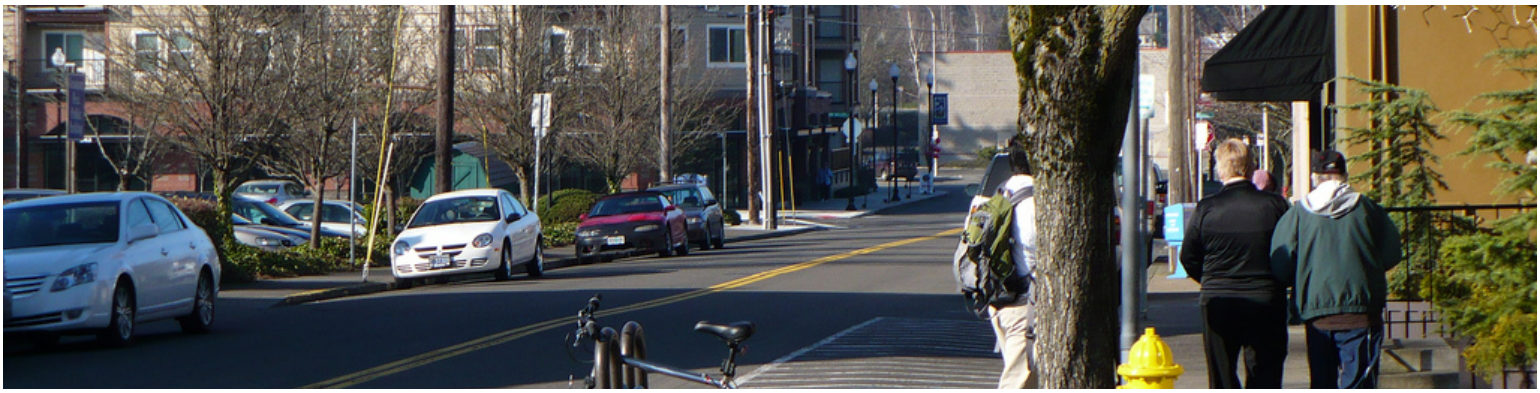
Fall 2009



Sustainability Focused Data Analysis

To what extent do walkability, crime, and neighborhood predict housing prices?

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SCI
Sustainable Cities Initiative

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About SCI

Sustainable Cities Initiative (SCI) is a cross-disciplinary organization at the University of Oregon that seeks to promote education, service, public outreach and research on the development and design of sustainable cities.

Our work addresses sustainability issues across multiple scales, from the region down to the building, and emerges from the conviction that creating the sustainable city cannot happen within any single discipline. SCI is grounded in cross-discipline engagement as the key strategy for solving community sustainability issues. We serve as a catalyst for expanded research and teaching; market this expertise to scholars, policymakers, community leaders, and project partners; and work to create and sponsor academic courses and certificates. Our work connects student passion, faculty experience, and community need to produce innovative, tangible solutions for the creation of a sustainable society.

About SCY

The Sustainable Cities Year Initiative is a 'partnership' with one city in Oregon per year where a number of courses from across the University focus on assisting that city with their sustainability goals and projects. The Sustainable Cities Year faculty and students work with that city through a variety of studio projects and service learning programs to: 1) provide students with a real world project to investigate; 2) apply their training; and 3) provide real service and movement to a local city ready to transition to a more sustainable and accessible future.

About Gresham

With just over 100,000 people, Gresham is the fourth largest city in Oregon. It is bordered to the west by Portland, the largest city in the state. Gresham is home to the Mount Hood Jazz Festival and is known as "The City of Music". It is close in proximity to the Columbia Gorge National Scenic Area and Mount Hood, the highest point in Oregon. Gresham has a wide variety of neighborhoods including the Civic Center, known for its active transportation network, rapid transit connections and residential, commercial and retail mix.

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I. Executive Summary

For the final project in Quantitative Methods, students performed statistical analyses on the impact of walkability on home prices. Holding crime, year sold, home type, neighborhood, acreage and square footage constant, a significant negative correlation was found between walkability and home values. For every one point increase in walkability, as scored by www.walkscore.com, home prices decline by $2,651 dollars. When analyzed on a neighborhood basis, the same general trend applied to most areas except for the Rockwood and City Center neighborhoods. In those two neighborhoods, home prices were shown to significantly increase by $4,692 and $3,562, respectively, for every point increase in walkscore.

