Accessibility of Parks and the Correlation to Health Measures / Risk Factors in Chicago

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Background

- Inequity of green space in Chicago associated with socioeconomic inequality
- Benefits of trees and community gardens
- Trends of green space leading to gentrification
- Importance of safe and accessible third-spaces in building community and a social safety net
- Industrial pollution sources in the water and soil affecting the health of residents

Research Question:

To what extent does the accessibility of parks/public open space throughout Chicago correlate to various other mental / physical health measures?

Data

- Chicago Park District Boundaries shapefile
  - https://data.cityofchicago.org/Parks-Recreation/Parks-Chicago-Park-District-Park-Boundaries-curren/ej32-qgdr
- Public and Open Space categories from the city zoning data shapefile
  - https://data.cityofchicago.org/Community-Economic-Development/Boundaries-Zoning-Districts-current-/7cve-jgbp
- Census tracts within Chicago
  - https://data.cityofchicago.org/Facilities-Geographic-Boundaries/Boundaries-Census-Tracts-2010/5jrd-6zik
- PLACES (health demographic data by census tract)
  - https://www.cdc.gov/places/measure-definitions/index.html

Research

Dukmasova, Maya. “Community gardens beautify urban space, but some seek to transform urban society” Chicago Reader, March 13, 2019. https://chicagoreader.com/news-politics/community-gardens-beautify-urban-space-but-some-seek-to-transform-urban-society/

LVEJO. “Reclaiming Green Space.” 2014. http://www.lvejo.org/our-accomplishments/reclaiming-green-space/

Rao, Prashanti. "Role of Green Spaces for Maintaining Well-Being in Residential Community Development" In Improving Quality of Life: Exploring Standard of Living, Wellbeing, and Community Development, edited by Ryan Yonk. London: IntechOpen, 2021. 10.5772/intechopen.97681, https://www.intechopen.com/chapters/76802

