Divvy Bike Stations in Chicago

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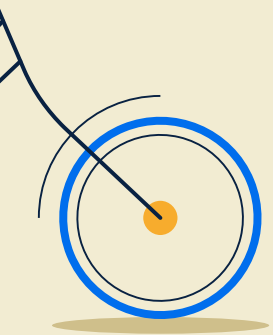
Divvy Bike

- Bike share system that consists of manual and electric bikes.
- Has a network of docking systems throughout the Chicago area.
  - Launched in 2013.
  - First station installed within the loop.
- In 2019, Divvy expanded outwards and to lower-income communities.
- Currently 950 Divvy bike stations.

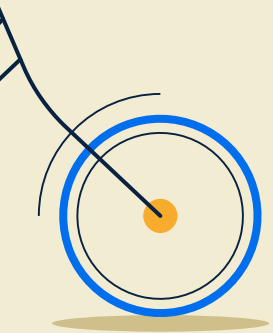


Data

- **Demographic Data:**
  - Population data by zip code
  - Median household income by zip code
- **Bike Data:**
  - Divvy bike stations
    - Station name
    - Total docks
    - Location data (Long/Lat, zip code, community)
  - Bike routes
  - Major streets
- **Boundaries:**
  - Community area
  - Zip code
  - Census tract

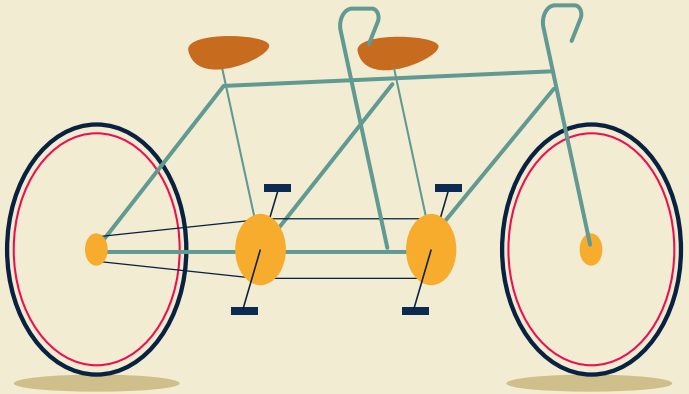
Questions

1. **Where are Divvy bike stations located?**
    a. Where are the hot/cold spots?
    b. Where are there outliers?
2. **Do different demographic factors influence the number of Divvy Bike Stations?**
    a. Median Household Income
    b. Population
3. **Where could we use more Divvy bike stations?**
4. **How accessible are Divvy bike stations?**