Taken at face value, this result would indicate that residents in Gresham do not generally value walkability when they purchase a house. However, the citywide negative correlation between walkability and home values is in conflict with the general literature. A similar study by Joe Cortright found positive correlations between home prices and walkability in his survey of 15 different housing markets across the country. One possible explanation for the discrepancy in Gresham could have to do with the walkscore.com tool itself, including exclusion of street design, accessibility issues, or other barriers which might limit walkability.

Because of the social, environmental, and economic benefits of active transportation, it is recommended that further investigations of the relationship between walkability and home values be conducted. These studies could include a more refined assessment of walkability, or a survey directly asking residents how much they value walkability.

II. Introduction

The term "walkability" has recently found itself on the tips of planners' and policymakers' tongues who are seeking to create more livable communities. Secretary of Transportation Ray LaHood said one of his policy priorities is to, "Enhance the unique characteristics of all communities by investing in healthy, safe, and walkable neighborhoods – rural, urban or suburban." (LaHood 2009) This mirrors another statement he made in AARP magazine about livable communities: "It's a community where if people don't want an automobile, they don't have to have one. A community where you can walk to work, your doctor's appointment, pharmacy or grocery store. Or you could take light rail, a bus or ride a bike." (Findlay, 2009) At the highest levels of administration, walking is getting new attention.

Neighborhood View in Gresham, Oregon
Photo Courtesy of Flickr Creative Commons

Aside from top-down support of increasing walkability scores, there is evidence that consumers also value walkability in their community. Handy et al. (2008) report strong public support for mixed use neighborhoods and suggest that there is an unmet demand currently for housing in walkable neighborhoods. Indeed, Leinberger (2008) claims "Pent-up demand for urban living is evident in housing prices" and "...it carries an enormous price premium," referencing Portland, Oregon as one of many cities that have anywhere from a 40% to 200% premium per square foot for urban neighborhood space over rural areas. Studies indicate that although there is less support for mixed use neighborhoods in rural areas, interest is still increasing as people recognize the convenience and other benefits of walkable living areas (Handy et al, 2008; Leinberger, 2008).

This study asks whether residents of Gresham, Oregon value the benefits of mixed land use as indicated by higher housing prices in walkable neighborhoods, controlling for other factors that affect home prices. By controlling for these other factors, this analysis identifies key predictors of housing values in Gresham and teases out the association of walkability with home prices, independent of lot size, neighborhood crime, and other possible confounding elements.

III. Context

Gresham has seen remarkable growth over the past decade and expects similar growth in the near future. As with any growing city, the development decisions made today have implications decades into the future. During the 20th century, development patterns in the United States became increasingly oriented toward high-capacity, limited-access roads that quickly move automobiles but leave few options for non-automobile modes of transportation. This development pattern has left a lasting impression on the urban form in cities across the country. Gresham presents an exciting opportunity to plan new developments with deliberateness and foresight, having similarly lasting impacts throughout the 21st century.

