Hotspot Analysis

Moran's I has a null hypothesis that states that the crime events in Chicago are randomly distributed and do not form any form any cluster pattern with respect to census blocks; while the alternative hypothesis is that the crime events are not randomly distributed amongst the census blocks and have a statistically significant pattern of clustering or dispersion. Given the z-score of 123.6, the crimes show evidence of being clustered, and in combination with the p-value's 0.00% chance of this having occurred randomly, there is sufficient evidence to reject the null hypothesis in favor of the alternative hypothesis that the crime rates do form a cluster pattern in regard to the census blocks.

General G has a null hypothesis that states that the census blocks' distribution spots are random and do not form any hot or cold spots; while the alternative hypothesis is that the census block locations are not randomly distributed and contain a pattern comprised of at least one hot/cold spot(s) for neighboring block groups. Given the z-score of 37.9, the block groups show evidence of being highly clustered, and in combination with the p-value's 0.00% chance of this having occurred randomly, there is sufficient evidence to reject the null hypothesis in favor of the alternative hypothesis that there is a cluster pattern of the census blocks of Chicago. This means that there are block groups clustered together and these neighborhoods are areas of high crime.

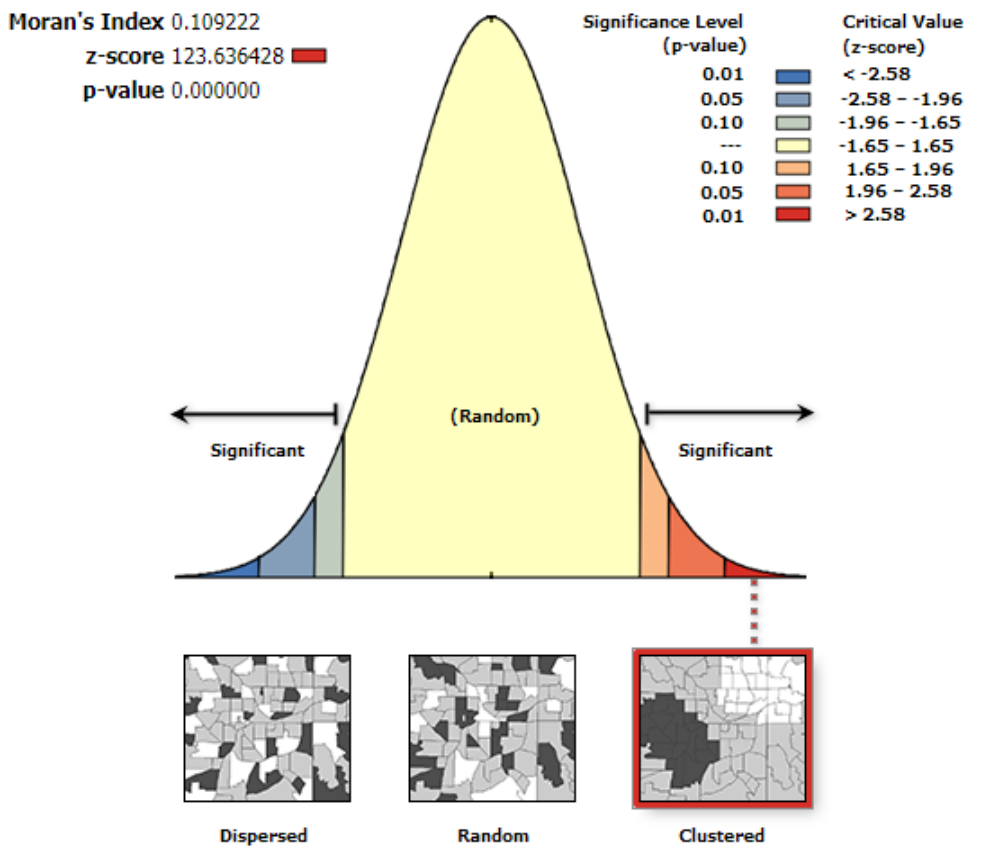
Combining the results of the Moran's I test stating that the crime rates form a cluster pattern for the block groups of Chicago, IL with the results of General G which shows that these are in fact highly-clustered and several hot spots are present within the city. These clusters are in fact all hot spots with 90% or higher confidence and no cold spots. The other patterns are in the location. The High clusters are along the coast of Lake Michigan between Uptown and Downtown; between Oak Park and Cicero, or in South Shore reaching out towards Burbank and Oak Lawn. These high crimes and high block group neighborhood clusters are almost completely encapsulated by low crimes and high block group neighborhood outliers. There is then a ring of non-significant census blocks and then the remaining blocks are almost all low crimes and low block group neighborhood clusters (a few high crime and low block group neighborhood outliers).