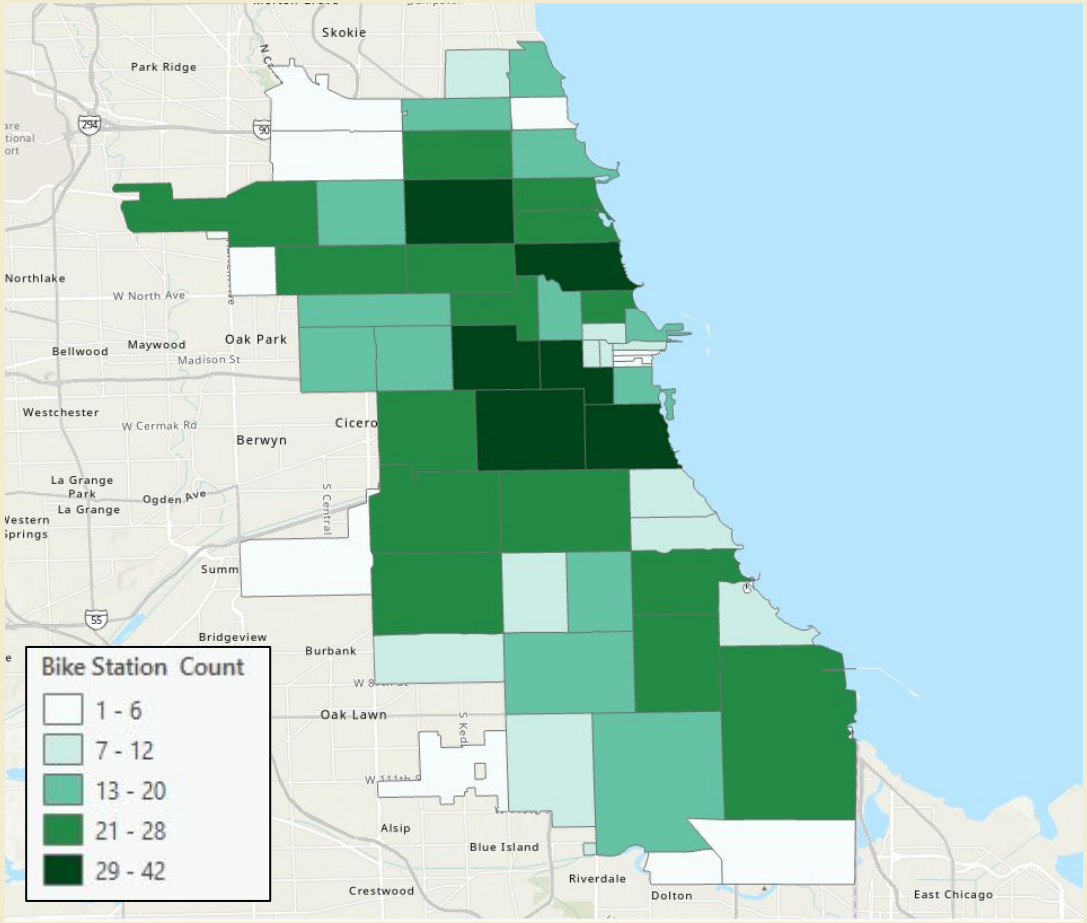


Workflow

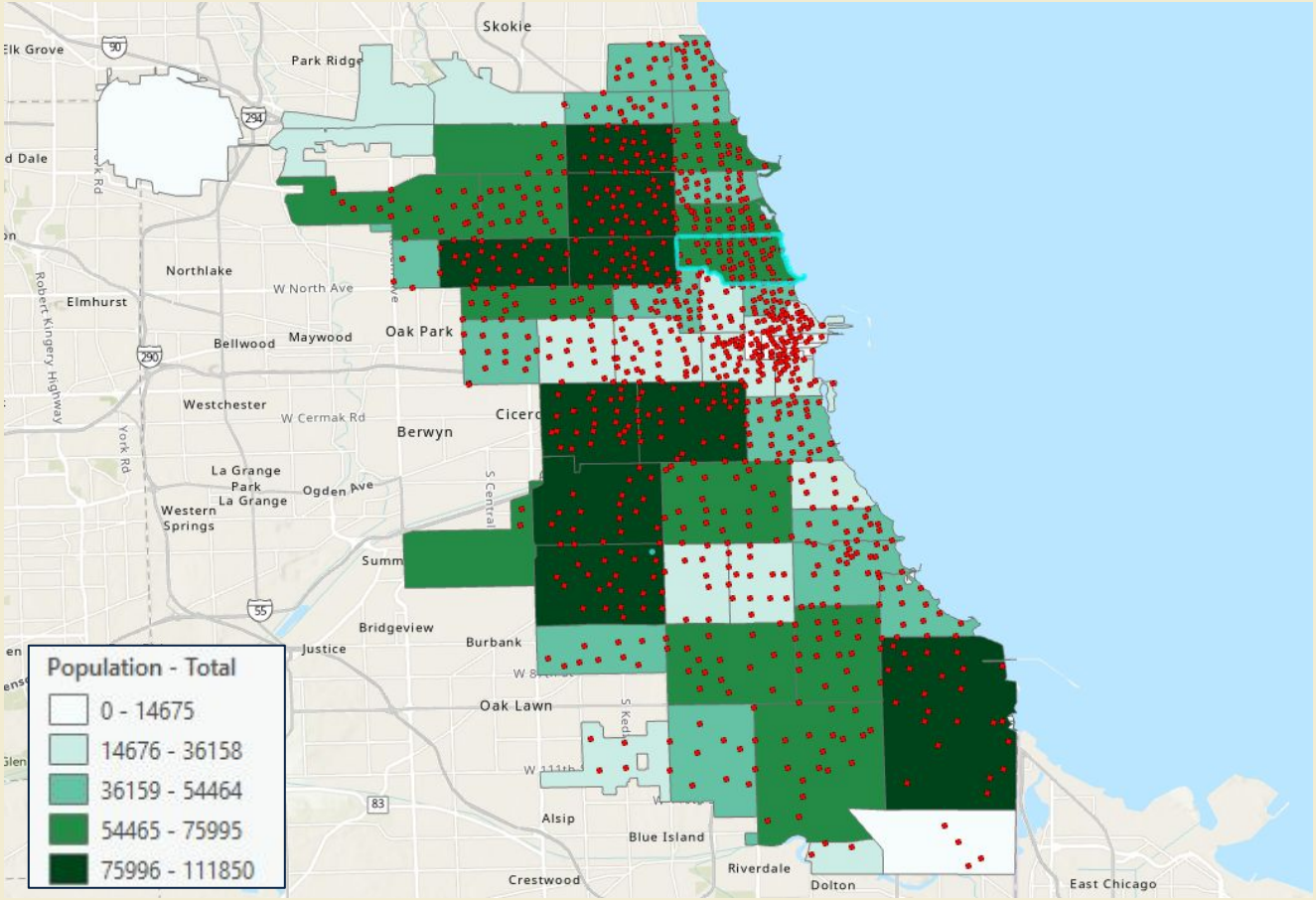
1. **Gather data**
2. **Clean data**
    a. Get rid of null values
    b. Join data
    c. Project data
3. **Run Models**
    a. OLS
    b. Exploratory Regression
    c. GWR
4. **Analysis**
    a. Hot spot
    b. Outliers
    c. Buffer
    d. Network