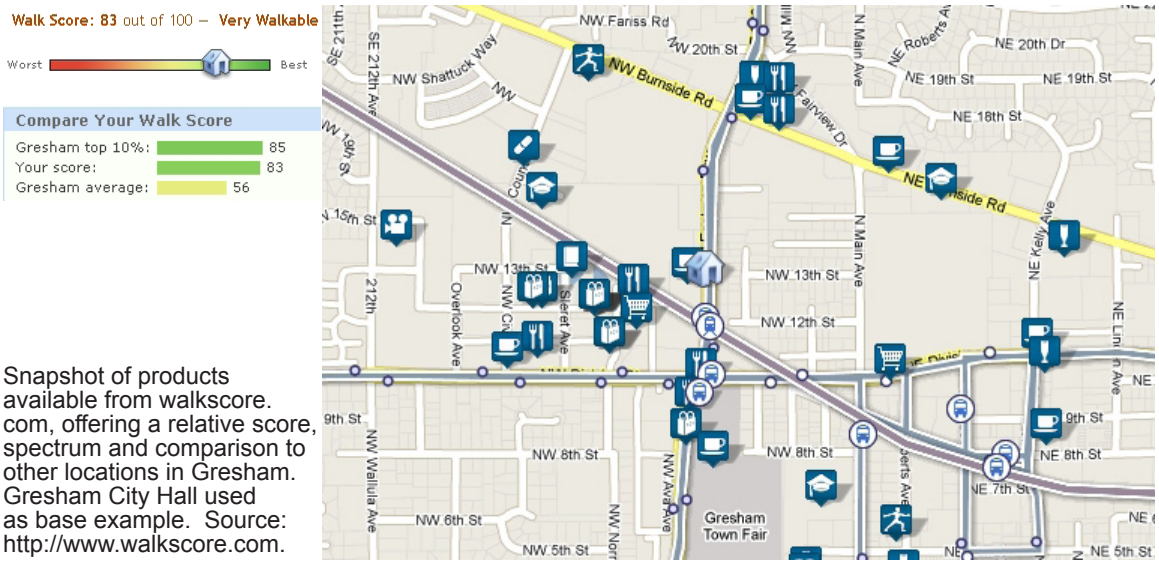
In order to serve the needs of the community, planners would benefit by having a solid foundation on which to base an emphasis on greater walkability, defined as denser, mixed-use development. By quantifying the financial impact produced by residential developments in more walkable areas, the below analysis gives a better basis on which to make decisions regarding how to design new developments.

Interstate 84 in Portland heading towards Gresham
Photo Courtesy of Flickr Creative Commons

IV. Methodology

Defining a "walkable" community can prove to be a difficult task. An extensive literature has developed around what attributes in a community lead people to walk more. Is it the width of sidewalks? The variety of land uses within a quarter-mile radius? Or does it more hinge on personal preferences? Different researchers have focused on different aspects, such as intersection density (Frank et al. 2005; Leslie et al. 2005), self-selection (Handy et al. 2006; Owen et al. 2007), land-use mix (Saelens et al. 2003; Frank et al. 2005; Leslie et al. 2005), and others. While these measures capture a nuanced portrait of walkability, data collection can present a labor-intensive obstacle to assessment of a large area such as the City of Gresham.

In order to determine the walkability of a certain location or neighborhood, the analysis made use of ratings from www.walkscore.com. This is following the precedent set by a similar study conducted by economist Joe Cortright, which used the walkscore.com rating of 15 housing markets to investigated the relationship of housing price and walkability. (Cortright, 2009). This website uses a 100-point scale allocated based on an algorithm that takes into account only one factor, the proximity of amenities to a residential location. For example, if the closest grocery store is within 0.25 miles of a residential location, that location is awarded the maximum number of points for that amenity category.



Snapshot of products available from walkscore.com, offering a relative score, spectrum and comparison to other locations in Gresham. Gresham City Hall used as base example. Source: http://www.walkscore.com.

Importantly, walkscore.com does not take into account the following:

- Street width and block length: Narrow streets slow down traffic. Short blocks provide more routes to the same destination and make it easier to take a direct route.
- Street design: Sidewalks and safe crossings are essential to walkability. Appropriate automobile speeds, trees, and other features also help.
- Safety from crime and crashes: How much crime is in the neighborhood? How many traffic accidents are there? Are streets well-lit?
- Pedestrian-friendly community design: Are buildings close to the sidewalk with parking in back? Are destinations clustered together?
- Topography: Hills can make walking difficult, especially if one is carrying groceries.
- Freeways and bodies of water: Freeways can divide neighborhoods. Swimming is harder than walking.
- Weather: In some places, it is just too hot or cold to walk regularly.

These significant limitations will be discussed below, but should be kept in mind while looking at the findings of this analysis.

Initially, a simple bivariate analysis of walkscore.com ratings and home price was performed (see Tables 1 and 2). Then, a multivariate regression was used to control for factors including house type, year the house was purchased, crimes per square mile, square footage, and lot acreage. The multivariate analysis was aggregated at the city, neighborhood, and housing-type level.

