



RESEARCH ARTICLE

ASSESSING CRIME AND WALK SCORE IN MIAMI-DADE COUNTY

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ABSTRACT

Objectives: The safety and walkability of a school neighborhood can influence the health of children, yet few studies have attempted to quantify and compare these objectively. This paper will assess safety and walkability using total crime indices and Walk Score in three areas within Miami-Dade County, FL.

Methods: Schools in Hialeah, Pinecrest, and Miami Beach were selected based on average income levels and assessed based on total crime index and Walk Score. Using Tableau 10.4, these measures were mapped.

Results: Hialeah's selected area represented the lowest total crime index of 96 and the median average Walk Score of 55. Pinecrest's included the highest total crime index of 337 and the lowest average Walk Score of 32. Miami Beach's area depicted the middle total crime index value at 215, with the highest average Walk Score of 86.

Conclusions: The average Walk Score did not seem to have any relation to total crime index and areas were not more walkable nor safer in the highest income neighborhood.

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INTRODUCTION

The built environment can play an important role in the health outcomes of individuals. Characteristics such as walkability and safety of a neighborhood can influence an individual's time spent outdoors (Saelens 2008). Consequently, research has shown declines of children in the U.S. walking to school. This decline was attributed to parental safety concerns and the walkability in the surrounding areas near the schools (Kerr, 2006). Because of this, children in grade school may less likely to engage in physical activity and can contribute to the prevalence of childhood obesity in the U.S. Currently, about 13 million children and adolescents between the ages of 2 and 19 years old are obese. With unfavorable neighborhood conditions, chronic conditions such as obesity and diabetes could become more prevalent throughout the country (<https://www.cdc.gov/obesity/data/childhood.html>). Through this paper, the Walk Score and total crime rate of elementary schools' neighborhoods in Hialeah, Miami Beach, and Pinecrest located in Miami-Dade County, Florida are studied.

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Previously, researchers have attempted to discover the various factors that could influence active commuting to elementary schools. In a study by Oluyomi et al., researchers performed a cross-sectional analysis to evaluate the relationship of traffic and personal safety as it relates children actively commuting to school in 81 elementary schools in Texas. In this study, they found that parents were more likely to not allow their children to walk to school if the sidewalks in the surrounding neighborhoods near the school were poorly maintained and traffic was a major concern within the area (Oluyomi, 2014). Another study by Kerr et al. in Seattle, WA also examined the relationship between active commuting to school as it relates to the environment, parental concerns of safety, and the socioeconomic (SES) levels of neighborhood areas. In this study, they found that children who attend schools in higher SES areas were more likely to actively commute to school than those in low SES areas. Additionally, children were less like to actively commute to school if parents have concerns regarding personal safety in those areas regardless of SES (Kerr, 2006). In a study done by Mendoza and Liu, an analysis was completed to assess neighborhood safety, school travel, and obesity rates of elementary schools within the U.S.

Researchers also found that children that actively commuted in in kindergarten in both unsafe and safe areas was associated with a lower Body Mass Index (BMI) in fifth grade (Mendoza, 2014). Overall, these studies reveal that there is an association between neighborhood characteristics and safety that may influence active commuting for children to elementary school. However, these studies are limited due to the lack of objective measures used to assess neighborhood characteristics such as walkability and crime rate. Instead, these studies use questionnaires and perceived opinions to assess neighborhood quality and safety. Similar to the studies described above, this study will focus on the neighborhood characteristics and safety around elementary schools. However, this study will use objective measures such as median income, Walk Score and crime rate around neighborhoods in Miami-Dade County to assess if these factors are associated. Additionally, areas including Hialeah, Miami Beach, and Pinecrest were chosen to represent the various SES within Miami-Dade. This study could be used to inform future research to increase safety and walkability to promote active commuting in children as well as be used as a tool for urban planning throughout Miami-Dade County.