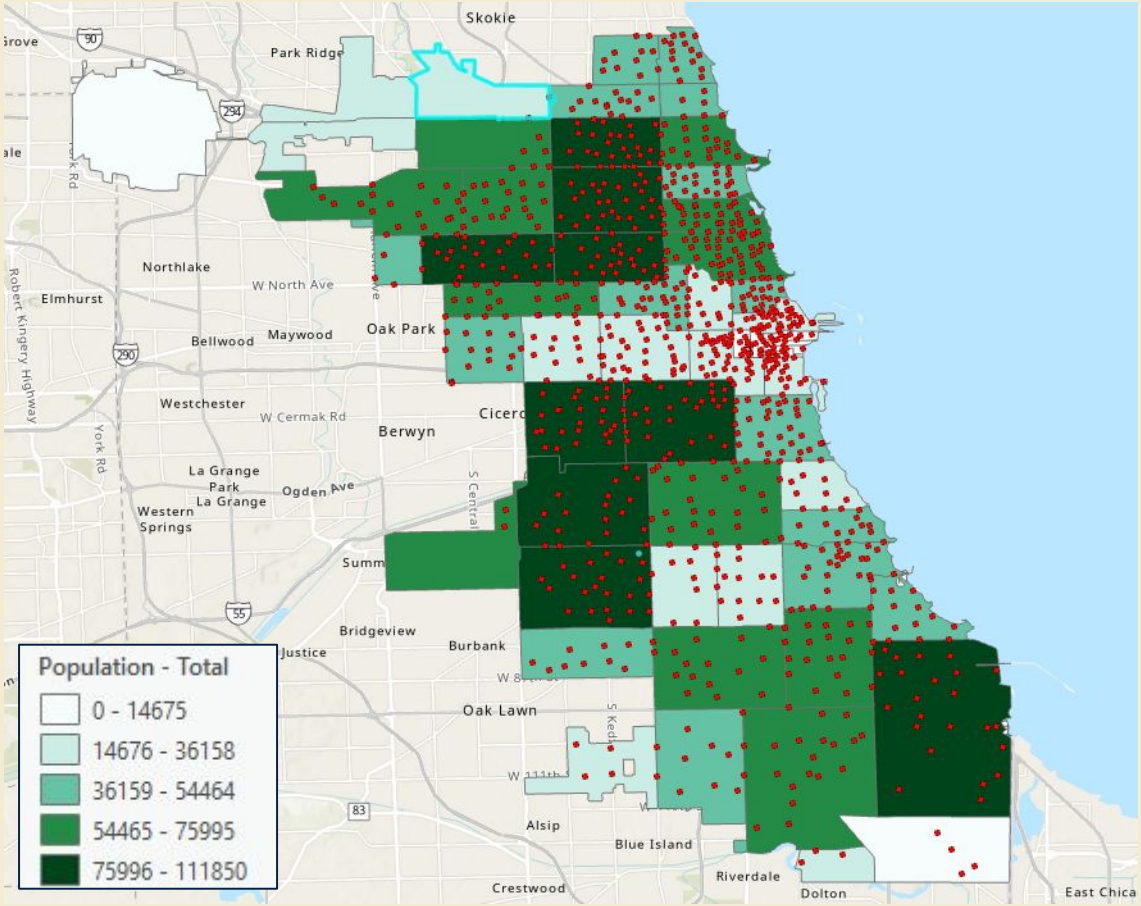
Divvy Bike Station Count by Zip Code



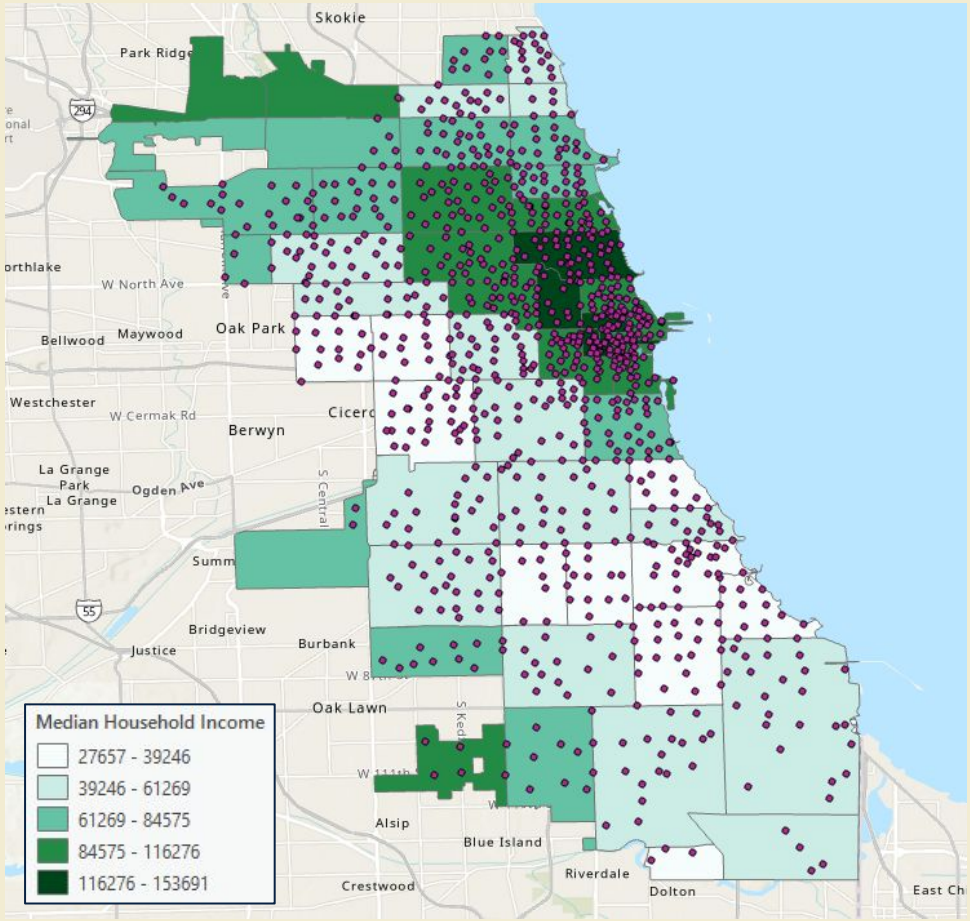
Most Divvy Bike Stations - 60614



Least Divvy Bike Stations - 60646



Divvy Bike Stations by Income



OLS Model

Summary of OLS Results

Variable	Coefficient[a]	StdError	t-Statistic	Probability[b]	Robust_SE	Robust_t	Robust_Pr[b]	VIF[c]
Intercept	-1.338486	4.196808	-0.318930	0.750949	3.695940	-0.362150	0.718582	--------
POPULATION	0.000268	0.000045	5.901309	0.000000*	0.000035	7.681553	0.000000*	1.173514
INC_2018_2	0.000056	0.000037	1.517493	0.134673	0.000034	1.659842	0.102442	1.173514

OLS Diagnostics

Input Features	pls	Dependent Variable	JOIN_COUNT
Number of Observations	60	Akaike's Information Criterion (AICc)[d]	429.260710
Multiple R-Squared[d]	0.383707	Adjusted R-Squared[d]	0.362083
Joint F-Statistic[e]	17.744271	Prob(>F), (2,57) degrees of freedom	0.000001*
Joint Wald Statistic[e]	73.997396	Prob(>chi-squared), (2) degrees of freedom	0.000000*
Koenker (BP) Statistic[f]	1.057359	Prob(>chi-squared), (2) degrees of freedom	0.589383