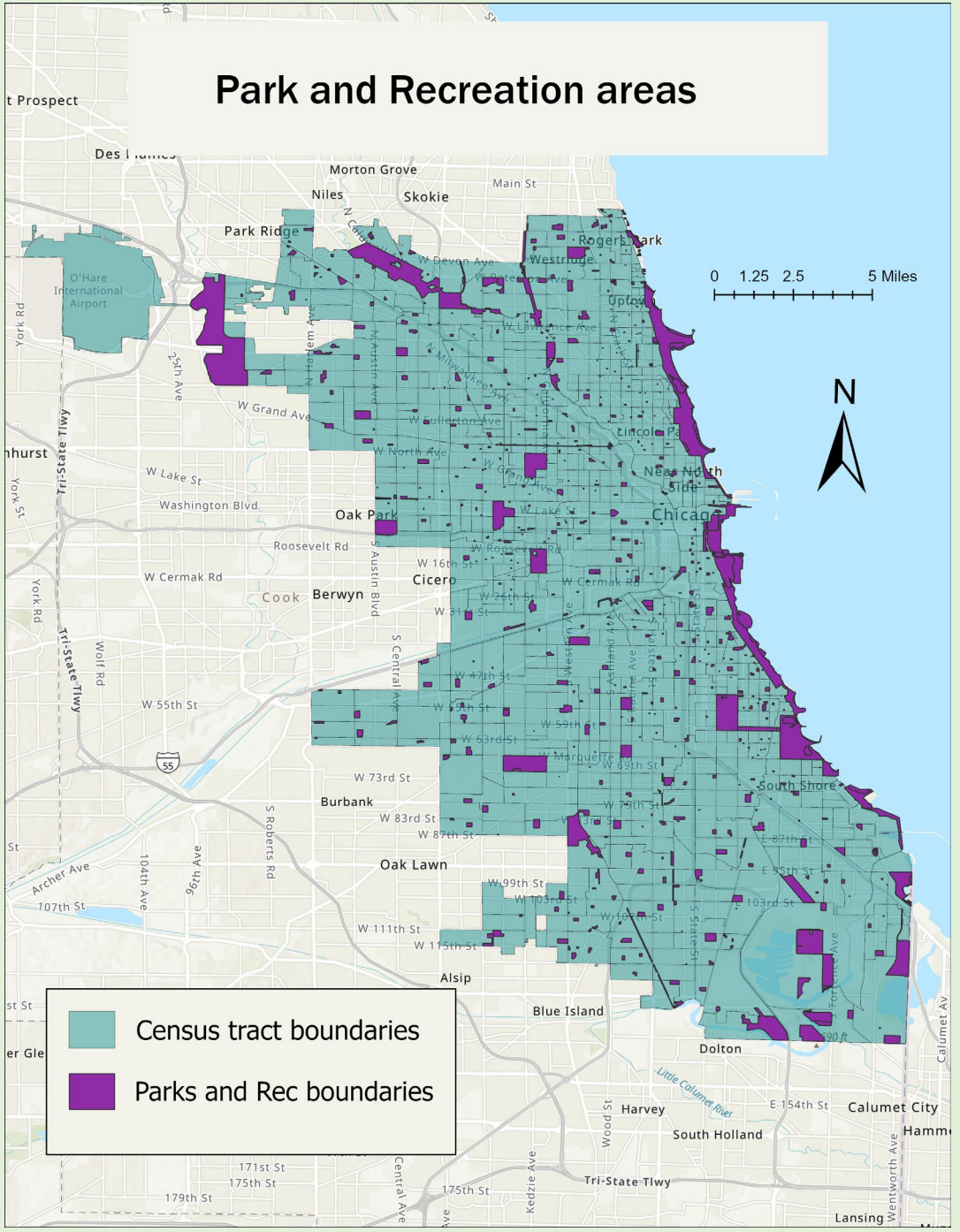
Wen M, Zhang X, Harris CD, Holt JB, Croft JB. “Spatial disparities in the distribution of parks and green spaces in the USA.” Ann Behav Med. 2013 Feb;45 Suppl 1(Suppl 1):S18-27. doi: 10.1007/s12160-012-9426-x. PMID: 23334758; PMCID: PMC3590901.

PLACES data measures used:

- **Cancer:** "Respondents aged ≥18 years who report ever having been told by a doctor, nurse, or other health professional that they have any other types (besides skin) of cancer."
- **Asthma:** "Weighted number of respondents who answer "yes" both to both of the following questions: "Have you ever been told by a doctor, nurse, or other health professional that you have asthma?" and the question "Do you still have asthma?""
- **Physical Leisure:** "Respondents who answered "no" to the following question: "During the past month, other than your regular job, did you participate in any physical activities or exercises such as running, calisthenics, golf, gardening, or walking for exercise?""
- **Binge Drinking:** "Adults aged ≥18 years who report having five or more drinks (men) or four or more drinks (women) on an occasion in the past 30 days."
- **High Blood Pressure:** "Respondents aged ≥18 years who report ever having been told by a doctor, nurse, or other health professional that they have high blood pressure. Women who were told high blood pressure only during pregnancy and those who were told they had borderline hypertension were not included.
- **General Health:** "Respondents aged ≥ 18 years who report their general health status as "fair" or "poor." on a scale of "excellent," "very good," "good," "fair," or "poor" (excluding unknowns and refusals)."