METHODS

Setting

During this study, the population deduced was the elementary school students of the Miami-Dade County in Florida found from the Discover M-DCPS Website.⁶ To select areas to study, average incomes were assessed using Income by Zip Code.⁷ Income by Zip Code uses the US Census Bureau and the American Community Survey 2015's five-year estimates, which have the most current comparable income statistics available to calculate the average incomes by regions.

Consequently, Hialeah, Pinecrest and Miami Beach were chosen to represent low and high-income areas within Miami-Dade County. Hialeah consists of 33018, 33016 and 33015. Pinecrest, within Miami, consists of 33156. Miami Beach is made up of 33141, 33139 and 33140. After choosing the three regions, the elementary schools in each area were found and inputted into a table: seven in Hialeah, three in Miami Beach and three in Pinecrest.

Environmental Measures

The total crime index, from the South Florida Business Journal datacenter article *Miami-Dade Crime Rates by Zip Code*, was used to indicate the crime within each zip code in each region.⁸ Scores for the following sections of personal crime, murder, rape, robbery, assault, property crime, burglary, larceny, and motor vehicle theft were combined to determine a value for total crime index by zip code, for which the specific algorithm was not published. The South Florida Business Journal used a third party analytic parsing service, Caspio, to calculate the indices on September 27th, 2013. This total crime index should be interpreted as an area with an index higher than 100 is more likely than average to have crime, which was used as the basis for comparison of the three regions "crime" values. Additionally, Walk Scores for each zip code were collected using the Walk Score website, which provides scores by addresses and zip codes.⁹ Walk Score is a tool used to describe neighborhood walkability derived from the distances away from various amenities on a scale from 0 to 100 (Brown, 2013).

Procedure

In order to study these environmental measures, total crime indexes and Walk Scores were mapped together using Tableau

