



Environmental Influence on Hypertension in San Francisco, California.

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Research Question/Hypothesis

Could where you live determine your risk of developing hypertension?

Environmental stressors, park access, access to services and healthy food outlets, and transportation are social determinants of health that may be associated with heart disease and stroke. Walkable neighborhoods may grant easier access to transit and increase the likelihood of an individual to meet daily physical recommendations.

Introduction

Hypertension, more commonly known as high blood pressure, occurs when there is a long-term force of blood against one's artery walls. In the United States alone, about 75 million adults have high blood pressure- which makes up 1 in every 3 adults ("High Blood Pressure in the United States," Centers for Disease Control and Prevention).

One particular study shows a distinct difference in prevalence rates among those who live in a highly walkable neighborhood compared to those neighborhoods not conducive to walking and exercise. This particular research study is titled, "Moving to a Highly Walkable Neighborhood and Incidence of Hypertension: A Propensity-Score Matched Cohort Study," and was conducted in the past year, 2016. The purpose of this study was to evaluate whether or not increased walking is associated with the prevalence of obesity and the risk of incident hypertension. The main findings reported by the investigators of this study was that moving to an area with a very high Walk Score were associated with a lower risk of hypertension. A percentage of 54% showed lower risk of incident hypertension when they moved from an area of low to high walkability areas (Chiu, 2016).

Walkability score indicators are used as the measurement to assess various neighborhoods and are based on a set criteria that identifies the strengths and weaknesses of each neighborhood. The neighborhood and build environment was measured based on accessibility to healthy food places, quality of the jogging path, lighting of the park, amount of benches, parking, and park safety.

The objective of conducting an environmental scan on hot spots and cold spots in San Francisco is to (1) analyze differences between neighborhoods with higher levels of hypertension between areas with lower levels of hypertension (2) find if there is a relationship between neighborhood walkability scores and hypertension rates, and (3) determine external factors that could cause hypertension. Conducting an environmental scan has served as the basis of this particular study.

Figure 1. Jackson Park Playground is a hot spot located on 17th St., San Francisco. It was scored lowest among other parks within the hot spot areas.



Figure 2. Lands End Trail is a cold spot in San Francisco, located at the northwestern corner of San Francisco. The beginning of the trail overlooks the Golden Gate Bridge.



Method

Environmental Score

This study focuses on individuals residing in San Francisco, California. The variables were the parks that were observed within San Francisco, specifically in Potrero Hill and Presidio. Jogging paths, lighting, benches, parking, and general safety of the park. All 6 parks were scored based on how well they meet the expectations of park characteristics on a 1-5 basis, 1 being the lowest and 5 being the highest.

Walkability Score Indicators

Jogging Paths

Scored based on the accessibility of a clear path for running within each park. Parks that had a walk path within it scored higher than parks that only had sidewalks surrounding the park. Jogging paths that were cemented and less bumpy received a higher score than parks filled with only dirt paths and grass.

Lighting

Parks with light posts illuminating walk paths, benches, and various structures within the park received a higher score than poorly lit parks. Parks that had light posts scattered along the perimeter of the park and not on the walk paths within the park received a lower score.

Benches

Scored based on the number of benches per acre. A more frequent number of benches and rest areas in the park were given a higher score than parks that did not provide an adequate number of seating areas.