# of Divvy Bike Stations per Zip Code = -1.34 + 0.00027(POPULATION) + 0.000056(MEDIAN HOUSEHOLD INCOME)

Exploratory Regression

Choose 2 of 2 Summary

Highest Adjusted R-Squared Results

AdjR2	AICc	JB	K(BP)	VIF	SA	Model
0.36	429.26	0.51	0.59	1.17	0.00	+POPULATION*** +INC_2018_2

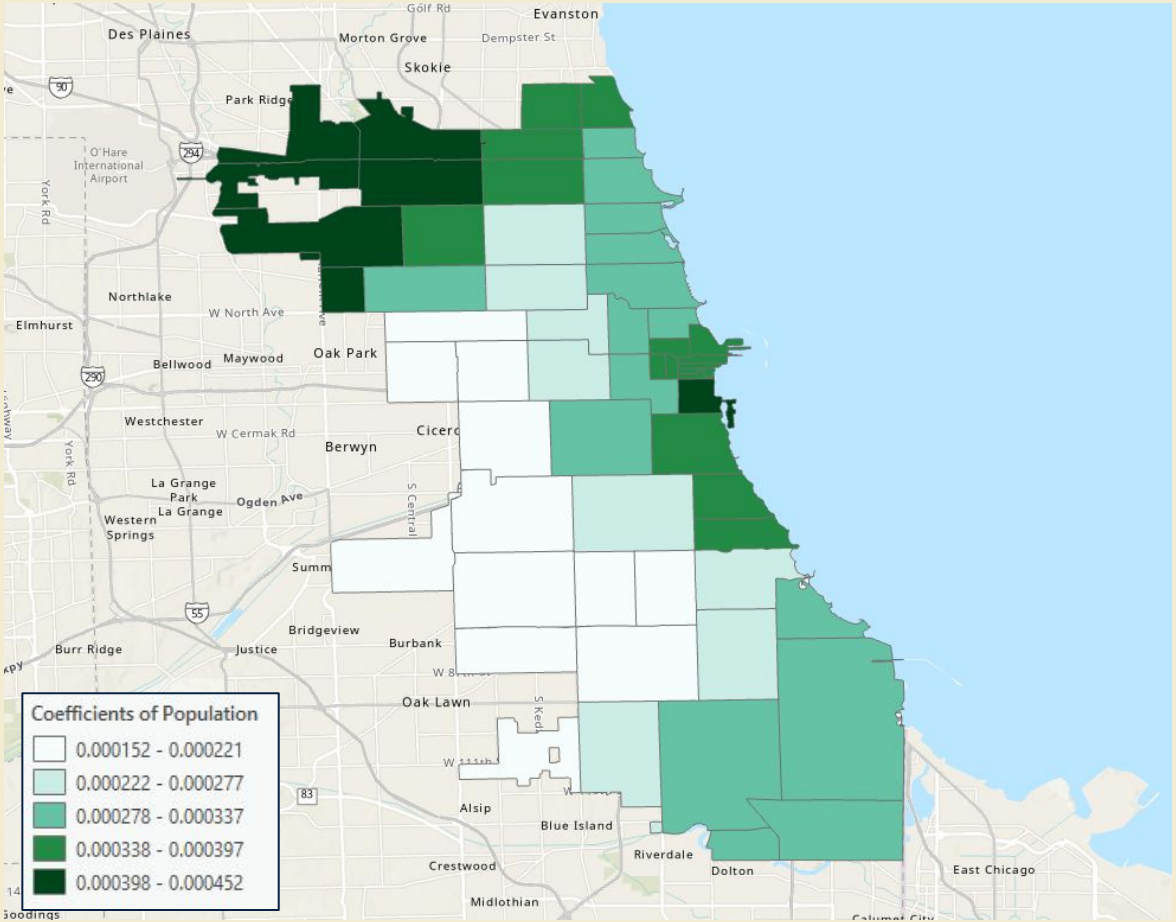
GWR

Model Diagnostics

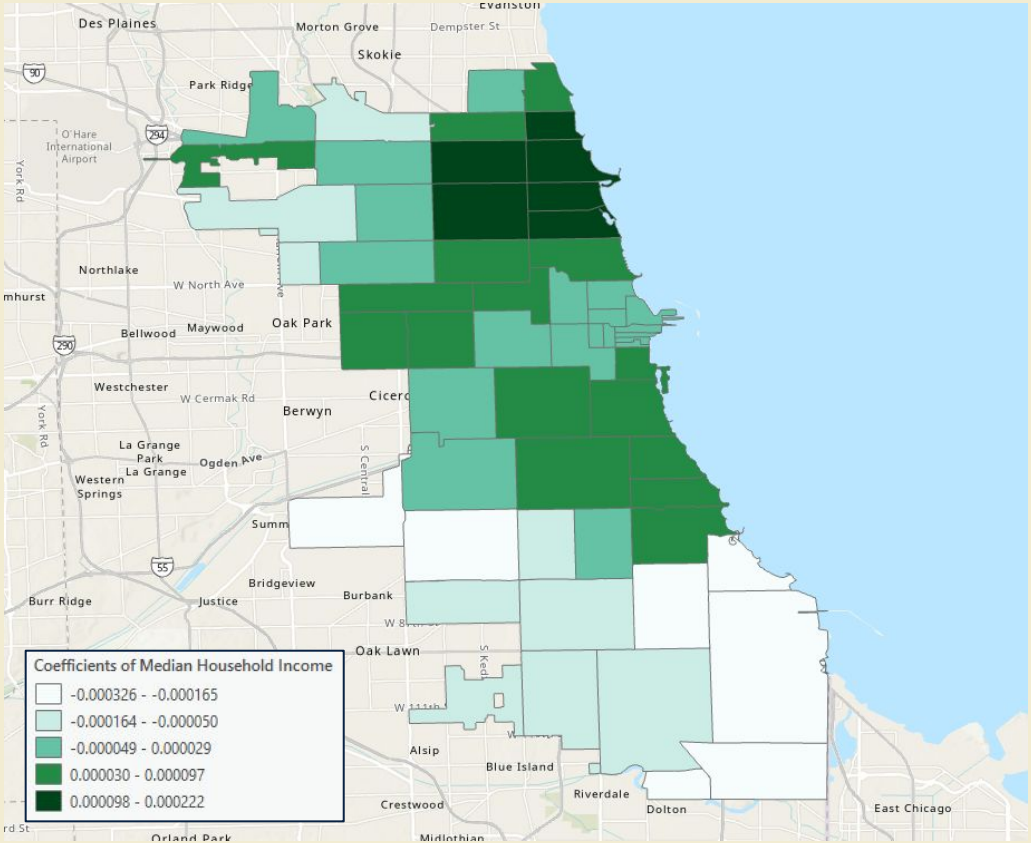
R2	0.7933
AdjR2	0.6922
AICc	402.8582
Sigma-Squared	32.0940
Sigma-Squared MLE	21.7282
Effective Degrees of Freedom	40.6210
Adjusted Critical Value of Pseudo-t Statistics	2.6819

