The Relationship between the Built Environment and Walkability

Navin Raj

Polytechnic Institute of New York University

The Relationship between the Built Environment and Walkability

Introduction. Some have nicknamed this country the "Fast Food Nation" because of our fast growing love of fast food, and even faster growing obesity epidemic. In New York, half of all adults are overweight or obese; this makes people susceptible to a plethora of diseases such as diabetes, heart failure, and arthritis (NYC Department of Health and Mental Hygiene, 2012). Overcoming these health issues is of utmost importance. Walking has been shown to be an important action for healthy adult activity (Leslie et al., 2004). Leslie et al. (2004) also cites the importance of the physical environment in the decision to walk across a neighborhood. Owen et al. (2007) agrees that the built environment attributes are related to physical activity and active transportation. Physical Activity in the urban environment is incredibly important given the high rates of obesity in cities such as New York (NYC Dept. of Health and Mental Hygiene, 2012). In fact, 23.7% of New Yorkers are expected to become obese, which can lead to massive health issues (NYC Dept. of Health and Mental Hygiene, 2012). Thus, features that allow physical activity in a city are incredibly important for the liveliness and health of citizens. There is a relationship between the built environment and the desire to walk; the relationship between the two can have positive impacts on health and economics of a local area.

This study is focusing on the aspects of a built environment that affect the overall walkability. We are asking what sets of built environment features affect walkability. Then, relating walkability to the larger socio-economic aspects of the area, we are asking how the built environment can be improved to encourage economic development and improve health, particularly in an urban setting.

Background. The study focuses on the neighborhood of Brownsville, Brooklyn, NY. Brownsville is located towards the middle of the New York City borough of Brooklyn.

Brownsville is bordered by the neighborhoods Bedford-Stuyvesant to the North, and Canarsie to the South.

According to the Long Island Exchange (2013) description of Brownsville, the major demographics are Caribbeans, Hispanics, and African-Americans. Brownsville has historically been a suburb of Manhattan for poor immigrants. Most of the buildings are residential, austere, and tightly-packed together; this is a reflection of the old-New York style of packing in residents, and mass-producing buildings at a cheap price. It was originally conceived to relieve congestion on the Upper East Side, but became incredibly dangerous in the late 1960s (Long Island Exchange, 2013). Brownsville was frequently rated as having the worst crime rates in the city, and was a center for gang warfare. Many of the buildings were abandoned lots as residents fled the area, and the area fell into disrepair (Long Island Exchange, 2013).

The poor reputation of the area led to widespread poverty. As the Brownsville Partnership (2008) describes it, concentrated poverty leads to the "highest rates of unemployment, poor health, crime, family violence, low educational achievement and overcrowding—conditions that make people vulnerable to losing their homes and community supports" (p. 1). Brownsville, according to the Partnership (2008), is at the center of the homelessness issue. It is a breeding ground for poor New Yorkers to become homeless New Yorkers, and has been vulnerable to public health issues since its downfall in the 70s. Brownsville is home to some of the NYC's major public health issues, the most prevalent of which is obesity. Brownsville has some of the highest rates of obesity in all of NYC, according to the NYC Health and Mental Hygiene Department (2012).

Figure 1
Obesity in Brownsville
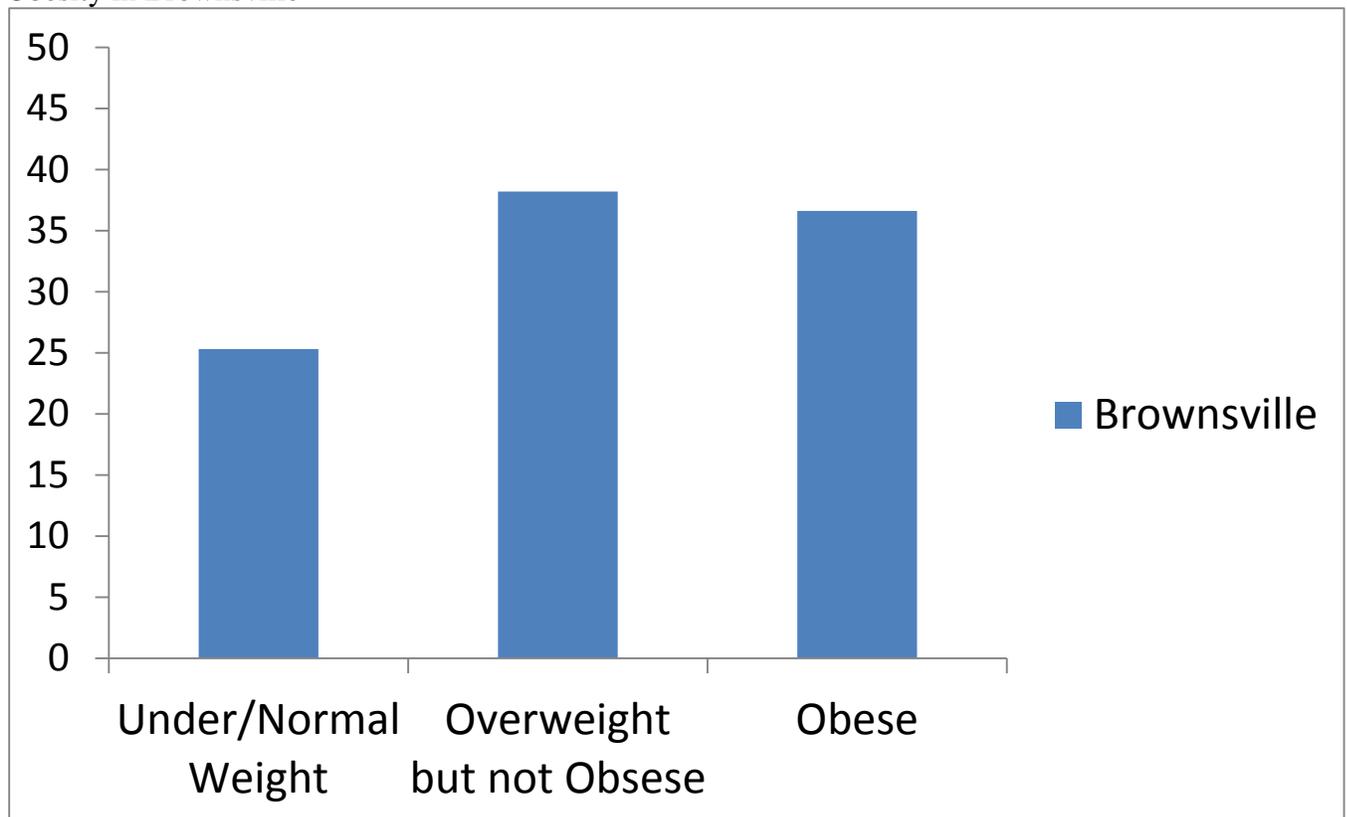
Note: NYC Health and Mental Hygiene Survey

As Figure 1 shows, the majority of Brownsville residents are considered obese. In fact, the

Health and Mental Hygiene Survey says that 36.6% of Brownsville residents are expected to

become obese, higher than the NYC average (NYC Dept. of Health and Mental Hygiene, 2012).