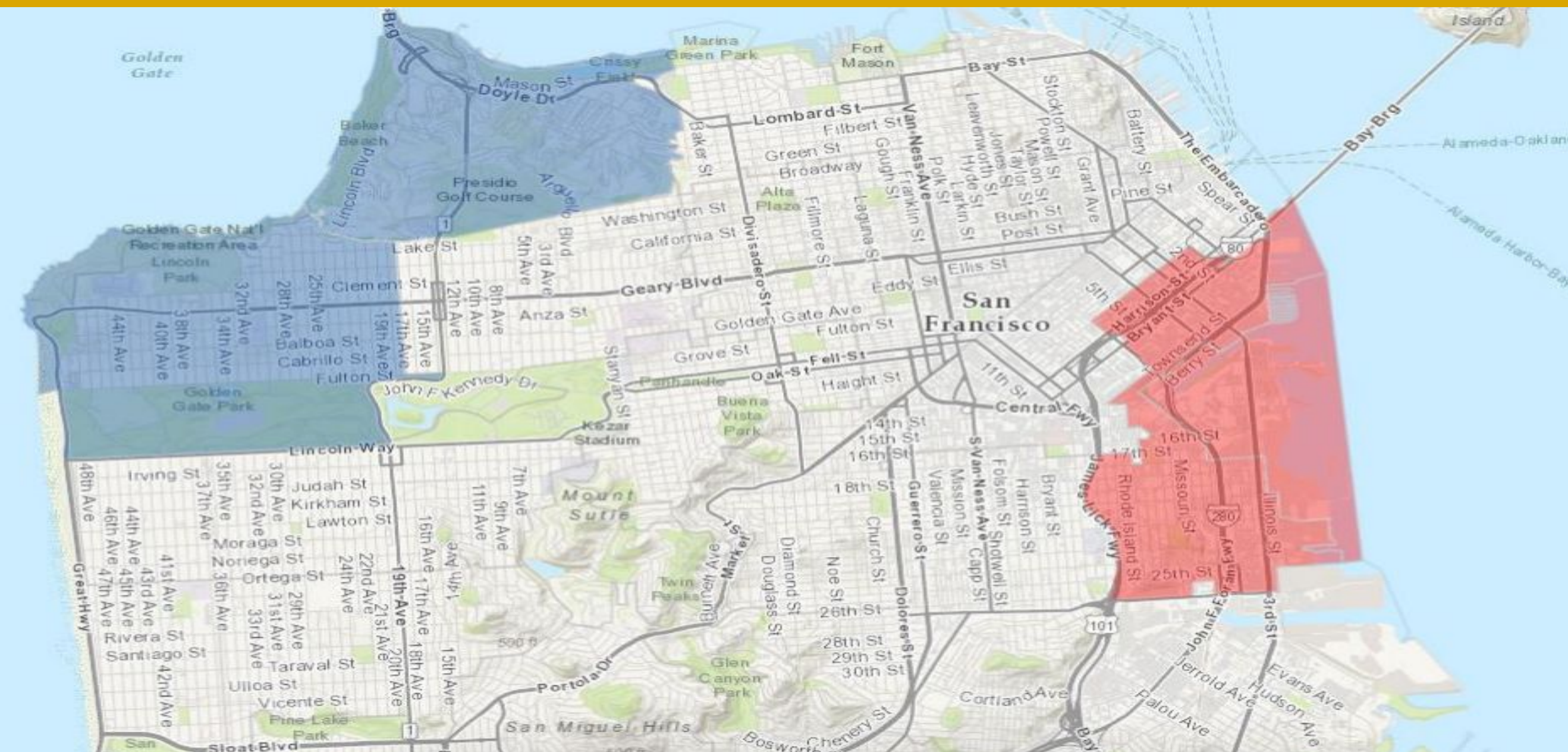
Parking

Parking was scored based on the difficulty to find parking in the surrounding area. Parks with only street parking in downtown San Francisco were scored lower than parks with a designated parking, since street parking was more limited. Parks located in busy areas with shared parking also received lower scores.

Park Safety

Scored based on the general location of the park and surrounding environment. Trails that were roped off or enclosed with jogging path indicators were scored high. Parks located in a remote area and were poorly illuminated received a low score.

Figure 3. Hot spot map showing the spatial distribution of hypertension in San Francisco. The parks with the least prevalent rate of hypertension, also known as "cold spots," were located around the northern tip of the Peninsula: Lincoln Park Playground, Lands End Trail, and Golden Gate Park. Parks with the highest prevalence rate of hypertension, or "hot spots," were in the Mission District: Jackson Playground, Franklin Square Park, and McKinley Square.



Results

Based on the environmental scan conducted in San Francisco, there were notable differences in neighborhood walkability in the hot spots versus the cold spots. The scores from the environmental scan supported the findings from the hot spot analysis using GeoDa. The highest score an individual park could receive was 25. The cumulative score the parks in both the hot spot and cold spot could receive individuals is 75. According to the parks in the hot spot area of San Francisco received 44% walkability. The parks in the cold spot area of San Francisco received 71% walkability.

A few foreseeable improvements that may need to be made in areas with high prevalence rates of heart disease include more sidewalks and more highly walkable and well-lit areas. These minor changes in various factors of the community could make a major difference in the health of an individual and their motivation to live an active lifestyle. If an individual does not feel safe in their own environment due to various factors including bad park conditions or a lack of sidewalks and adequate lighting, it may influence an individual's decision to live a more sedentary lifestyle.

Limitations

Other factors may be attributable to the environment and its impact on the risk of acquiring hypertension. Some of these influences may include: genetics, violence and crime rates, median household income, and air pollution.

Conclusions

Preventing a rise in high blood pressure to occur in the future will take a great deal of time and attention towards neighborhood characteristics and the minor and major changes that must be made. Utilizing hot spot analysis, as seen in this particular research, to pinpoint where hypertension has occurred in the past will benefit future research and provide focus on what sets hot spot neighborhoods aside from areas of lower prevalence rates of heart disease. Although limiting variables, such as genetics, may not be accounted for in the process of conducting an environmental scan, measuring aspects of the built and physical environment is significant in determining whether where someone lives further influences the likelihood of developing hypertension.

References

- ArcGis Pro. (n.d.). How Hot Spot Analysis (Getis-Ord Gi*) works. Retrieved April 09, 2017, from <http://pro.arcgis.com/en/pro-app/tool-reference/spatial-statistics/h-how-hot-spot-analysis-getis-ord-gi-spatial-stati.htm>
- Centers for Disease Control and Prevention. (2016, June 16). High Blood Pressure Fact Sheet. Retrieved April 10, 2017, from https://www.cdc.gov/dhbsp/data_statistics/fact_sheets/fs_bloodpressure.htm
- Chiu, M., Rezai, M., Maclagan, L. C., Austin, P. C., Shah, B. R., Redelmeier, D. A., & Tu, J. V. (2016). Moving to a Highly Walkable Neighborhood and Incidence of Hypertension: A Propensity-Score Matched Cohort Study. *Environmental Health Perspectives*, 124(6), 754-760. doi:10.1289/ehp.1510425
- San Francisco Health Improvement Partnership (SFHIP). (2016, July). Age-Adjusted ER Rate due to Hypertension. Retrieved April 09, 2017, from <http://www.sfhip.org/index.php?module=Indicators&controller=index&action=view&indicatorId=2345&localeId=131344>