Succeeded at Saturday, April 20, 2024 1:49:20 PM (Elapsed Time: 19.46 seconds)

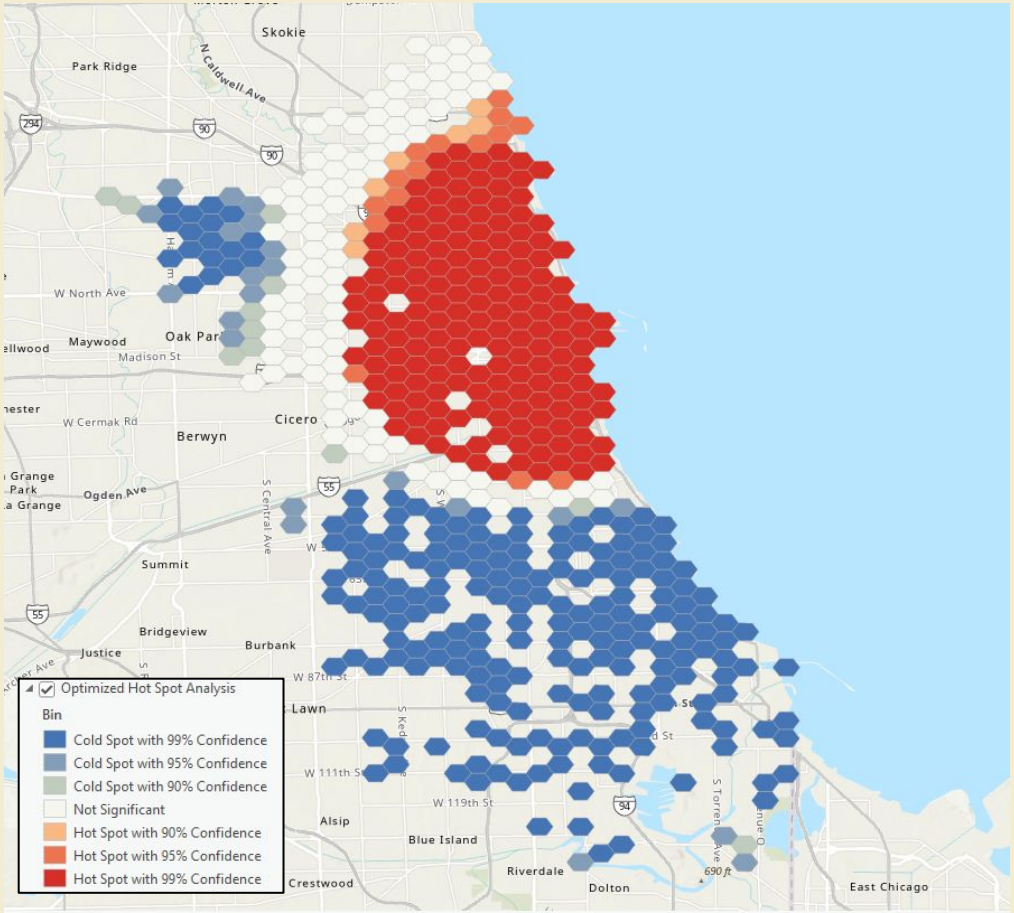
GWR - Population Coefficients



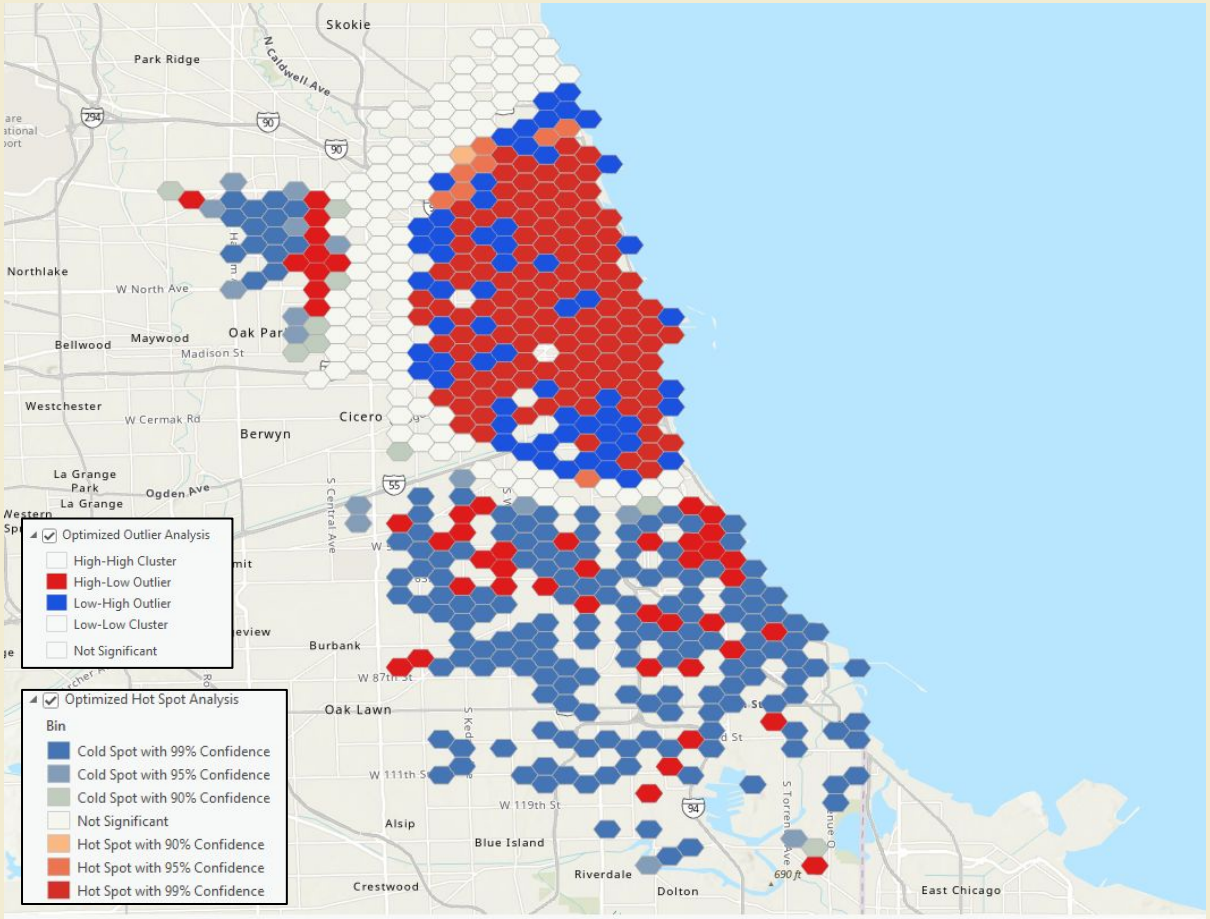
GWR - Median Household Income Coefficients