This can produce a serious health epidemic in the neighborhood, and can affect the economy, the

education, and the overall livelihood of the area.

Despite the major issues that face Brownsville, the area has improved greatly since the

60s thanks to strong leadership and community activity (Long Island Exchange, 2013). "It has

seen plenty of housing developments in recent times" (Long Island Exchange, 2013). The old

lots have been replaced with new community gardens, thus aiding the campaign against obesity.

The Brownsville Partnership has made it their goal to reduce the number of homeless in the area, and improve the quality of life. So, a new Brownsville is emerging from the ashes of the old. New investment into the community has brought in business along Pitkin Avenue. These shops have created a more vibrant Brownsville that is a community for citizens, rather than a dormitory for immigrants. The question remains, how can we help Brownsville protect the livelihood of its citizens through the design of their environment?

Patterns of Walkability and the Built Environment

Literature Review. Walkability is outlined by two major journals as a key factor in urban health (Frank et al., 2006; Leslie et al., 2004). Furthermore, both studies hinge on the notion that the limitation of walkability is due to specific built environment features, and can have an adverse affect on the health of a particular area. There is a correlation between non-mixed use neighborhoods, in which residents must travel elsewhere for work and play, and the increase in vehicle usage as opposed to walking. Frank et al. (2006) says that the distances between places where people live, work, and play are often too great to walk (p. 75). In fact, 85.5% of all work trips are made in private vehicles in the Seattle area that the Frank study was based in (Frank et al., 2006).

Experts agree that walkability is a public health concern, and whether a lack of physical movement can be tied to various diseases such as diabetes and heart failure (Owen et al., 2007). Where the examination turns is in the characteristics of the built environment that determine the walkability of a region. Frank et al., (2006) invests much time in the governance of the matter. Many of the characteristics of the built environment center on zoning laws, and restriction of certain land uses. The restriction of the land leads to the loss of mixed-use buildings, and thus the loss of the work-play-live balance (Frank et al., 2006). We see that Leslie et al., (2004) agrees with the notion of mixed-land use being an important design characteristic; however, puts a particular emphasis on street connectivity and the more suburban nature of her study. Based on the Hawthorne neighborhood, the street connectivity and location to metropolitan centers definitely became a different factor compared to the more urban-focused studies conducted on walkability. While other studies examined mixed-land use as a walkability factor, the Hawthorne

neighborhood stood out for its utter lack of connectedness and amenities, in general (Leslie et al., 2004).

The gap that seems to be missing from the discussion of the effect of walkability is a much larger ramification beyond public health. Walkability, in conjunction with its public health benefits, also brings foot traffic into an area. This foot traffic sets the tone for the economics and social aspects of the neighborhood, and can seriously change more than just the health. Frank et al. (2006) touches upon the concept of live-work-play communities, briefly as an example of poor government zoning (p. 75). However, where the discussion does not go is to the dangers of these communities not existing from an economic standpoint. In the case of Brownsville, the worse the reputation of the area, the less private investment went into the community. We can find a possible correlation between this lack of walkability and the economic misfortune. The existing research does not see fully beyond the economic scope of the issue. There is an attempted correlation between the socio-economic backgrounds of residents, and their willingness to walk, but the point of that data is not fully utilized (Leslie et al., 2004). Rather than view this as "wealthy people are refraining from walking," (Leslie et al., 2004), it can be interpreted as "wealthy people are moving out of certain neighborhoods *because* of the lack of walkable built environment factors."

Methods. In order to examine the relationship between the built environment and walkability; we needed to examine the two variables independently. The independent variable was the built environment features, while the pedestrian volume accounted for the dependent variable. First, the characteristics of the streets themselves were understood through the Irvine-Minnesota-Inventory (IMI) 2.0. The IMI was originally developed by Kristen Day, Ph.D.,

Marlon Boarnet, Ph.D., Mariela Alfonzo, MURP, and Ann Forsyth, Ph.D as a system of 162 different questions. It was used widely in research, and was tested for reliability.

Before the actual study could be performed, training was necessary to use the IMI 2.0. We were given in-class training on the procedures of the IMI 2.0, such as the various codes and regulations. Afterwards, the entire class performed a street sample in the area understand the actual survey process. Next, reliability testing was performed on the IMI 2.0 by every user. Four segments were surveyed near the Polytechnic Institute of New York University in Brooklyn. The results were then compared against the professors, and other students' results. Discussions were opened about why certain areas had low reliability. This allowed for mistakes to be corrected before the actual resting began.

The IMI 2.0 asked us 280 questions about the characteristics of a segment (the area between two intersections) that have been pre-determined as important to the hierarchy of walking needs. The questions range from the convenience of the road, to the landscaping, to the layout of the retail stores. For example, one question asked whether the curb cuts at each crossing-point were convenient to use. Another question asked if there is a school of any type on the segment. We marked down our answers in the IMI spreadsheet, and generally marked answers on a scale of 1 (yes) or 0 (no); 8 was not applicable. Sometimes the question was more expansive, and included various options such as "somewhat" or "few," in which case more numbers are added. We each marked down 20 segments in Brownsville of various styles with 10 out of the 20 segments being repeated for reliability. Each segment took roughly 20 minutes. For the safety of the raters, we performed the surveys on the Google Streetview mapping software. This provided accurate depictions of the segments in Brownsville, and all of the features. While this allowed us to take our time with the study, we were hampered by the lack of certain features.

For example, the smell of a segment could not be ascertained. Also, an accurate pedestrian count was difficult since the photos were out of date, somewhat. The dependent variable, as a result is somewhat skewed because of this fact. Nevertheless, Google Streetview proved a safe and convenient alternative to actually entering Brownsville. The data was inputted into the spreadsheet for correlation with the second data collection method.

