

Introduction

- Health disparities are pervasive in America's cities. While our biggest cities' challenges are often in the national spotlight, America's small and midsize cities are home to more people, and their health disparities receive far less attention.
- Social determinants of health are the nonmedical factors that influence health outcomes. Some examples of social determinants of health are safe housing, transportation, and neighborhoods; polluted air and water; and access to nutritious foods and physical health opportunities.

Literature Review

- Higher poverty levels are associated with lower life expectancy, but several aspects of this relationship and the association of social determinants remain unclear.
- First, most studies have examined the relationship at a country level. To what extent do gaps in life expectancy vary at the local area level?
- Second, the sources of the poverty gap remain unclear. There is debate on the importance of factors such as inequality, economic and social stress.
- Third, is there a method to match demographically comparable high and low poverty cities in order to leverage policy and program approaches targeting poverty that will also advance health?

Methods

- Study Population — Identified cities with the 25 highest and the 25 lowest poverty rates through the 2020 US Census Bureau data. Inclusion limited to small/mid sized cities with populations ranging from 50,000 to 275,000.
- Design and Setting — Data from publicly available databases including the US Census Bureau utilized to create datasets of city poverty rates, life expectancy and 16 measured social determinants
- Data Analysis and Availability — Statistical comparisons were performed using paired t-tests and correlation coefficients were calculated using Pearson correlation with a significance level of $P < 0.05$.
- Development of Matching Algorithm using Python — The assumptions for the development of the matching program was to choose cities that 1) minimize the variance in the demographics and 2) maximize the likelihood of observing a statistically significant effect. To do this, the algorithm would find cities, one from the high poverty group and one from the low poverty group, that are as similar as possible to be pairs, to create a measure of 'similarity'.

Utilizing large sociological data sets and the development of a novel matching algorithm to understand the relationship between poverty, social determinants and health outcomes in small to mid-sized US cities

Jared Duggal

Results

- **National Level Life Expectancy by Poverty Rate** — A statistically significant difference in life expectancy ($p < 0.001$) between cities in the high poverty city group [76.1 ± 2.5 (72–79.5)] and the low poverty groups [81.7 ± 1.6 (79.9–85.5)] (Figure 1).
- **National Level Comparison of Social Determinants by Poverty Rate** — A statistically significant difference between the high and low poverty areas in all measured variables except park access ($p = 0.73$) and air pollution concentration ($p = 0.07$).
- **Regional Correlates of Social Determinants Variation** — Demonstrated the strongest negative correlation with households with broadband connection ($r = -0.88$, $p < .001$) and the strongest positive correlation with the credit insecurity index ($r = 0.96$, $p < .001$) (Figure 2).
- **Local Level Validation of Matching Algorithm** — A statistically significant difference in 'similarity' ($p < 0.001$) between paired cities created by the algorithm versus those in a random pair generator