Moran's I

Moran's Index = 0.109222
p-value = 0.000000
Z-score= 123.636428

H_0: The crime events in Chicago are randomly distributed and do not form any cluster pattern with respect to census blocks.
H_A: The crime events are not randomly distributed amongst the census blocks and have a statistically significant pattern of clustering or dispersion.

Spatial Autocorrelation Report



Given the z-score of 123.636428, there is a less than 1% likelihood that this clustered pattern could be the result of random chance.

Global Moran's I Summary

Moran's Index	0.109222
Expected Index	-0.000430
Variance	0.000001
z-score	123.636428
p-value	0.000000

The calculated significance level (Z-score) is drastically high, 123.6 is more than 3 standard deviations from the mean and greater than 2.58. The positive value of the z-score indicates evidence towards the clustered pattern (instead of the dispersed pattern of the negative z-scores). Also, the calculation for randomness (p-value) is statistically 0.00 meaning there is a 0% probability that the observed values were by random chance.

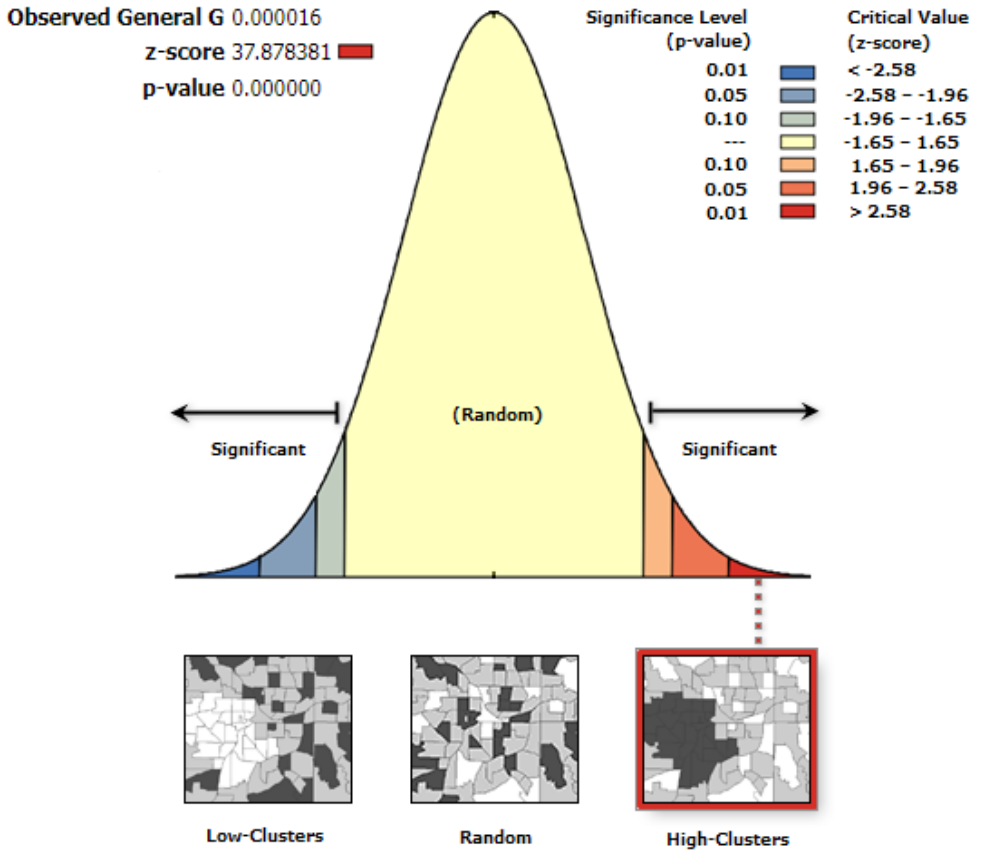
Given the z-score of 123.6, there is a less than 1% likelihood that this clustered pattern could be a result of random chance, therefore we can reject the null hypothesis in support that there is sufficient evidence in favor of the alternative hypothesis that the crime events follow a clustered pattern for the block groups.