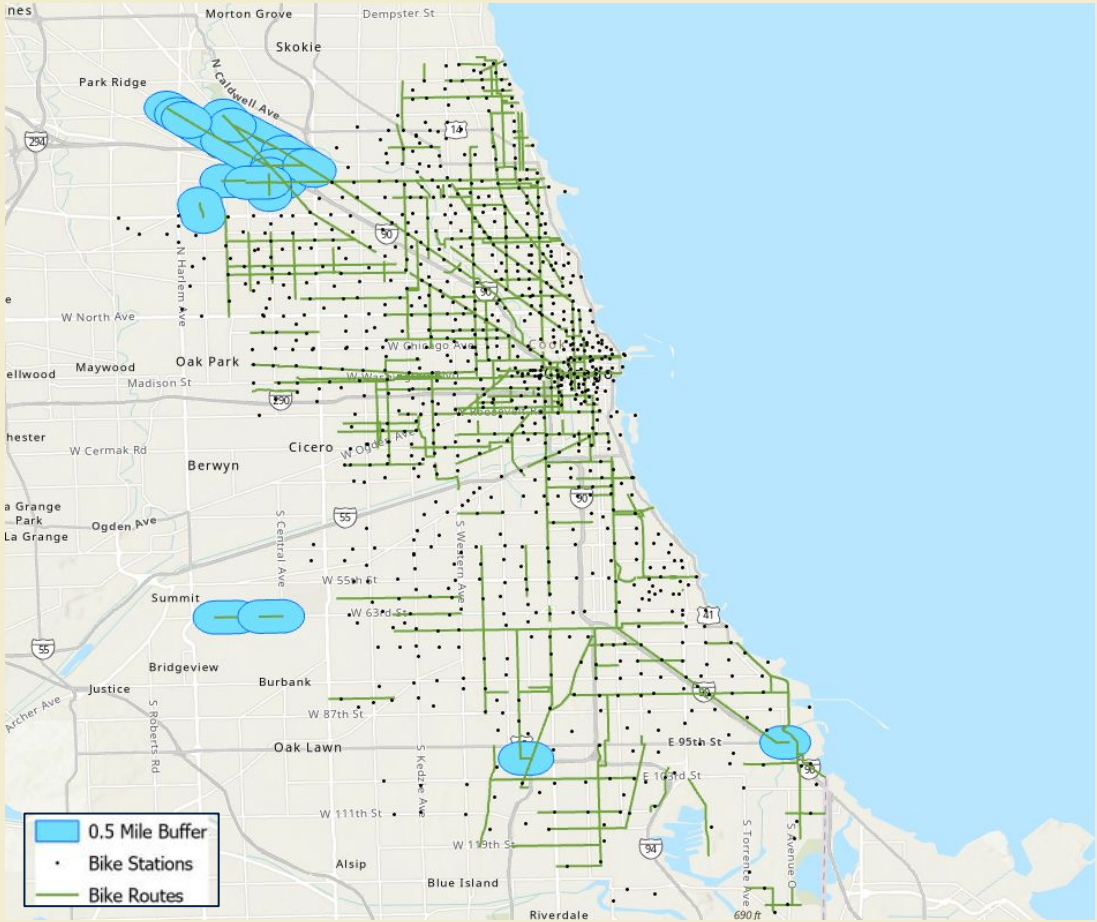
Optimized Hot Spot Analysis



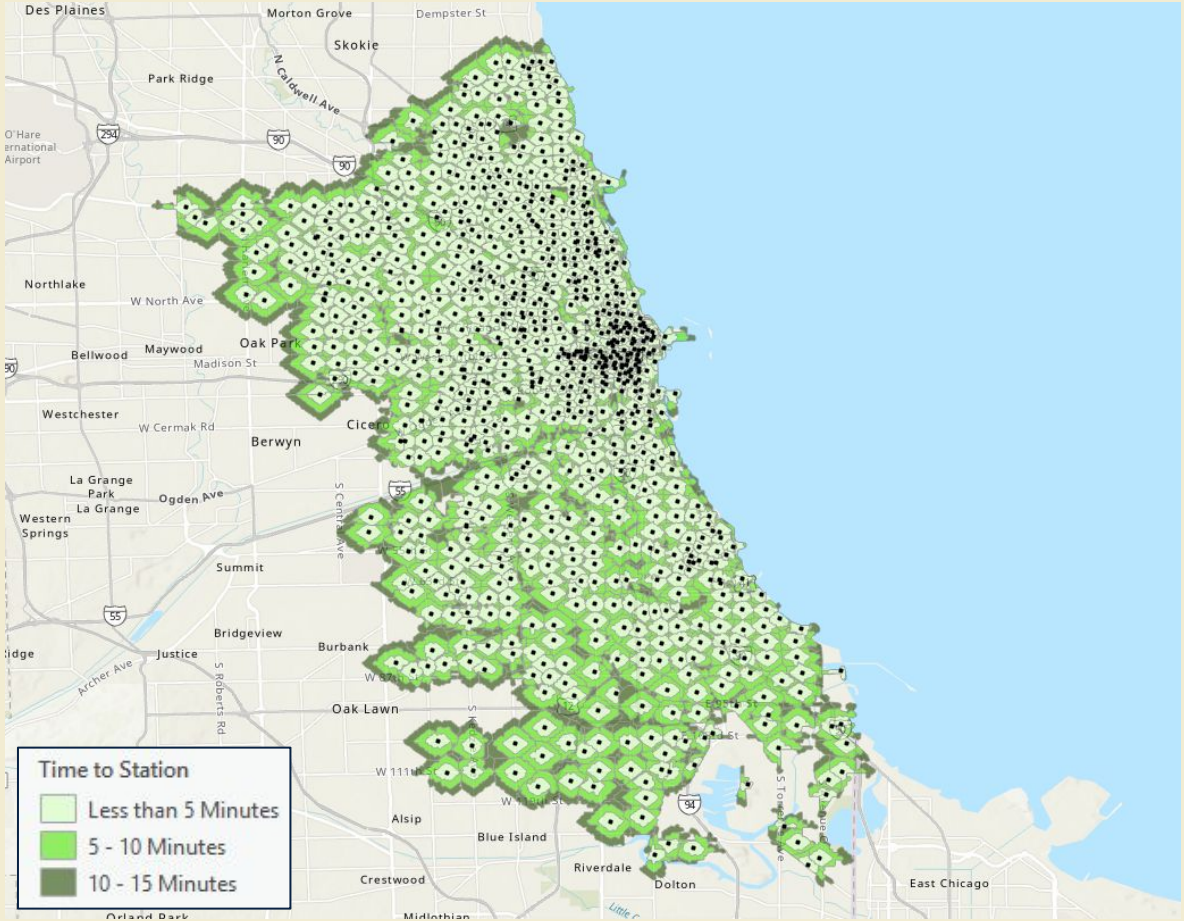