Table 1 Descriptive Characteristics of Neighborhood and Homes Purchased in the City of Gresham 2005-2008

Characteristics	(n = 5840)
Sale Price (mean)	278,558
Neighborhood Factors	
Walkability Index (mean)	45.9
Crimes Per Square Mile (mean)	477.7
Home Factors	
Type of Home (%)	
Single family	81.8
Row house	9.8
Condominium	8.4
Square footage of home (mean)	1718.2
Lot acreage (mean)	0.2
Year Purchased (%)	
2005	32.4
2006	28.0
2007	22.8
2008	16.9

Table 2 Bivariate Analysis of Key Variables for Homes Purchased 2005-2008

Characteristic	Home sales price	Walkability index	Crimes per square mile	Square footage of home	Lot acreage
Home sales price	1.00				
Walkability index	-0.25***	1.00			
Crimes per square mile	-0.13***	0.58***	1.00		
Square footage of home	0.22***	-0.49***	-0.38***	1.00	
Lot acreage	0.08***	-0.16***	-0.20***	0.30***	1.00

* p<.05 **p<.01 ***p<.001

V. Findings

In a simple bivariate analysis of walkscore and home prices aggregated at the city level, we find a negative relationship; for every one point increase in walkability score, home prices are on average $3,701 lower, at the city-wide scale (Table 3, column 2). After controlling for the above mentioned factors, we still see a significant negative relationship between walkability and home prices (Table 3, Column 3). Though weaker than in the bivariate analysis, home prices are still significantly associated with a $2,651 reduction for every one point increase in walkscore. Together the variables predict 12% of the variation in home price in Gresham.

Table 3 Multivariate Relationships between Walkability and Home Sale Price, Controlling for Neighborhood, Home, and Time Period Variables

	Walkability Only Model (n = 5840)	Full Model (n = 5840)
Walkability Index	-3,701***	-2,651 ***
Crimes Per Square Mile	—	-30 *
Home Factors		
Home Type		
Single family	—	—
Row house	—	176,321***
Condominium	—	29,314
Square footage of home	—	82***
Lot acreage	—	90,283**
Year Sold		
2005	—	—
2006	—	63,554***
2007	—	80,027***
2008	—	102,942***
Neighborhoods		
Asert	—	13,685
Centennial	—	-25,219
Central City	—	4,867
Gresham Butte	—	-80,378**
Gresham Pleasant Valley	—	-150,867
Holly Brook	—	-64,785**
Kelly Creek	—	18,474
Mt. Hood	—	-57,695
North Central	—	4476
North Gresham	—	-41,747
Northeast	—	-35,832
Northwest	—	-75,688**
Powell Valley	—	21,174
Rockwood	—	34,410
Southwest	—	-47,832
Wilkes East	—	—
R-Squared	0.06	0.12

* p<.05 **p<.01 ***p<.001

Using this model, we also see a significant relationship between home prices and crime, with home prices $30 lower on average per additional crime per square mile. Home factors and year sold are also significant predictors of home price, specifically the relationships between prices for row houses and single family homes, square footage, and lot acreage. The year the home was sold is also a significant predictor of home value.

Lastly, we look at all neighborhoods separately to determine whether walkability is a predictor of home prices in each individual neighborhood (Table 4). In eight of the sixteen neighborhoods, controlling for the other factors we have been examining, walkability does remain a significant predictor of home prices. As with the city-wide analysis, most neighborhoods showed a negative correlation between walkscore and home prices. Contrary to all other findings, in the neighborhoods of Central City and Rockwood we observe a significant positive relationship between home prices and walkability. In Rockwood, for every unit increase in walkscore, home prices are $4,692 higher (with the model explaining 30% of home price variance) and in Central City, $3,562 higher (with the model explaining 71% of variance in home price). These observations are more in line with the literature, and the reason for the difference is discussed below.