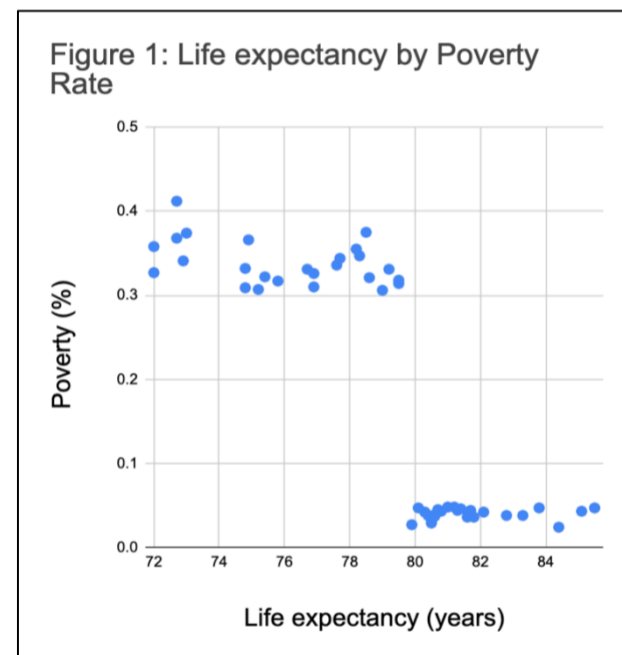


Figure 1 – High poverty vs low poverty group life expectancy



Figure 3 - Syracuse, New York



Figure 4 - Pearland, Texas

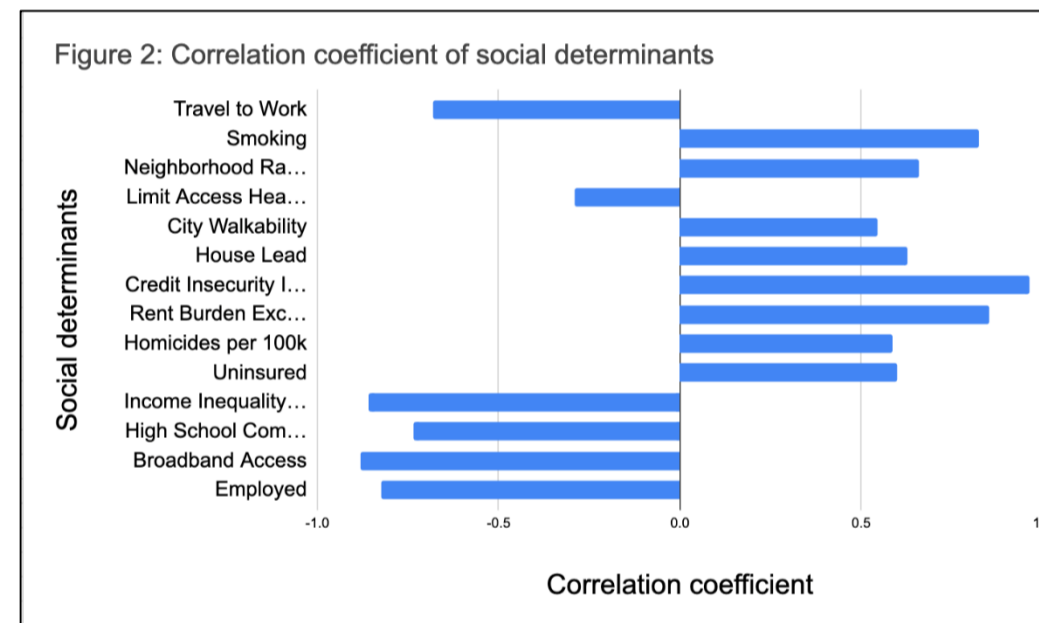


Figure 2 – Univariate Pearson correlations between poverty and social determinants

TABLE 2 - Social Determinants		
Syracuse	Variables	Pearland
0.326	Poverty (%)	0.038
76.9	Life expectancy (years)	80.4
0.559	Employed (%)	0.6970
0.58	Broadband access (%)	0.8530
0.835	High school completion (%)	0.951
-34.7	Income inequality (index)	20.7
0.05	Uninsured (%)	0.07
149.6	Homicides per 100k	13
56.2	Rent burden excessive (%)	37
41.4	Credit insecurity (index)	18.4
75.9	Park access (%)	24
5.9	Air pollution (concentration)	10.1
43	House lead (%)	2.3
59.9	City walkability (score)	20.4
50.6	Limit access healthy food (%)	86.0
15.4	Neighborhood segregation (score)	17.2
22.1	Smoking (%)	15.0
17.4	Travel to work (minutes)	34

Table 1 - Comparison of social determinants

Discussion

- In this study, data covering the US population were used to obtain more comprehensive and precise estimates of the relationship between poverty, life expectancy, and social determinants at the city level.
- The matching algorithm created will help city leaders understand how poverty and health disparities in their communities are driven by social factors like income inequality and rent burden and allow comparison with demographically similar cities to guide policy interventions (Figure 3,4, Table 1).
- Facilitate smarter investment strategies in a city when that approach has proved successful in another city of the same population demographic type when addressing specific social determinants of health.
- Relationships between poverty and life expectancy should not be interpreted as the causal effects of having more money because poverty is correlated with other attributes that directly affect health.

Conclusion

- The average rate of poverty in the U.S. was 11.4% in 2020.
- However, the association between life expectancy and poverty varies substantially across geographic areas.
- The differences in poverty were correlated with social determinants.
- The role of local data in guiding public health action cannot be overstated.

Future Directions

- Outreach to city governments in the low poverty group to utilize the matching algorithm – Syracuse Data Challenge, Expanded broadband for high poverty communities in the city of Syracuse
- Call on Americans to address poverty as a national emergency and advocate for policy changes that provide less aid to the rich and more aid to the poor.

References

- Braveman, P., Gottlieb, L., The Social Determinants of Health. Public Health Rep. 2014 Jan-Feb; 129: 19–31.
- Department of Population Health, NYU Langone Health. City Health Dashboard.
- United States Census Bureau.