Optimized Outlier Analysis



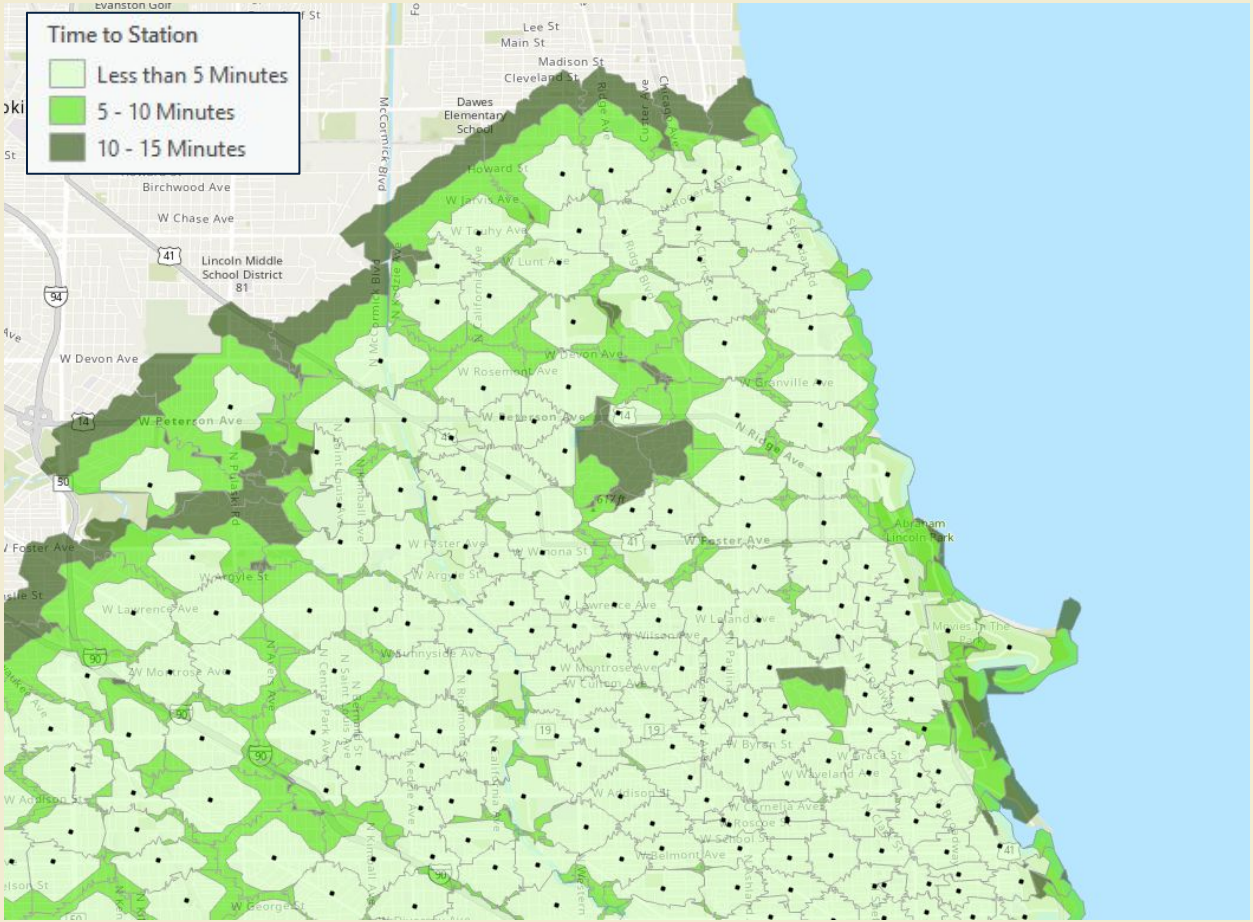
Where Could we use more Divvy Stations?