Table 4 Summary of Multivariate Relationships Between Home Sale Prices and Walkability for Gresham Neighborhoods[1]

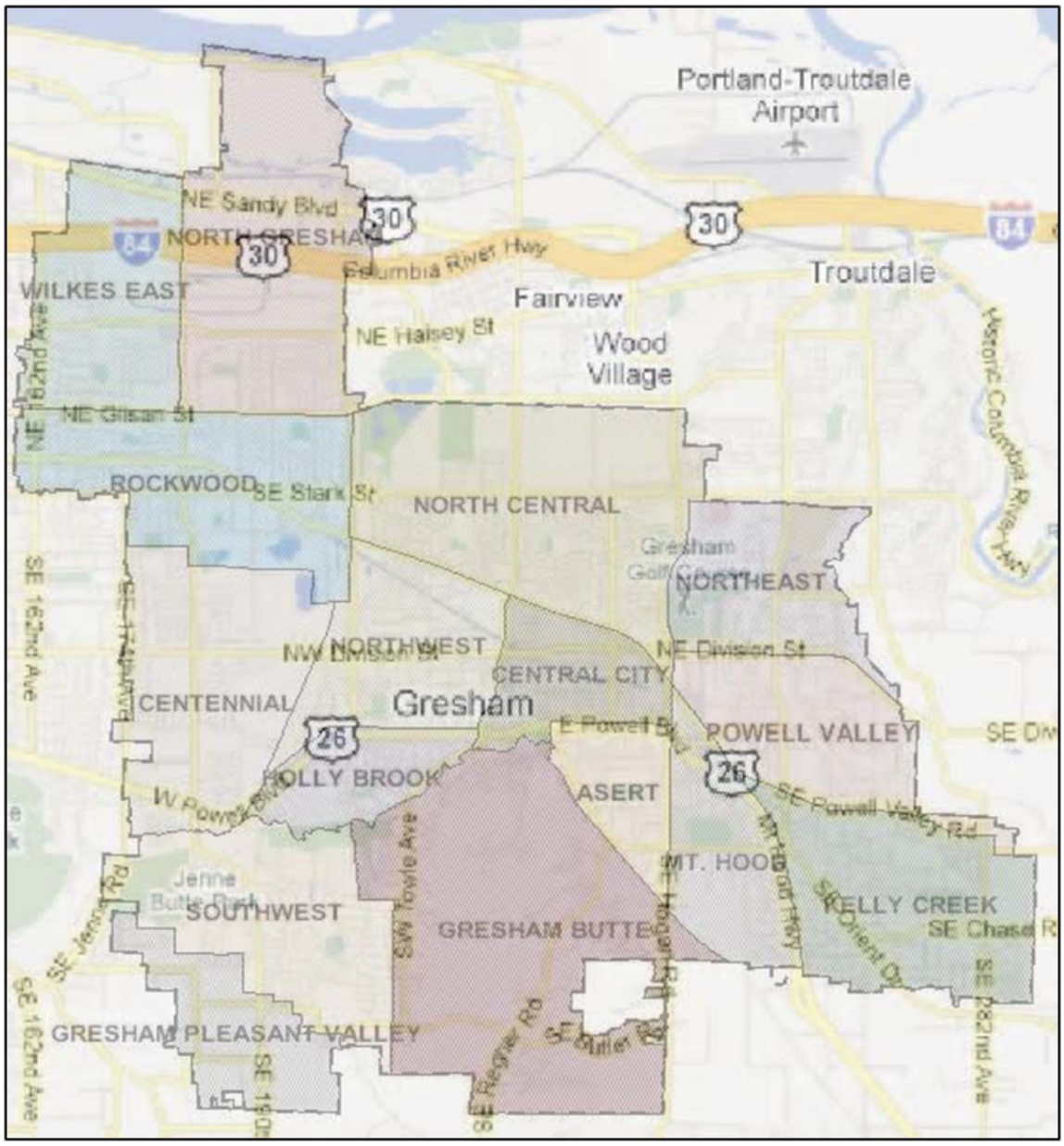
Neighborhood	Walkability
Asert (n= 199)	296
Centennial (n=525)	-2,137*
Central City (n=105)	3,562***
Gresham Butte (n=510)	-883*
Gresham Pleasant Valley[2] (n=7)	N/A
Holly Brook (n=179)	645
Kelly Creek (n=765)	-5,115*
Mt. Hood (n=161)	-486
North Central (n=569)	-98
North Gresham (n=211)	-650*
Northeast (n=310)	-197
Northwest (n=465)	128
Powell Valley (n=406)	-8,368**
Rockwood (n=561)	4,692***
Southwest (n=606)	-7,481**
Wilkes East (n=261)	-660