Getis-Ord General G

Observed General G = 0.000016
p-value = 0.000000
Z-score= 37.878381

H_0: The census blocks' distribution spots are random and do not form any hot or cold spots.
H_A: The census block locations are not randomly distributed and contain a pattern comprised of at least one hot/cold spot(s) for neighboring block groups.

High-Low Clustering Report



Given the z-score of 37.8783813606229, there is a less than 1% likelihood that this high-clustered pattern could be the result of random chance.

General G Summary

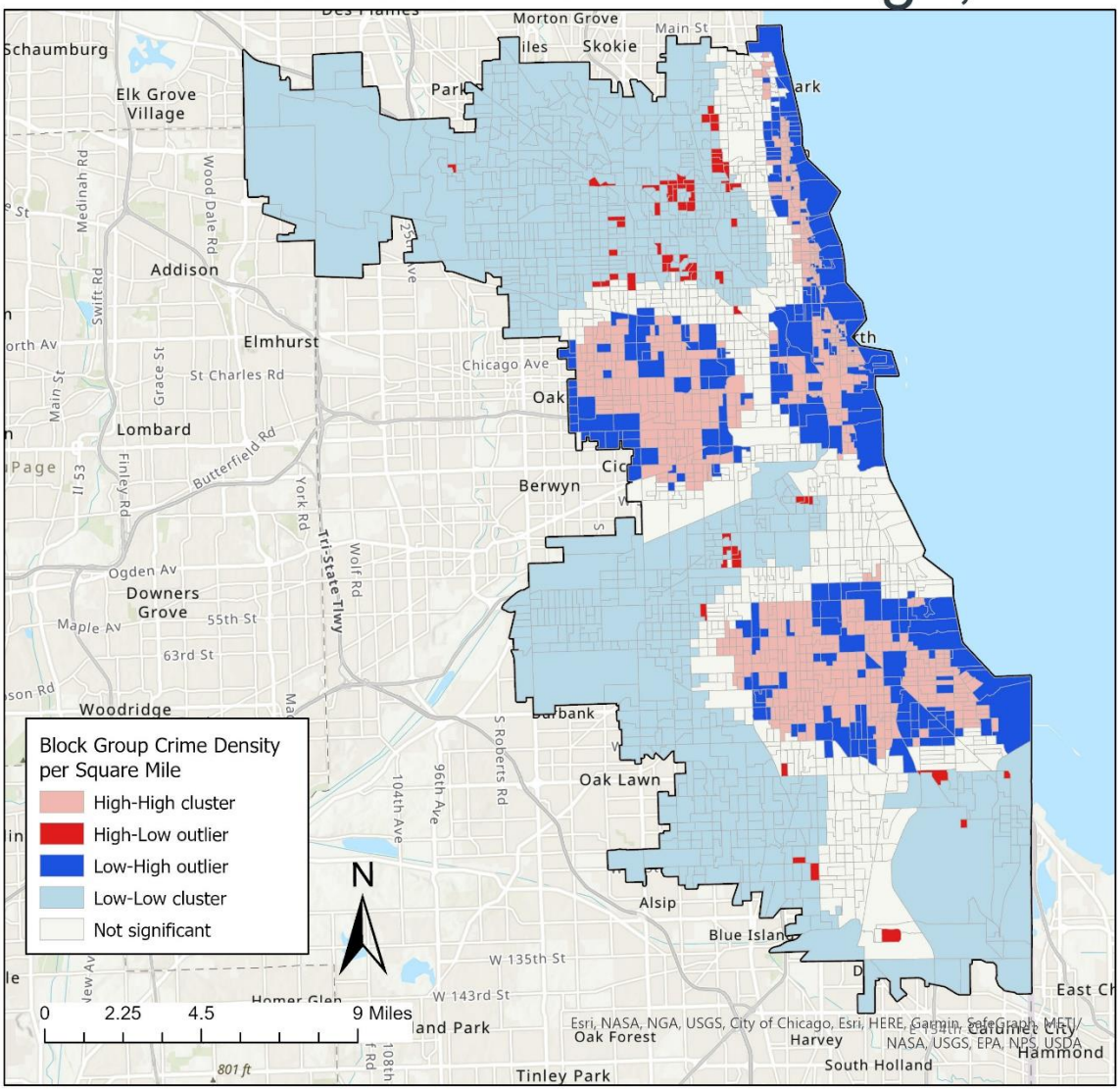
Observed General G	0.000016
Expected General G	0.000010
Variance	0.000000
z-score	37.878381
p-value	0.000000