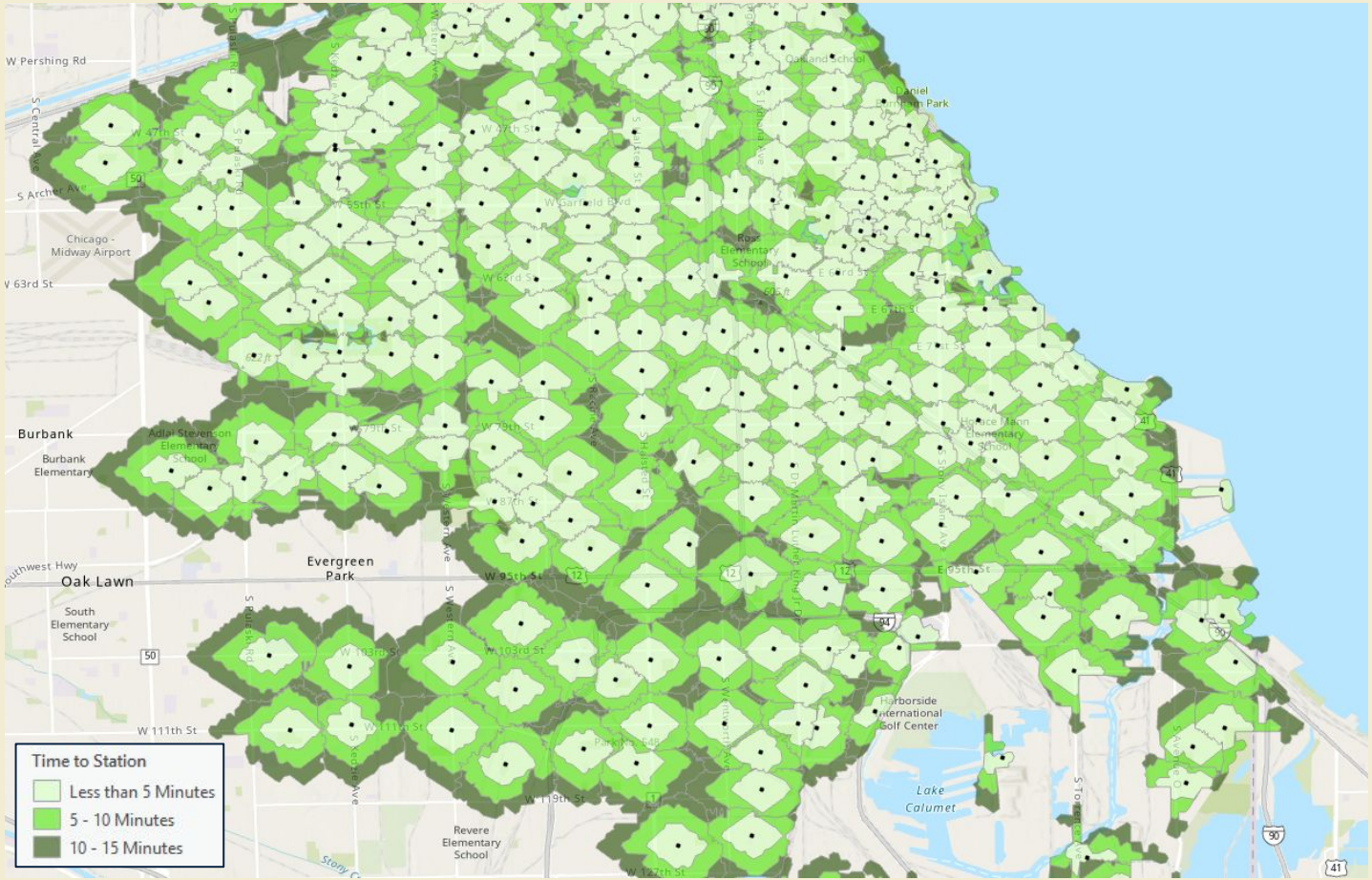
Bike Station Accessibility - Walk Time



Bike Station Accessibility - North



Bike Station Accessibility - South



Future Research

Divvy Trips

Divvy has a 'trip' dataset with every ride taken. Even looking at one year, still over 1 million rows.

Time

Would be interesting to see how the stations were added over time across the city.

Other Cities

Seeing how Chicago compares to other cities.

Conclusion

- **More Divvy bike stations are in higher income areas.**
- **Higher population does not always equate to more stations.**
  - Loop has a lot of stations but lower population density.
- **North side of Chicago has better access to bike stations.**
  - More hot spots in the north.
- **There is still room for more Divvy bike locations in the city.**

References

Demographic Information:

- Population Data, 2020
- Median Household Income
- Chicago Population by Zip Code, 2018

Bike Information:

- Bike Routes in Chicago
- Divvy Bike Stations, 2024
- Major Streets in Chicago
- Divvy History

Boundaries:

- Chicago Community Area Boundaries
- Chicago Zip Code Boundaries
- Chicago Census Tract Boundaries

Questions?