* p<.05 **p<.01 ***p<.001

[1] Holding constant crimes per square mile, home factors, and year sold

[2] There were too few observations to include an estimate of walkability for this neighborhood

Map 1 Gresham Neighborhoods



Source: Google Maps and City of Gresham

VI. Discussion

It is surprising that in general Gresham shows the reverse trend described in the literature. With the exception of the Rockwood and Central City neighborhoods, home prices were negatively correlated to walkscore.com ratings in a large, statistically significant way. This could mean several things.

Most obviously, it could mean that most Gresham residents do not value walkable areas as defined by walkscore.com. The implication in this interpretation is that homebuyers put a premium on housing locations that are far removed from amenities such as schools and grocery stores, such as in a suburban location.

The second possibility could have to do with the significant limitations mentioned above regarding walkscore.com's rating algorithm. The website does not take into account many of the elements considered to be crucial in forming a walkable area, such as sidewalks, crosswalks, and low traffic volumes, among others. As mentioned in the Transportation Research Board report Does the Built Environment Affect Physical Activity, half of people polled by Gallup indicated that measures which would increase safety and otherwise ease the ability to engage in active transportation would increase these activities (2005). Furthermore, traffic safety in particular was singled out as a major barrier to walking, particularly for children. Streets can be made more amenable to walking through the use of traffic calming measures (speed bumps, elevated crosswalks, etc.) and by the use of sidewalk furniture, such as trees, benches, trash cans, and other features. None of the above features, though important to the walkability of the built environment, is measured in walkscore.com.

Another possible explanation for the difference between City Center and Rockwood could be self-selection of residents who value walkable neighborhoods. The idea of neighborhood self-selection is that residents will sort themselves into neighborhoods where household preferences are similar in regard to the built environment. Thus, a neighborhood with a low biking or walking travel mode share may not indicate very much about the built environment, but more that the residents do not put any value on biking and walking. Handy et al. (2006) explore the relationship between the built environment and walking with regard to neighborhood self-selection, and conclude that while the built environment may influence travel mode, a person's attitude toward walking was the most significant predictor of whether he or she engaged in that activity. While improvements in walking infrastructure may yield some increases in walking, the principle of self-selection based on attitudes and preferences seem to play a larger role in travel behavior. Central City and Rockwood, because of their built environment design attributes or some other quality, may present two of these self-selection nodes.

VII. Conclusion

Despite the environmental, health, and social benefits identified with walkable neighborhoods, housing prices in Gresham are negatively associated with walkability scores with the exception of two neighborhoods. This would indicate that overall, Gresham residents do not place a premium on walkable neighborhoods and are not willing to pay more to live in one. However, the findings for Rockwood and Central City may signal that some residents do value walkability and select their neighborhood accordingly.

Taking this study at face value, it would seem that promoting car-oriented developments geographically removed from amenities would best serve the preferences of residents in 14 out of 16 neighborhoods in Gresham. However, there are two reasons why this may not be the optimal policy direction. The first has to do with the limitations of the WalkScore tool itself. Since it does not take any built environment features into account other than the distance to the nearest amenity, a more refined tool may yield different results. Secondly, Handy et al. point out that even in self-selected "car-oriented" neighborhoods, modest gains can be made in walking and biking by improving the built environment. Given the public health, congestion, and economic incentives for increasing walking and biking, it may be decided that even these modest gains are worth the expense. Either way, further studies are required to better understand residential preferences.

One way to determine the value placed on walkable neighborhoods could be using a revealed preference model, where a random sample of residents are surveyed asking whether they prefer walkability features. Geospatial analysis could then be used to see how neighborhood preferences align with home values and walkability as indicated in the above analysis.

The fact that the analysis differs so greatly from a similar analysis conducted by Cortright indicates that there may be something interesting happening in Gresham that is different from other sites previously studied. This presents an excellent opportunity to gain more depth of knowledge on walkability and consumer preferences, allowing researchers in this field to understand a more nuanced model of how to best design new developments. Further study is needed to develop this understanding.

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