Walk Score and Total Crime Index by Zip Code

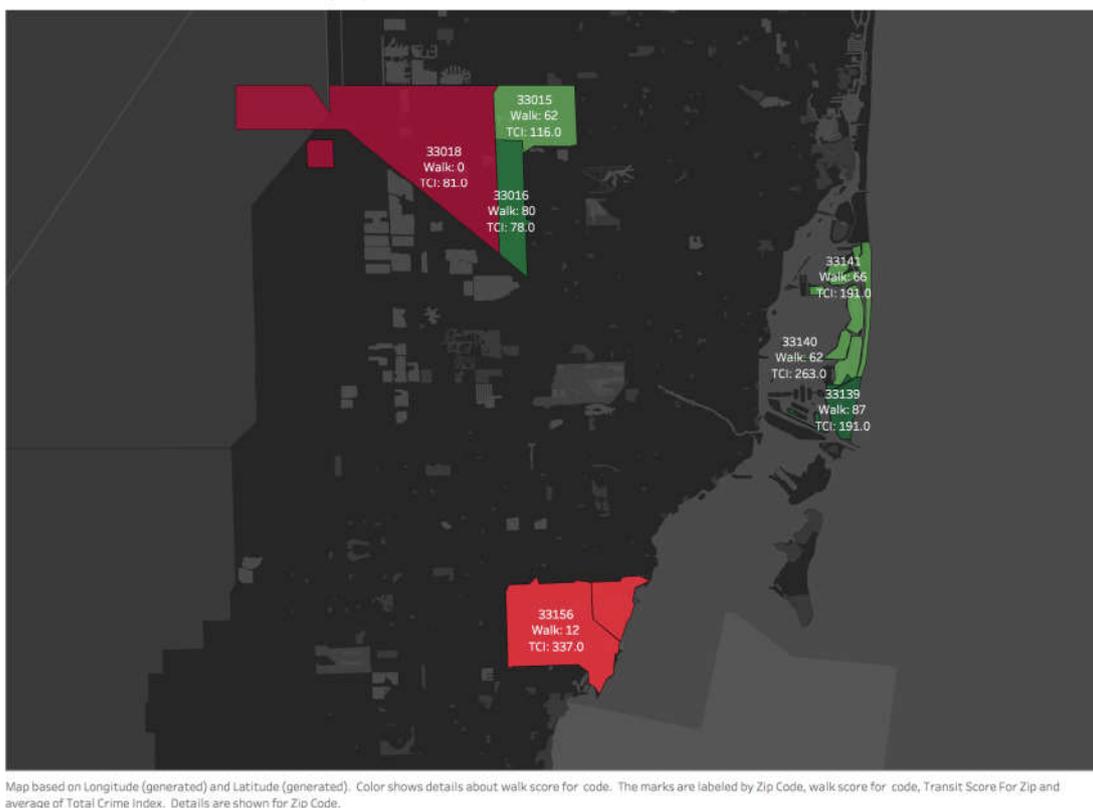


Figure 1. Walk Score and Total Crime Index by Zip Code. This figure represents the Walk Score (Walk) and Total Crime Index (TCI) for Zip Codes included in this comparison and is colored based upon how walkable the neighborhood is

10.4 and Google Maps. Walk Score was measured with regards to zip code and elementary school addresses, but compared in maps below only using the zip code derived score for continuity since total crime index were measured by zip code due to limited access to crime index information by neighborhood. Figure 1 (above) depicts the three areas we selected – Hialeah (top left), Miami Beach (middle right), and Miami/Pinecrest (bottom right) for our comparison of walkability and crime score index.

areas higher than 100 are more likely than average to have crime. Whereas the other areas, Miami Beach (low-middle) and Pinecrest (upper-middle) had average TCIs of 215 and 337 respectively. It is also important to note that TCI, as mentioned above, was calculated by a third-party source and the algorithm was not detailed, which could lead to inaccuracies. Figure 2 represents the Walk Score by school address, for which the latitude and longitude was utilized for each school to calculate the Walk Score and mapped in Tableau.