The second method was an extra pedestrian/bicycle observation on various segments to count the number of people that walked or biked on the street, as well as their characteristics. This study is not usually a part of the State of Place process, and was added both to accommodate a student who could not do the IMI, and to add extra information. Over the course of 20 minutes, various pedestrians were counted, and characteristics such as gender and age were marked down. These served as a portrayal of the demographics on the street.

Findings. After the IMI 2.0 was performed, the collected data was analyzed to reveal certain areas to focus on for data analysis. All of this worked in conjunction to create a State of Place score for Brownsville. The state of place score is determined through an algorithm based on the most desirable characteristics for a street. This score can be used to improve upon the quality of the streets, and thus increase the economics and health of a region. It takes into account the following factors of the built environment: 1) Density, 2) Form, 3) Proximity, 4) Connectivity, 5) Parks and Public Space, 6) Pedestrian Amenities, 7) Crime Safety, 8) Traffic Safety, 9) Aesthetics, and 10) Physical Activity Facilities. These various factors are ranked as to their prevalence, and in order of importance to a region.

The score for Brownsville was 57.69 out of 100.14. This is taking into account all of the previously stated factors set against their level of importance. Each individual factor was also broken down and shown as an indicator.
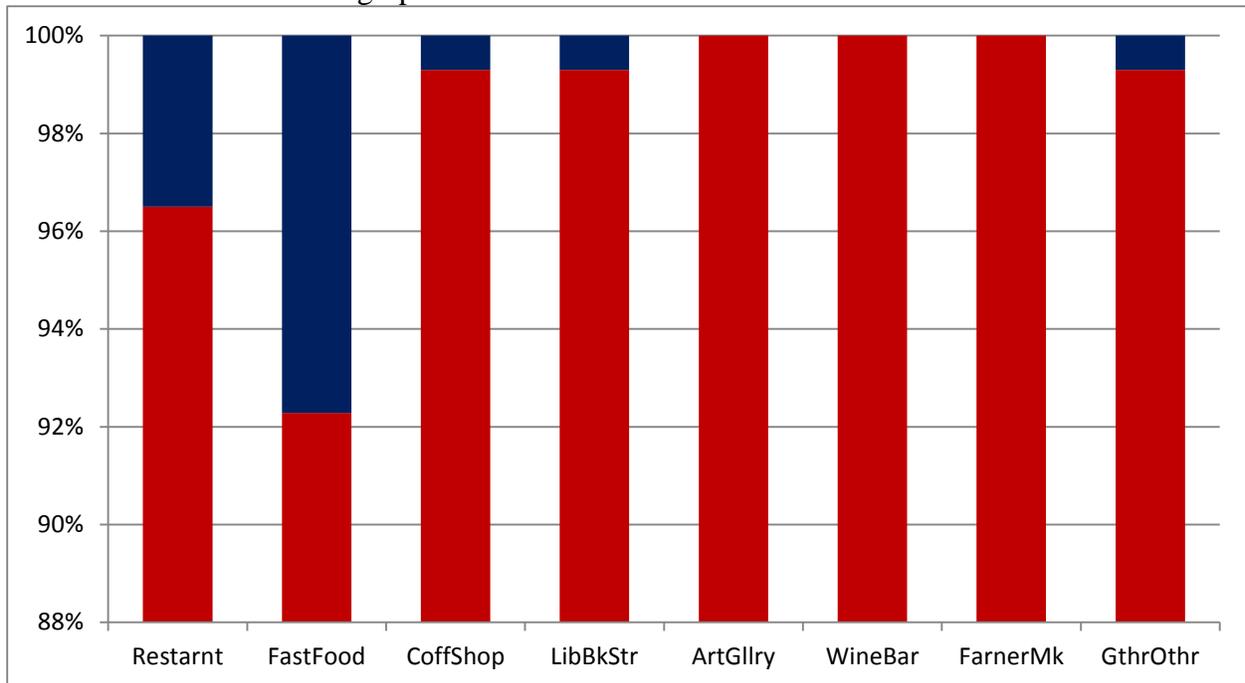
Figure 2

State of Place Breakdown
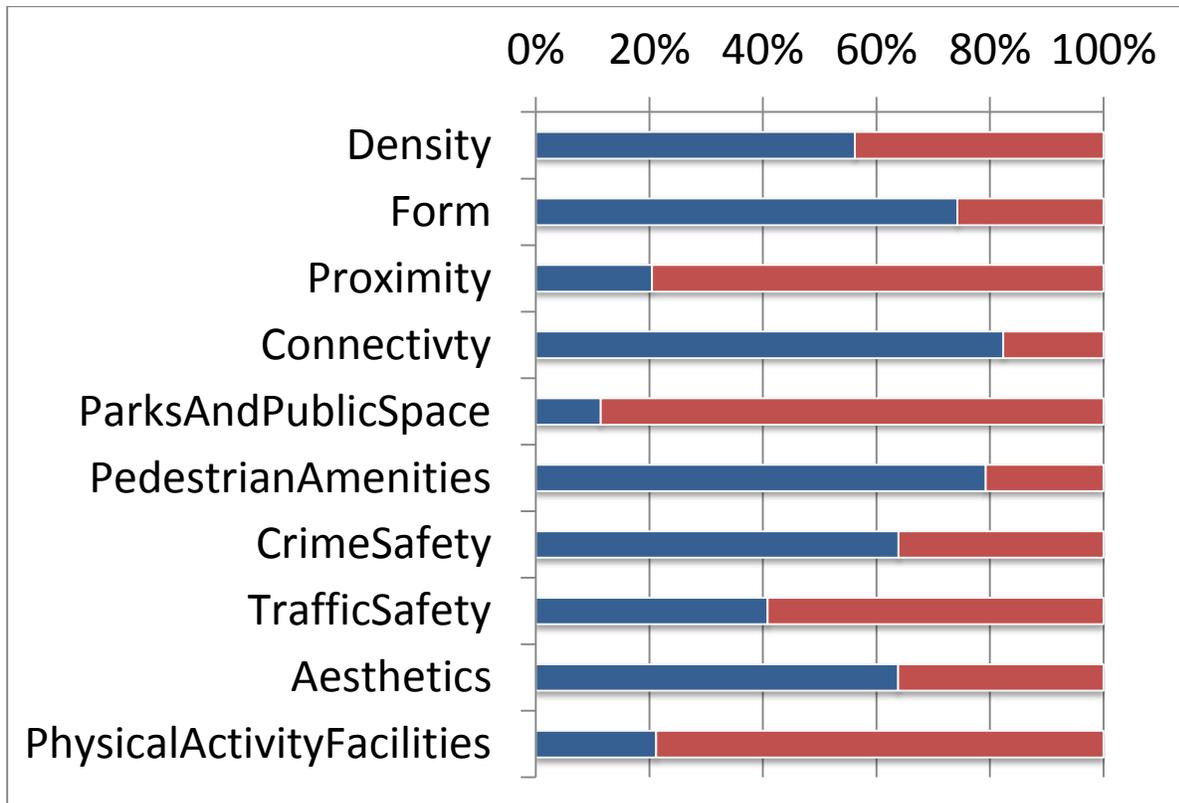
As the graph shows, the lowest indicators for the State of Place score were proximity, parks and