The calculated significance level (Z-score) is drastically high, 37.9 is more than 3 standard deviations from 2.58. The positive value of the z-score indicates evidence towards the high-clustered pattern (instead of the dispersed pattern of the negative z-scores). Also, the calculation for randomness (p-value) is statistically 0.00 meaning there is a 0% probability that the observed values were by random chance.

Given the z-score of 37.9, there is a less than 1% likelihood that this clustered pattern could be a result of random chance, therefore we can reject the null hypothesis in support that there is sufficient evidence in favor of the alternative hypothesis that there are crime hot/cold spots forming a high-clusters pattern for Chicago, IL.

Crime Cluster Outlier Analysis

2020 Census Blocks Chicago, IL



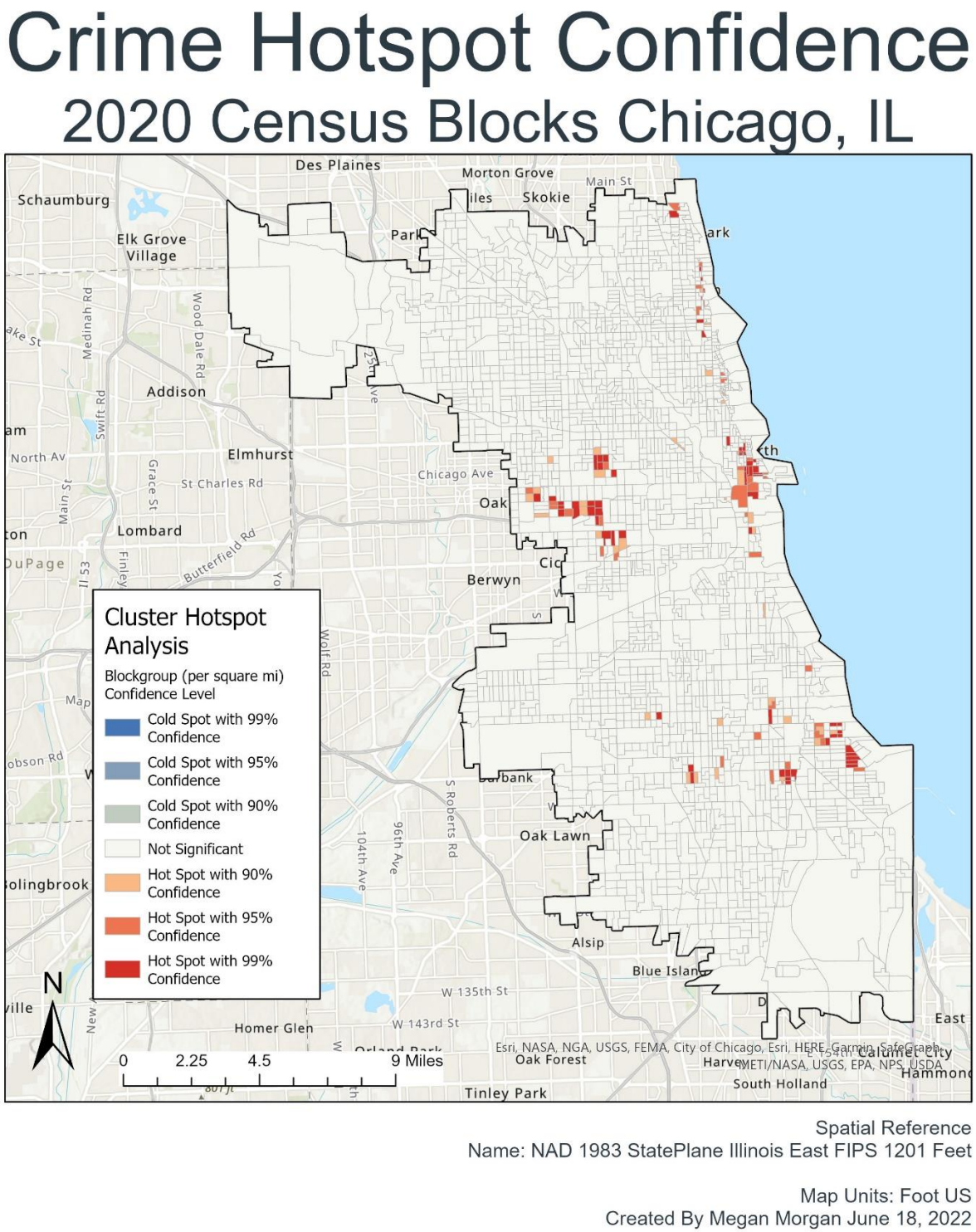
Spatial Reference
Name: NAD 1983 StatePlane Illinois East FIPS 1201 Feet

Map Units: Foot US
Created By Megan Morgan June 18, 2022

There are high clusters are along the coast of Lake Michigan between Uptown and Downtown; between Oak Park and Cicero, or in South Shore reaching out towards Burbank and Oak Lawn. These high crime-high block group neighborhood clusters are almost completely encapsulated by low crime-high block group neighborhood outliers. There is then a ring of non-significant census blocks and then the remaining blocks are almost all low crime -low block group neighborhood clusters (a few high crime-low block group neighborhood outliers).

The low crime-low block group neighborhood clusters contain all the high crime-low block group neighborhood outliers, and the low crime-high block group neighborhood outliers are all contained within the high crime-high block group neighborhood clusters. The low crime -high block group neighborhood outliers are sporadic and just a few. There is a small grouping of low crime-high block group neighborhood outliers in the northern most grouping of low crime-low block group neighborhood census block groups, although as shown in the next graph, is not statistically significant. The low crime-high block group neighborhood outliers cover roughly as many census blocks as the high crime-high block group neighborhood clusters do, and along Lake Michigan outnumbers the clusters in the number of block groups containing crime.

There are a few crime density patterns. The first is that the neighborhood clusters are all hot spots with 90% or higher confidence and no cold spots. These hot spots correspond to the high crime-high block group neighborhood clusters from the previous graph. The low crime-low block group neighborhood clusters although not outliers were also not statistically significant enough to be considered cold spots with regards to the neighborhoods.



The hotspots are located along the banks of Lake Michigan or between Cicero and Oak Park along West Harrison Street. There are a few other small block groups, but that is majority of the ones with 95% confidence or higher.