Walk Score by School Address

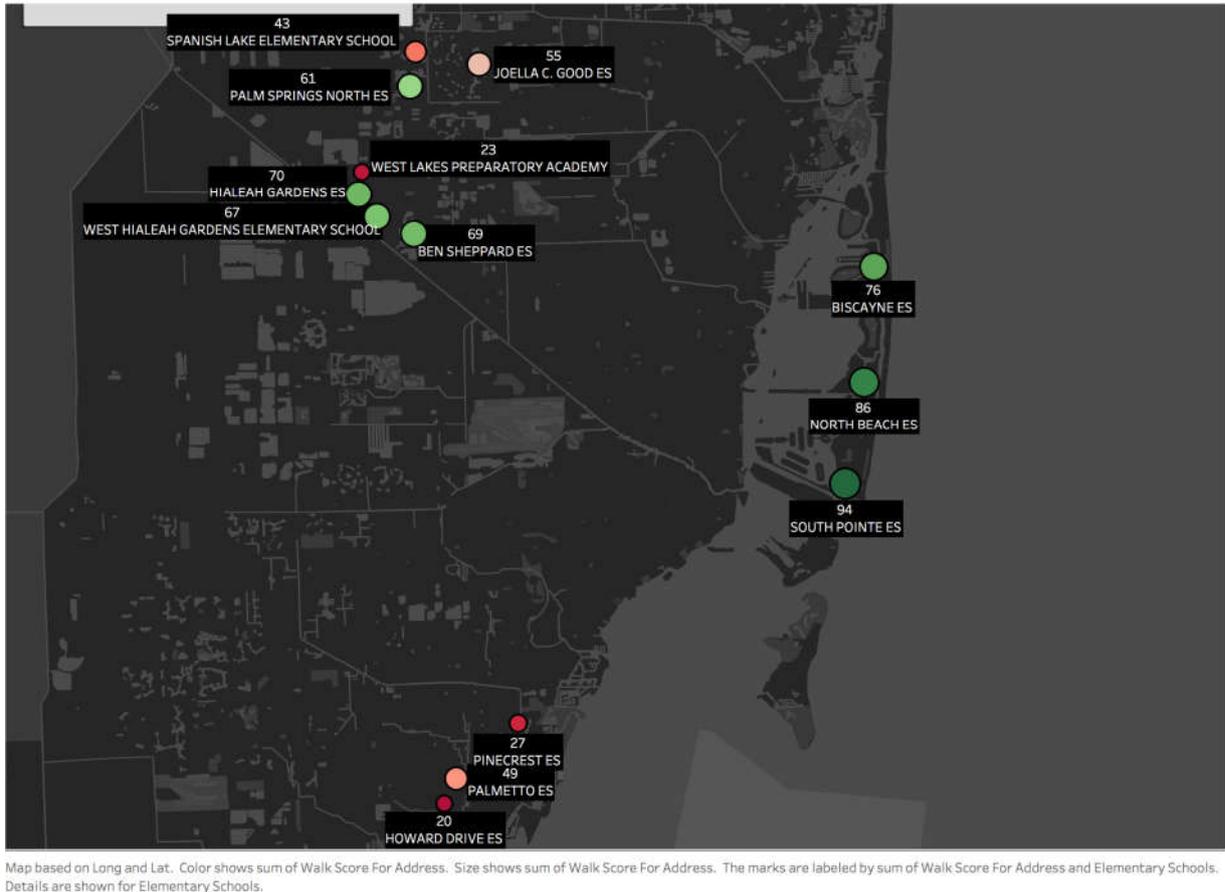


Figure 2. Walk Score by School Address. Figure 2 represents each school's location, which we used to calculate the Walk Score and represented this data by population size as well

The first value in each section depicts the zip code, followed by the Walk Score (Walk) figure and finally Total Crime Index (TCI). Since this sample was not large enough to run a correlation analysis between the two variables in question, the variables are depicted here by colors, which are scaled on a gradient. The darkest red represents the worst Walk Score, which was in this case 0, up to the darkest green, which represents the highest and most walkable score in our dataset with an 87. Because the TCI was calculated using the zip codes and not specific elementary school addresses, the Walk Score values were calculated based on zip code only in Figure 1. It is important to note the limitation of this feature, as this calculation arbitrarily places the pin somewhere within the zip code, which for 33018 was in the middle of a highway intersection, which is understandable why the value then was 0, as the middle of the highway is the most un-walkable location possible. We assumed that the higher income areas and more walkable areas would have lower crime indices, but in this case the data indicated otherwise. Hialeah had the lowest crime index of our data, 95, which based upon our source indicates that the average for the country is 100, so

Further, the circles represent the location of each school and are sized based upon their location, detailed in Table 1 and are colored on a gradient where the darkest red represents the poorest Walk Score, which in this case was Howard Drive Elementary School, 20, and the darkest green represents the highest Walk Score, which was South Pointe Elementary School, 94. Figure 3 and 4 represent birds eye views of the elementary schools with the lowest Walk Score and the highest Walk Score respectively in this dataset. Figure 3 is a representation of Howard Drive Elementary School, which has a Walk Score of 20 and is on two quite busy roads with few amenities in walking distance. South Pointe Elementary School is represented in Figure 4, with a designation of Walker's Paradise from Walk Score totaling 94, depicts shady and wide sidewalks with nice trees. Further, the neighboring roads have clearly defined crosswalks and rounded corners which encourages slower driving, and amenities nearby. Though the TCI at South Pointe Elementary School is 191 in the zip code, that is much lower than Howard Drive Elementary School's zip code which is 337, which also may encourage physical activity and walking instead of driving.