public spaces, crime safety, traffic safety, and physical activity facilities. Out of all of the

features that we were observing, these features proved to be the least prevalent in the segments.

These same indicators are further broken down below:

Figure 3
Presence of Social Gathering Spaces

The figure above shows, in red, the lack of the particular amenity, while the blue shows the presence of the amenity. As the figure shows, there are few amenities such as restaurants, book stores, or coffee shops; while amenities such as farmers' markets and art galleries are missing all together. On the flip side, the only group in which there are more versus less is in the fast food category. Thus, the proximity indicator correlates to the actual lack of many amenities in the region. There are few options in Brownsville, as indicated by this presence graph.
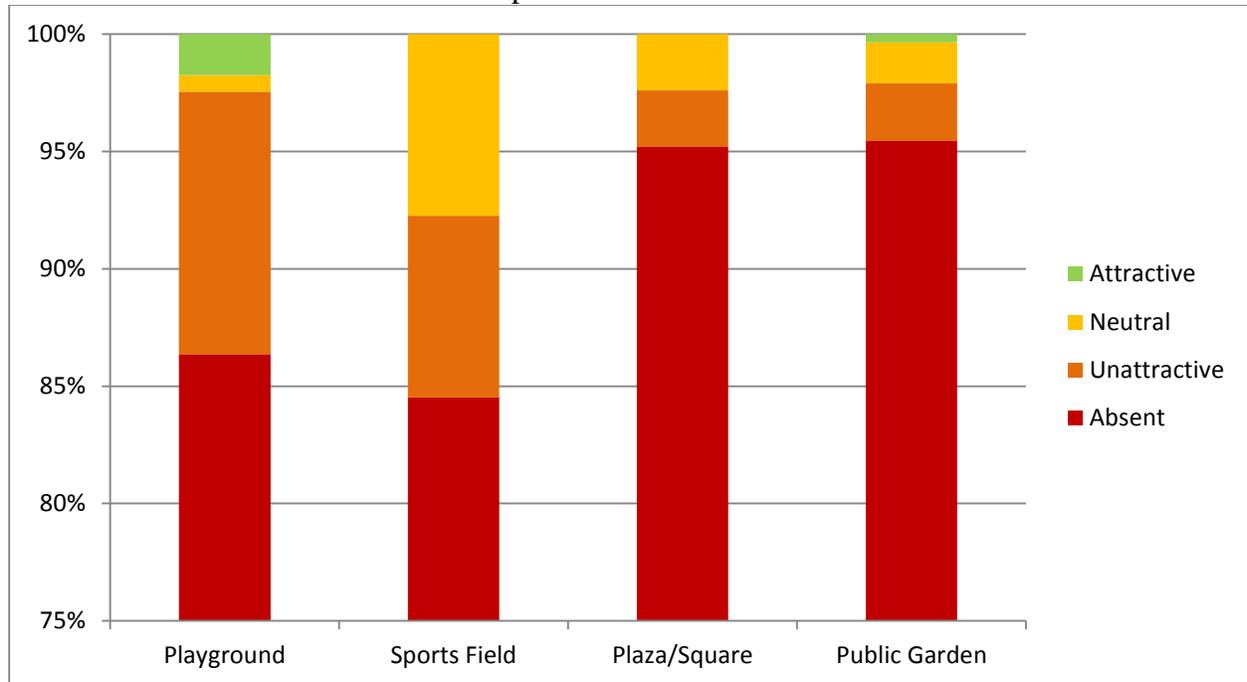
Figure 4
Presence of Public, Civic, and Institutional Destinations
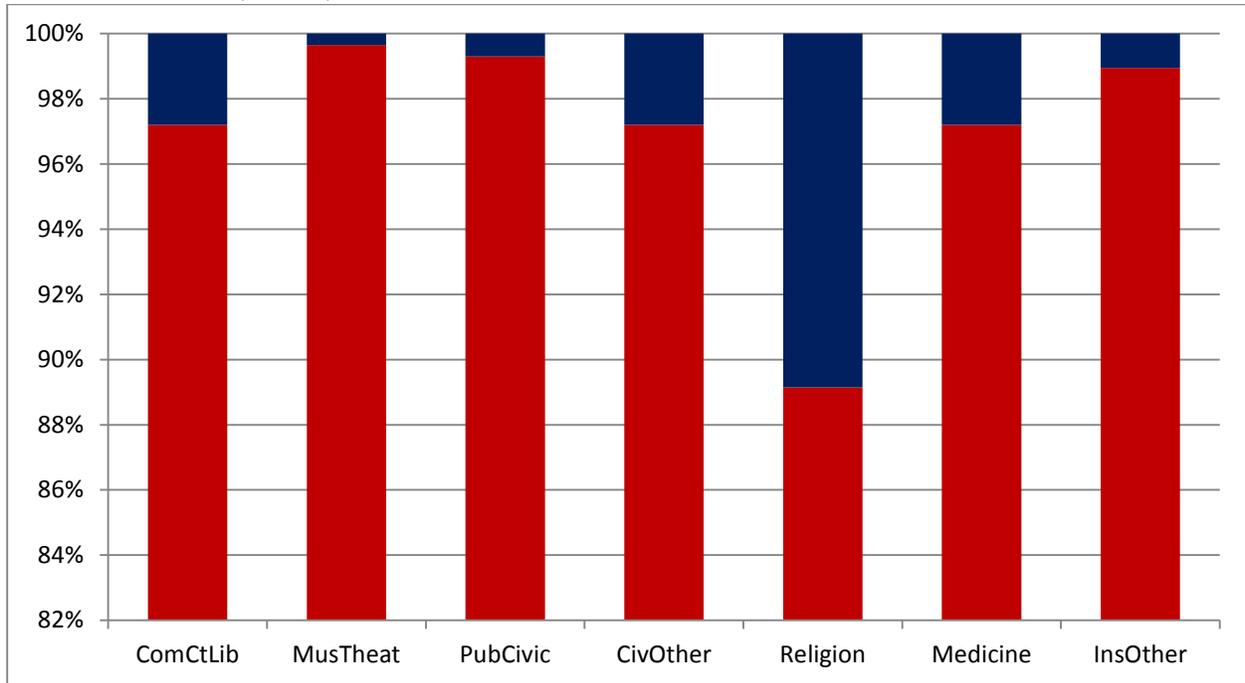
The figure above further displays the information about the presence of destinations. The red

