's Market	Quay Coffee	Weekend	Afternoon	Walk
Trip 7	Quay Coffee	Home	Weekend	Afternoon	Public transit
Trip 8	Home	Drunken Fish	Weekend	Evening	Walk
Trip 9	Drunken Fish	Bar Louie	Weekend	Evening	Walk
Trip 10	Bar Louie	Home	Weekend	Night	Car

	From:	To:	Weekday or Weekend	Time of day (Morning, Afternoon, Evening, or Night)	Mode of transportation to get to the destination (car, walk, bike, or public transit)
Trip 1	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Trip 2	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Trip 3	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Trip 4	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Trip 5	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Trip 6	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Trip 7	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Trip 8	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Trip 9	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Trip 10	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

**Sidewalks and Crosswalks**

What do you think about services and attractions that are within walking distance in Downtown Kansas City?

	Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
There are enough services to walk to (grocery stores, restaurants, banks, schools, etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
There are attractions to walk to (parks, museums, theaters, etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

What do you think about the condition of sidewalks and crosswalks along your common walking routes?

	Strongly Disagree	Disagree	Neither disagree nor agree	Agree	Strongly Agree
Sidewalks are clean	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sidewalks are well maintained (no large cracks, holes, uneven pavement, etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sidewalks are free of obstruction (light poles, trash cans, etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
There is enough separation of sidewalks from vehicle traffic	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
There are enough crosswalks	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Crosswalks allow enough time to cross the street	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**Perceptions of Crime and Safety in Downtown Kansas City**

How do you feel about safety in Downtown Kansas City?

	Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
I feel safe walking at all times of the day	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I feel safe walking during	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

the day ONLY

I feel safe walking at night ONLY	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Vehicle traffic makes walking unsafe	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lack of sidewalks makes walking unsafe	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lack of crosswalks makes walking unsafe	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I avoid walking near vacant buildings	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I avoid walking near parking lots	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I avoid walking down streets that look abandoned	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**Perceptions of the Highways in Downtown Kansas City (I-70 & I-670)**

How do you feel about the highways (I-70 and I-670) within Downtown Kansas City?

	Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
I avoid pedestrian routes that involve crossing highways on bridges	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I feel safe crossing highways on bridges	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sidewalks are wide enough on highway bridges	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
There are enough highway bridges/pedestrian crossings to make walking convenient	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Have you walked in this location? (Broadway crossing I-70)





Yes

No

If you answered yes, how did you feel about walking on this bridge? (Broadway crossing I-70)

	Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
I felt comfortable walking here	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The sidewalk is wide enough	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I felt comfortable with the amount of car traffic on the bridge	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I felt comfortable with the speed of car traffic on the bridge	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I felt comfortable with the amount of car traffic on the highway	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I felt comfortable with the speed of car traffic on the highway	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I felt comfortable with the height of the bridge	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I felt that the railing was tall enough on the bridge	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would avoid walking over this bridge in the future	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

If you answered no, how would you feel walking on this bridge? (Broadway crossing I-70)

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
I would feel comfortable walking here	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The sidewalk is wide enough	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would feel comfortable with the car traffic on this bridge while crossing this bridge	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would feel comfortable with the car traffic on the highway while crossing this bridge	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would feel comfortable with the height of this bridge	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would feel comfortable with the height of the railing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would avoid walking over this bridge	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Have you walked in this location? (Main crossing I-670)



Yes

No

If you answered yes, how did you feel about walking on this bridge? (Main crossing I-670)

	Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
I felt comfortable walking here	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The sidewalk was wide enough	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I felt comfortable with the amount of car traffic on the bridge	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I felt comfortable with the speed of the car traffic on the bridge	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I felt comfortable with the amount of car traffic on the highway	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I felt comfortable with the speed of the car traffic on the highway	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I felt comfortable with the height of the bridge	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I felt that the railing on the bridge was tall enough on the bridge	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would avoid walking over this bridge in the future	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

If you answered no, how would you feel walking on this bridge? (Main crossing I-670)

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
I would feel comfortable walking here	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The sidewalk is wide enough	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would feel comfortable with car traffic on the bridge while crossing this bridge	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would feel comfortable with car traffic on the highway while crossing this bridge	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would feel comfortable with the height of this bridge	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

3/14/2016

Qualtrics Survey Software

I would feel comfortable  
with the height of the  
railing

I would avoid walking  
over this bridge

### Demographic Information

What is your gender?

Male

Female

What is your age?

18-25

26-35

36-45

46-55

56-65

66+

What is your race or ethnicity?

Black or African American

Asian/ Pacific Islander

Hispanic or Latino

White, non Hispanic

Other

Do you have a driver's license?

Yes

No

Do you own a car?

Yes

No

## Appendix B - IRB Approval Letter



University Research Compliance Office

TO: Hyung Jin Kim  
LARCP  
208 Seaton

Proposal Number: 8092

FROM: Rick Scheidt, Chair  
Committee on Research Involving Human Subjects

DATE: 02/04/2016

RE: Proposal Entitled, "Assessing Pedestrian Connectivity and Experience in Downtown Kansas City"

The Committee on Research Involving Human Subjects / Institutional Review Board (IRB) for Kansas State University has reviewed the proposal identified above and has determined that it is EXEMPT from further IRB review. This exemption applies only to the proposal - as written - and currently on file with the IRB. Any change potentially affecting human subjects must be approved by the IRB prior to implementation and may disqualify the proposal from exemption.

Based upon information provided to the IRB, this activity is exempt under the criteria set forth in the Federal Policy for the Protection of Human Subjects, 45 CFR §46.101, paragraph b, category: 2, subsection: ii.

Certain research is exempt from the requirements of HHS/OHRP regulations. A determination that research is exempt does not imply that investigators have no ethical responsibilities to subjects in such research; it means only that the regulatory requirements related to IRB review, informed consent, and assurance of compliance do not apply to the research.

Any unanticipated problems involving risk to subjects or to others must be reported immediately to the Chair of the Committee on Research Involving Human Subjects, the University Research Compliance Office, and if the subjects are KSU students, to the Director of the Student Health Center.