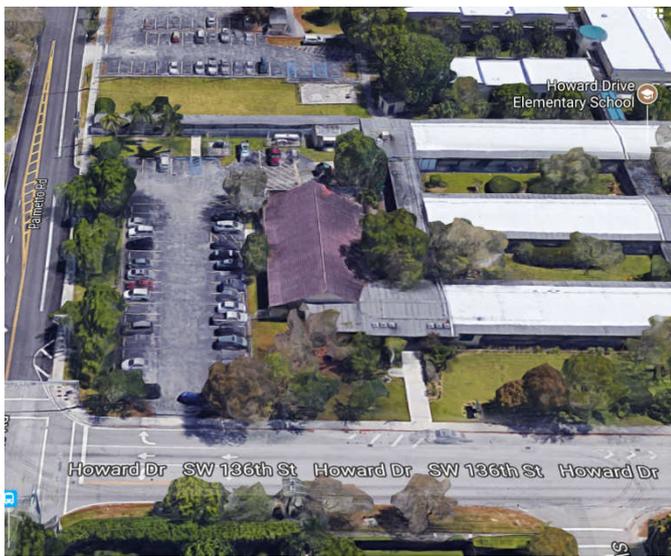
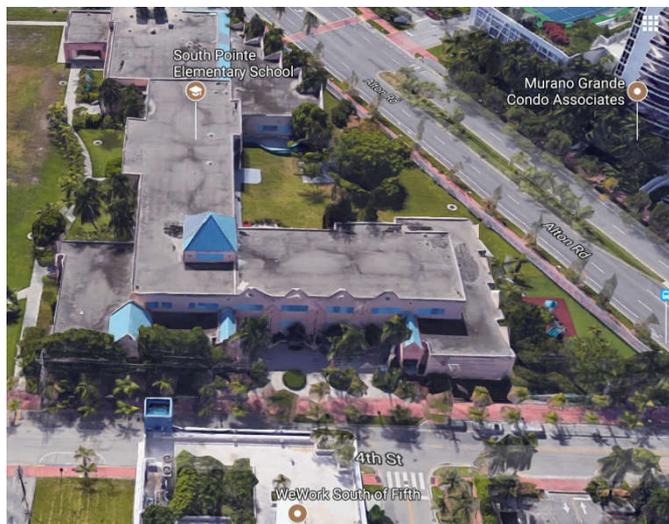


Figure 3. Howard Drive Elementary School – Google Maps, Street View – October 2017



Source – Google Maps, Street View - October 2017

Figure 4. South Pointe Elementary School

An appendix is included after the references (Appendix I) depicting the tabulated results.

DISCUSSION

General Summary

Within the included zip codes, Hialeah's average population was 54,071 with an average median household income of \$48,963, representing a low-income area. The average Walk Score by zip code was 38 and by elementary school address it was 55, which indicates the elementary schools were at least in more walkable locations within their zip codes. The average Transit Score by zip code and elementary school was 23 and 33 respectively. The TCI was the lowest in this area at only 96 on average. For the area included Miami/Pinecrest, the population was 33,269 with an average median household income of \$95,945, representing the upper-middle class area. Miami/Pinecrest's Walk Score's average was 12 for zip code and 32 for elementary school addresses and Transit Score's average was 13 for zip code and 21 for elementary school addresses. The TCI was vastly highest in this area, totaling 337. Miami Beach's included area represented an average

population of 32,152, with an average median income of \$48,076, representing the low-middle income area. The average Walk Score was 72 for zip code and 86 for addresses and Transit Score was not able to be calculated for zip code and 52 for addresses. The TCI was relatively high in this area as well, valued at 215 on average. In summary, the assumption that higher income areas would have lower TCIs was the total opposite in this study. Further, Urban Sprawl clearly plays a role in how our communities are built and suburbs like Pinecrest represent a more car-dependent area. As studies have indicated perceived safety influences people's likelihood to walk or bike instead of drive, it should be further investigated whether a crime measurement is correlated with Walk Score and walking and physical activity level.

Implications for Studying the Environmental Measures

One of the main takeaways of our study revolved around the finding that median household income did not appear to be a significant predictor of walkability or crime rates, contrary to our research team's initial hypotheses. Our team learned that Walk Score is only a reliable indicator when it is used from a specific address, and our team would not recommend that further research utilizes the current software for entire zip codes. However, utilizing Walk Score provided an objective, numerical metric that could be used for direct comparison for pinpoints on the neighborhood grid. Another notable strength to the approach used in this research is that it is one of the pioneer studies exploring an association between Walk Score and crime. This is an important factor, as previous studies have revealed that a limitation of Walk Score lies in its inability to account for "neighborhood environmental constructs such as sidewalks, crime, perceived safety, and the quality of destinations." (Brown, 2013). An additional strength is that Walk Score has been utilized in public health research both nationally and internationally. Thus, further studies can be adopted and adapted by international researchers to continue exploring the relationship walkability has with public health in their respective countries.