shows a lack of various public amenities such as community centers, hospitals, and civic

buildings illustrating the lack of various building types in Brownsville that the proximity

indicator displayed.

We found parks and public spaces to be another low-scoring indicator on the State of

Place index.

Figure 5

Presence and Attractiveness of Public Spaces

As the figure indicates, Brownsville utterly lacks many of the public spaces found in urban

environments. Plazas and public gardens are virtually non-existent. While playground and sports

fields exist in small numbers, most of them are either unattractive or neutral. None of this

indicates a strong presence of public space for the local community, and relates to the low State

of Place score in this category.

The Crime Safety rating in the area was also considerably low, although not the lowest

score. The ratings for this section were based on many visual factors that related to safety for a

person on the street. It related both to a physical idea of crime safety, as well as a feeling that we

received from the segment.

Figure 6
Crime Safety Features
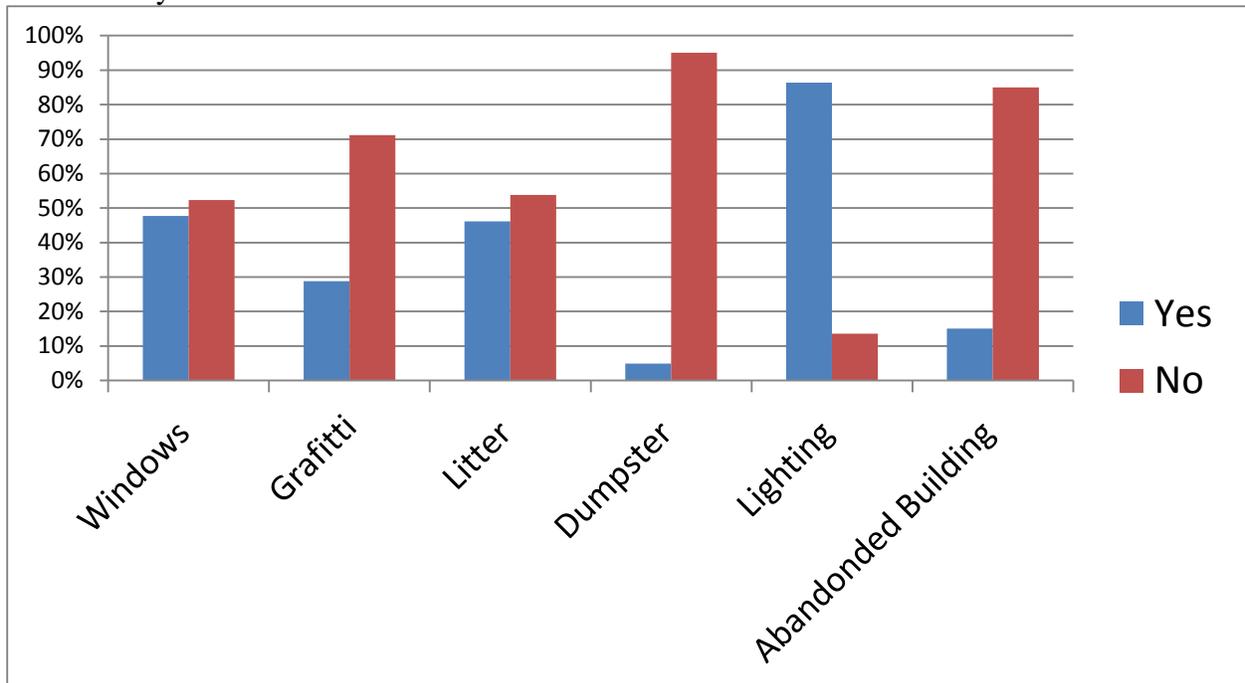
As the figure shows, most of the criteria for safety were actually not prevalent on the streets,

especially factors such as dumpsters and abandoned buildings. However, there were enough in

the small area of Brownsville to be relevant data. The most striking feature that related to the

crime safety was the street lighting. The graph clearly shows that we believed lighting was poor

in most of Brownsville.

Relating closely to crime safety was traffic safety, and while not the lowest indicator, it

ranked lowly enough in the data to be considered an important factor in the State of Place. The

Figure 7
Sidewalk Condition
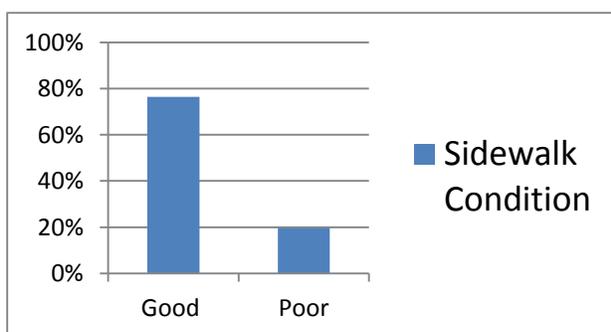
traffic safety features most closely examined were the crosswalk designs,

sidewalks, and presence of bike lanes. These

factors showed how safe the area would be to

a pedestrian using them against the traffic.

Although the sidewalk was considered in

mostly good quality, as the graph shows, and the crosswalks were present, the indicator was still ranked lowly. One factor of the traffic safety that ranked very lowly was the presence of bike lanes.