Methodology

1. Download shapefiles for Chicago Park District boundaries and boundaries for the Parks and Open Space land use zoning, then merged these shapefiles in ArcGIS to create my parks dataset.
2. I used ArcGIS pro to create a walking distance buffer (0.25 miles) around each park shapefile to analyze the accessibility of each park, not just the total park area
3. Used the Summarize Within tool to calculate the total area within the buffer per census tract to get the percentage of park area per census tract.
4. Used R to create bivariate correlation maps between the poor health indicators/risk factors with inversed park accessibility



Map 1

Findings & Discussion

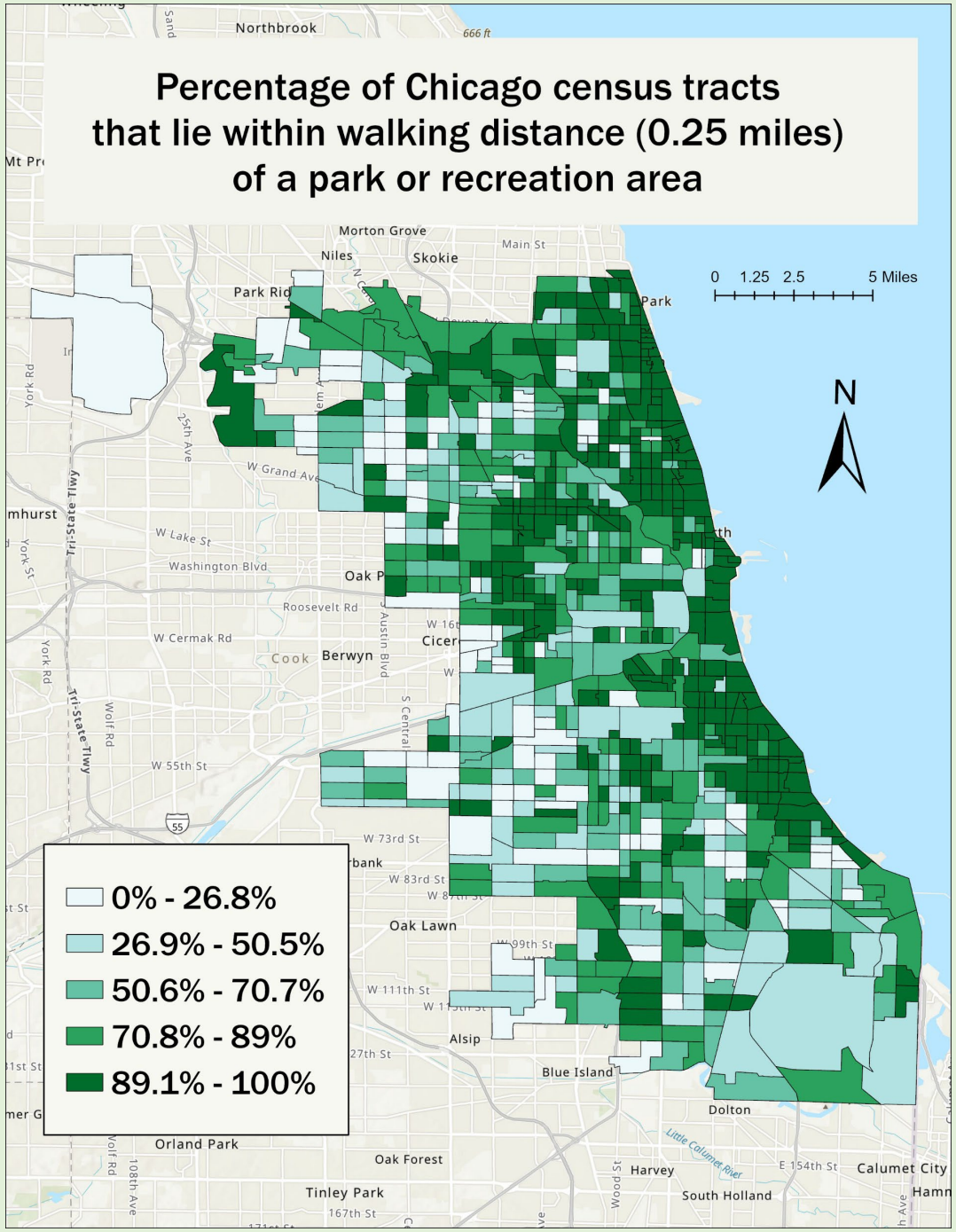
Total with 0%: 14
Total with 100%: 141

Figure 1

	No Leisure Physical Activity	Asthma	Binge Drinking	Cancer	High Blood Pressure	General Health
Min	9.8%	7.1%	6.5%	1.5%	10.4%	3.7%
Max	55.2%	17%	24.1%	11.3%	56.7%	46.9%
Average	28.6%	10.2%	13.9%	4.7%	31.1%	17.4%
St Dev	10.0%	2.2%	3.5%	1.4%	10.8%	8.4%