In addition to the caveats already mentioned, there were some key limitations regarding the metrics used for this study. Walk Score was not wholly available for entire zip codes, as seen in the maps it was available for some zip codes but not for others. This inconsistency of data calls to question how the zip codes truly stack up amongst one another in terms of overall pedestrian walkability. Additionally, Walk Score indicates the facilities available to walk to, however, it does not inform the client of the safety in that area. The Walk Score was compared to the total crime index which, however, both of these data are from different timepoints; Walk Score was updated in 2017 and is updated on a continuous basis while the total crime index was from September 23rd, 2013, a time from which the data has now altered. Also, the values for the zip codes were based off of estimated in 2015 which means these values were inflation-adjusted dollars, later downloaded in 2016 and used for this research in October 2017. Another major limitation is that aggregated crime data is difficult to verify as accurate, as it is likely that a far greater number of crimes occurred than what was reported. A range of factors might influence an individual's decision to report or not report a crime such as social connectedness, emotional distress, lack of trust from law enforcement, immigration status, and other demographic factors. For example, research has shown that older white females who are married are the kind of victims/witnesses

most likely to report crimes (<https://journalistsresource.org/studies/government/criminal-justice/crime-unreporting-emotional-distress-police-response>). Compared to youth and minorities, older whites are more likely to trust the police and have confidence in their ability to investigate crimes (<https://journalistsresource.org/studies/government/criminal-justice/crime-unreporting-emotional-distress-police-response>). In order to improve the accuracy of the research findings for future studies, our research team would ideally obtain the most recent crime data from a reliable source such as the Bureau of Justice Statistics. For the sake of our study, this database could not be used for specific zip codes without requesting prior access—something that could have been conducted if our research team had an increased amount of time and funding.

Implications for Public Health in this Community

This study concluded that when a school address has a good Walk Score, it does not necessarily mean that it has a low total crime index. For example, South Pointe Elementary School, which is located in Miami Beach, has the highest Walk Score “94” while the TCI of the area is 191, which is considered to be above average. Another example is West Lake Preparatory Academy, which is located in Hialeah, has a WalkScore of “23” whereas the TCI of the area is 81. Using the Walk Score has some limitations, such as it does not differentiate between supermarket or a small grocery store that sells chips and liquor in the scoring criteria. Another limitation is the use total crime index provided by the South Florida Business Journal. This method of estimating the average total crime index has been calculated for zip codes and is not for a specific address. Living in a suburban area which is more car-dependent may have its effect on the people’s preference to drive rather than walk or bike. Moreover, perceived safety from the parents’ perspective is another factor that may impact the residents’ decision on preferring walking or biking over driving to reach a certain destination. A very recent study concluded that children may not gain the same benefits from the built environment compared to adolescents (McGrath, 2015). This may be attributed directly to parents’ perspective of perceived safety. Furthermore, the weather may play a role in influencing individuals to drive rather than walk or bike. In this study, we used TCI to measure the crime whereas there are specific types of crimes we did not observed, such as personal crime, property crime, burglary ... etc. These variables should be investigated to derive a much more specific conclusion.

Conclusion

Safety and walkability remains to be important factors that influence active commuting for children to elementary schools. Within the areas of Pinecrest, Miami Beach, and Hialeah in Miami-Dade County, FL income levels did not act as a strong predictor for crime. Additionally, total crime index was not a strong predictor for walkability within these communities.

This warrants future research to find ways to accurately measure walkability. Additionally, more research needs to be done in urban planning to facilitate active commuting among children.

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