Figure 8
Percentage of Brownsville with Bike Lanes
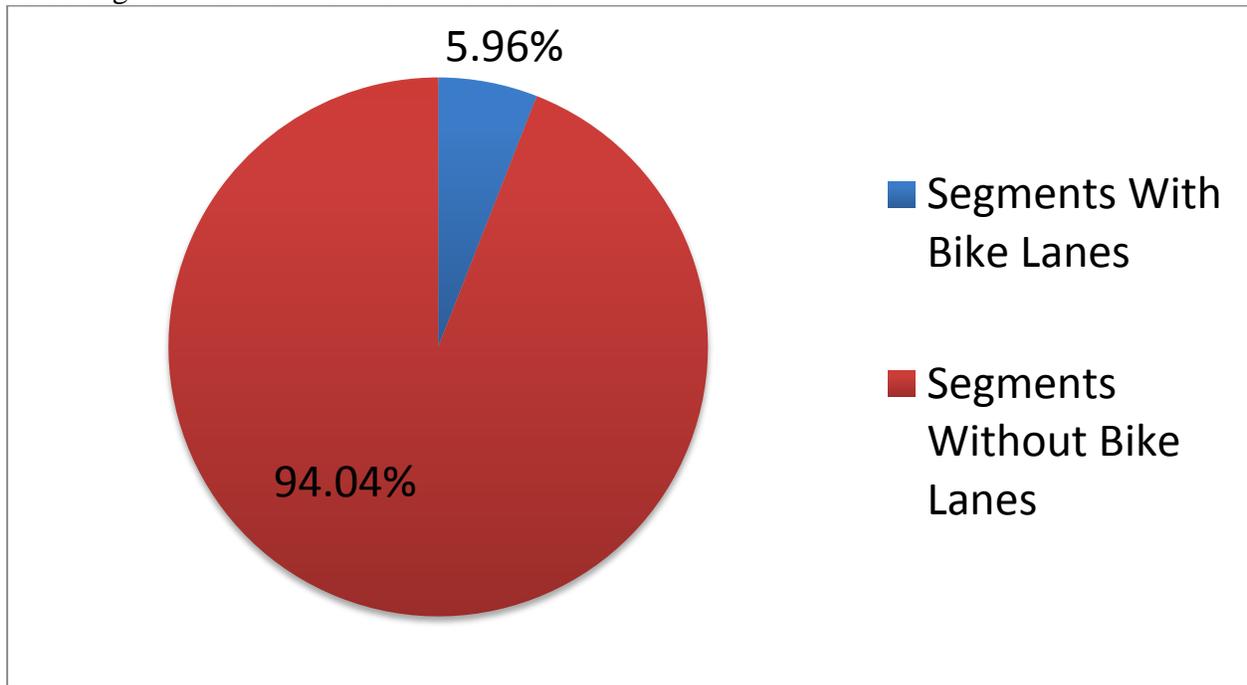
We found that the number of segments without bike lanes whatsoever greatly out-numbered those that did contain bike lanes. For bikers, this can be considered a traffic safety issue when competing with cars, buses, other bikes, and sometimes even pedestrians.

Finally, the physical activities indicator ranked among the lowest on the State of Place score, and this can be correlated to the data that was collected on the physical activity amenities. As Figure 9 below shows, activities that promote a healthy lifestyle, and allow for physical activity are low in Brownsville. The only significant amenity found was playground, where there were more playgrounds than not as the blue indicates. However, for adult-friendly activities, there are few options. Gyms and fitness centers are not frequent, not are areas that promote walking through their beauty such as gardens or plazas. There are some sports fields.

Figure 9
Presence of Spaces Promoting Healthy Lifestyles
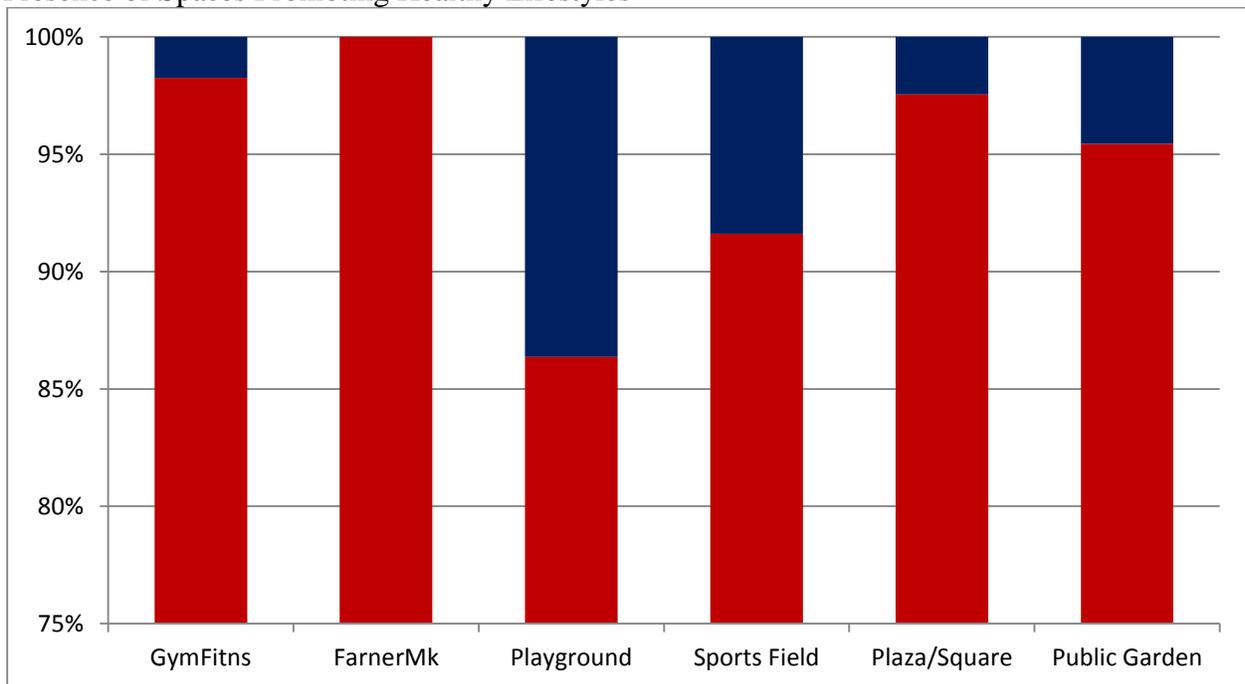
Another data point examined was the pedestrian volume along the streets while observing; as previously mentioned, some of this was skewed by Google Streetview. This data was used to correlate the built environment features to the walkability. The presence of people (or lack thereof) given a segments features gave the indicators for the State of Place score.

Figure 10
Pedestrian Volumes
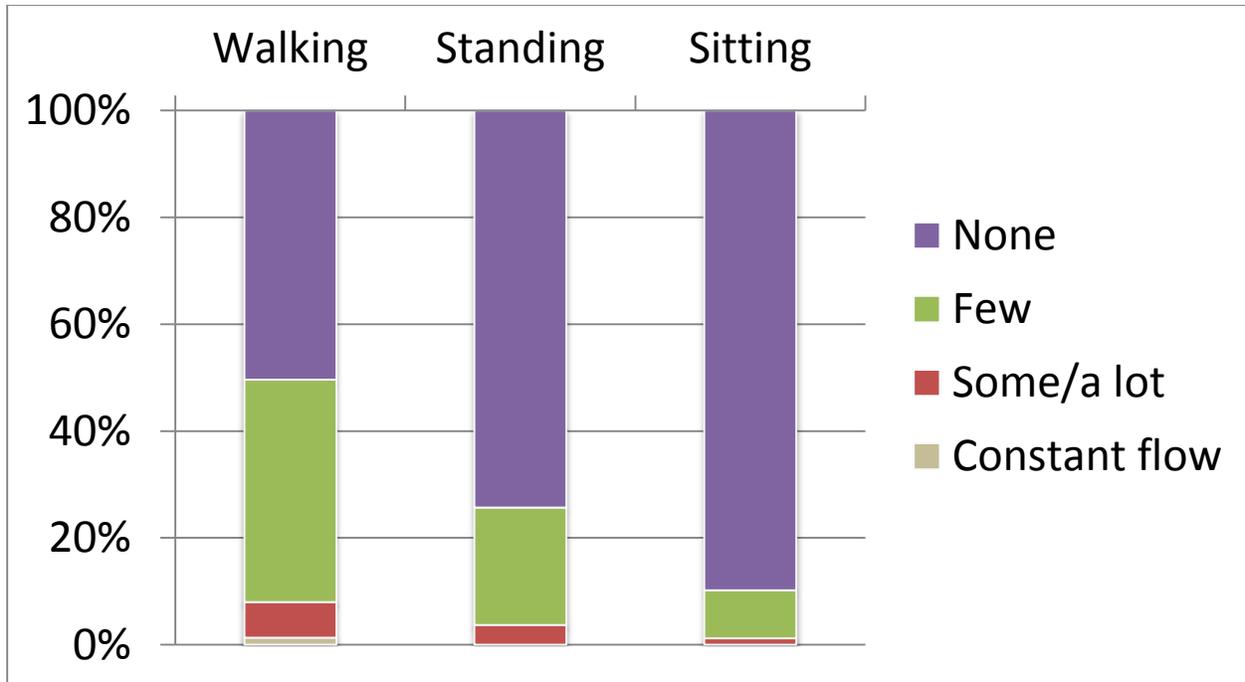
On the segments it was observed that the majority of streets did not contain many people walking standing or sitting. In fact, the majority of streets had no people performing either of the activities. This indicates few people interacting with the built environment.

Figure 11

Relationship between Pedestrian Volume and State of Place
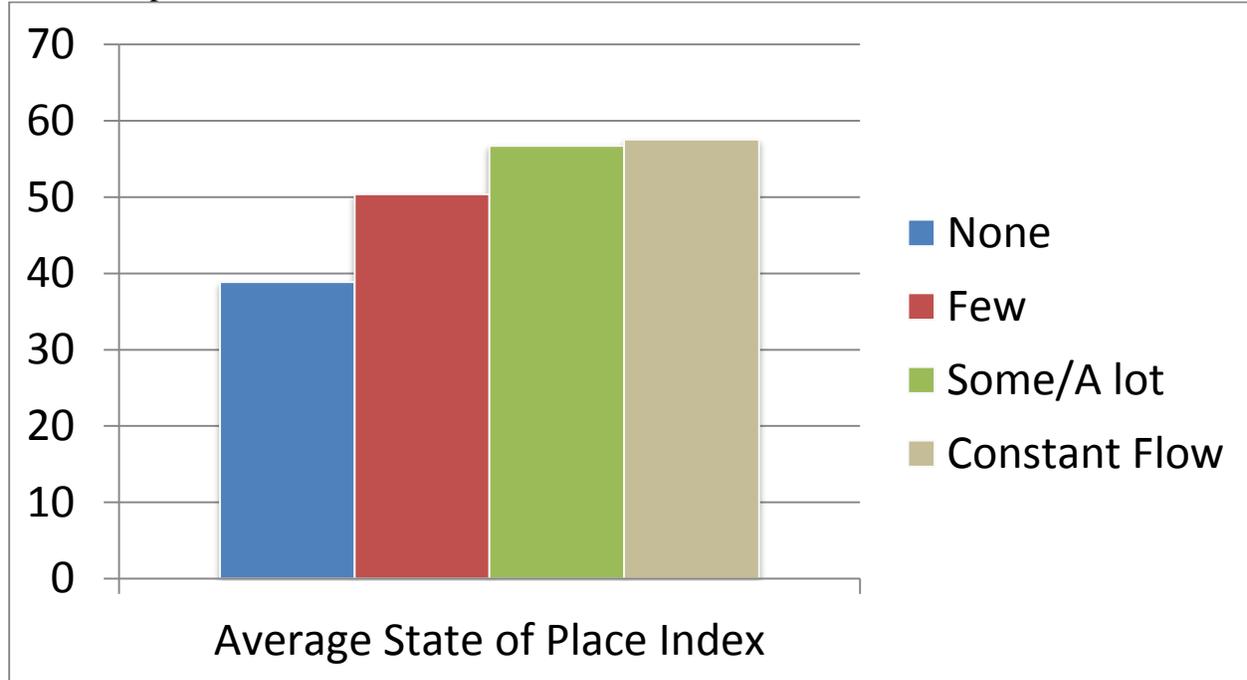
The graph above shows that there is a correlation between pedestrian volume and State of Place. As the State of Place score increases, the pedestrian volume also increases. Thus, a constant pedestrian flow is observed in an area of high score, or at the right end of the graph. When street observations occurred, this was observed physically in area that contained the more appealing built environment features.

Discussion/Recommendations. Understanding what the raw facts mean is important before understanding what can be done to help Brownsville. As clearly pointed out by the low State of Place score of 57.69, Brownsville has a problem with its built environment features which is now affecting the walkability, as indicated by the low pedestrian volumes. The problem exists, then, in the area of proximity, public spaces, crime and traffic safety, and physical activity facilities. In order to raise the public health of Brownsville, the problems that exist in those areas must be understood. This can be boiled down into two problems: First, there are few actual destinations to walk to in Brownsville. Second, there are few places promoting public health in

Brownsville. This results in a reticence to be active in the community, and hurts the local

economy, the public health, and the image of the area. All of this is also affected by the fact that

the methods that exist to promote walkability are not well maintained or existent. Thus,

Brownsville suffers.

Specifically, Brownsville lacks proximity, or different types of destinations. As the figure

indicated, Brownsville barely had any restaurants, theaters, public parks, or other features that

would encourage someone to leave their home. From the street surveys, we found endless rows

of homes and derelict buildings. There is a low score for proximity and public spaces in

particular, which is a clear indicator that there is nowhere to go in Brownsville. Missing these

crucial facilities such as gardens or retail can leave people reluctant to explore their own

neighborhood. This also relates to the lack of physical activity areas. Since Brownsville

physically lacks these amenities, the community cannot partake in them. The entire area suffers

because no one is able to leave their home and be active on the street, or in an approved area,

such as a public pool or field. The one feature Brownsville had a wide selection of was fast food

establishments. In figure 3, the only factor that had a positive rating was fast food, which

unfortunately has a negative health effect. Thus, the destination features of Brownsville

encourage the citizens to walk to unhealthy establishments, while refraining from offering

healthy alternatives.

There were some aspects of the built environment that existed in Brownsville; however,

figure 5 indicated general unattractiveness, which was common to many aspects of Brownsville.

This unattractiveness factored into the overall lack of safety in the area. Crime safety is related to

aspects such as proper lighting. Much of Brownsville lacked proper lighting, and if there is little

lighting, the citizens are less inclined to walk the streets. Furthermore, safety is hampered by the

bars on windows and the vacant lots. This all creates a feeling that Brownsville is desolate and unsafe. Furthermore, the fact that there are unattractive and a lack of amenities results in less people on the street, which thus results in a less safe environment because of the "eyes on the street" concept. With less people on the street, there are now less people to witness crime. Thus, crime is more likely to occur, and the entire area becomes even more unsafe. The vicious cycle results in less people venturing out onto the street for safety reasons. This is the sentiment in Brownsville with its lack of destinations or lighting. Thus, the overall problems in Brownsville is that there are a lack of amenities that encourage people to use their streets. With few people using the streets, the area feels unsafe, and few people are encouraged to partake in physical activity. This exacerbates the problem of obesity in Brownsville, and further affects the economic situations in Brownsville.

So what can Brownsville do to uplift itself from this vicious cycle? The most important step Brownsville can undertake to uplift itself, and improve the State of Place score, is to add more amenities. The two lowest areas were the public space and the physical activity indicators. There was just not enough to do in Brownsville that encouraged the community to leave their homes. To remediate this, we recommend Brownsville add programming to the local parks and public spaces that currently exist. This programming can come in the form of music events, or street fairs that invite local community members to partake in their existing surroundings. Engaging the community head on is important because there is so little space to begin with. A model for this system is Bryant Park, which operates as a private-public corporation. The park puts on various events such as theater productions and health events. Brownsville has a large field along Christopher Street, for example, which could serve as an activity ground for the

community. This sort of programming in a mostly residential community can bring people out onto the streets, which will then raise the public safety.

The other major change Brownsville can make to increase their State of Place score would be to improve the design of their neighborhood. In data collection, we found that Brownsville contained block after block of the same style of home. It was a tiresome design that did not inspire a citizen to browse their neighborhood. A dynamic area with signage and small shops would encourage more people to explore their interesting neighborhood. This goes along with adding more amenities; adding beautiful amenities is especially important. Furthermore, the design stretches to avoiding vacant lots and broken windows. Additionally, Brownsville must maintain the sidewalks and crosswalks it already has. This will definitely raise public interest in using the street because safety and intrigue will rise.

With more people interested and feeling safe enough to leave their home, Brownsville can begin to see an improvement in activity. An active community is also a breeding ground for economic benefits. New businesses will move into an active area, which come in the forms of new restaurants and markets. This aids in the health improvements in Brownsville, and can now begin to truly improve the obesity epidemic in the neighborhood. These built environment features must first by physically changed before an improved walkability standard can be found. As the data we collected has shown, improved features results in improved walkability. Walkability is correlated to the health benefits. Only by actively changing the features of Brownsville can the community effectively see change.

References

Frank, L.D., Sallis, J.F., Conway, T.L., Chapman, J.E., Saelens, B.E., Bachman, W. (2006).

Many Pathways from Land Use to Health: Associations between Neighborhood

Walkability and Active Transportation, Body Mass Index, and Air Quality.

Journal of the American Planning Association, 72(1), 75-87.

http://dx.doi.org/10.1080/01944360608976725

Leslie, E., Saelens, B., Frank, L., Owen, N., Bauman, A., Coffee, N., &Hugo, G. (2004).

Residents' Perceptions of Walkability Attributes in Objectively

Different Neighbourhoods: a Pilot Study. *Health and Place, 11,* 227-236.

 Retrieved from http://ipenproject.org/documents/publications_docs/LESLIE.pdf.

Long Island Exchange. *Brownsville, Long Island*. (n.d.).

Retrieved from http://www.longislandexchange.com/brooklynqueens/brownsville.html.

NYC Department of Health and Mental Hygiene. *Healthy Living: Obesity.* (2012, May 10).

Retrieved from http://www.nyc.gov/html/doh/html/living/obesity

Owen, N., Cerin, E., Leslie, E., duToit, L., Coffee, N., Frank, L.D., Bauman, A.E., Hugo, G.,…

Sallis, J.F. (2007). Neighborhood Walkability and the Walking Behavior

of Australian Adults. *American Journal of Preventive Medicine, 33(5),* 387-395.

doi:10.1016/j.amepre.2007.07.025.

The Brownsville Partnership . (2008). *The Brownsville Partnership: A Community Approach to

Ending Homelessness before It Begins.* (n.d.)

Retrieved from http://cmtysolutions.org/projects/brownsville-partnership.