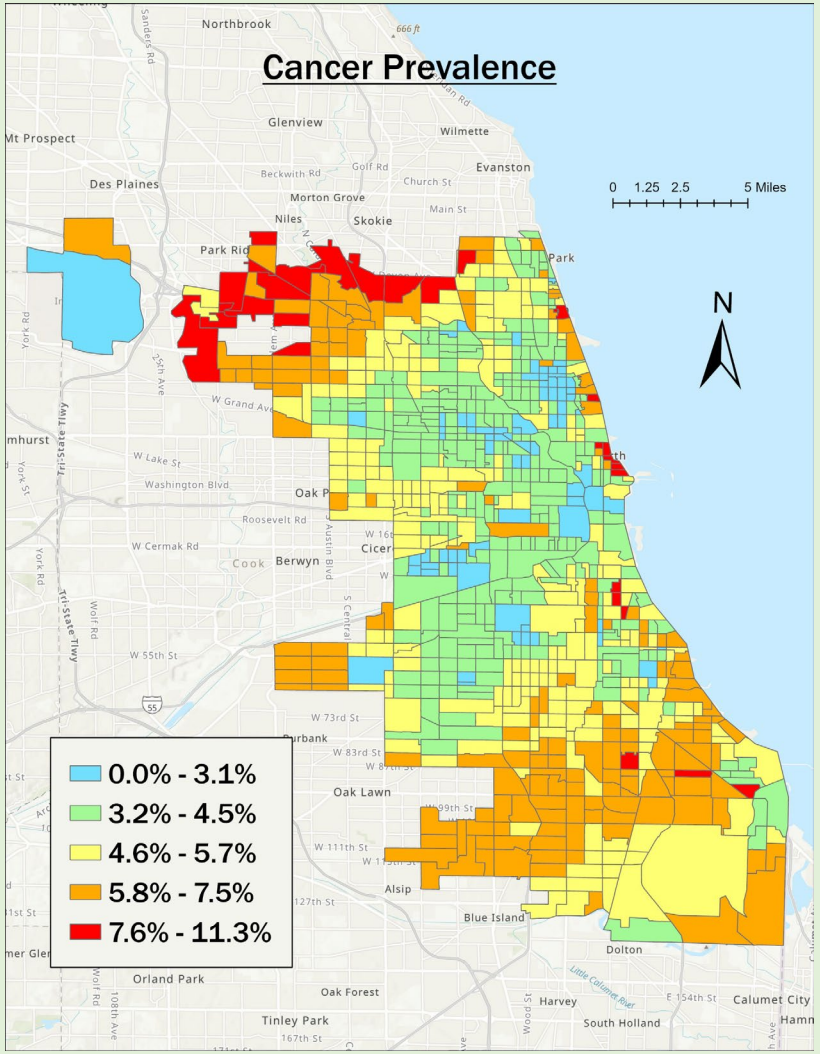
Figure 2

There are a lot of green spaces that are not part of the Chicago Park District, and there are also many facilities ran by the Chicago Park District but aren't necessarily greenspace parks. To get a more comprehensive look at what parks and rec areas there are, I decided to merge the shapefiles for Parks and Open Space land use zones with the Chicago Park District boundaries shapefile. This means that my parks dataset includes both public and private spaces, such as school playgrounds, private golf courses, community gardens, and some yards. But it does not account for different ways people might be using the land, such as empty lots zoned for other uses but being repurposed as a community garden.

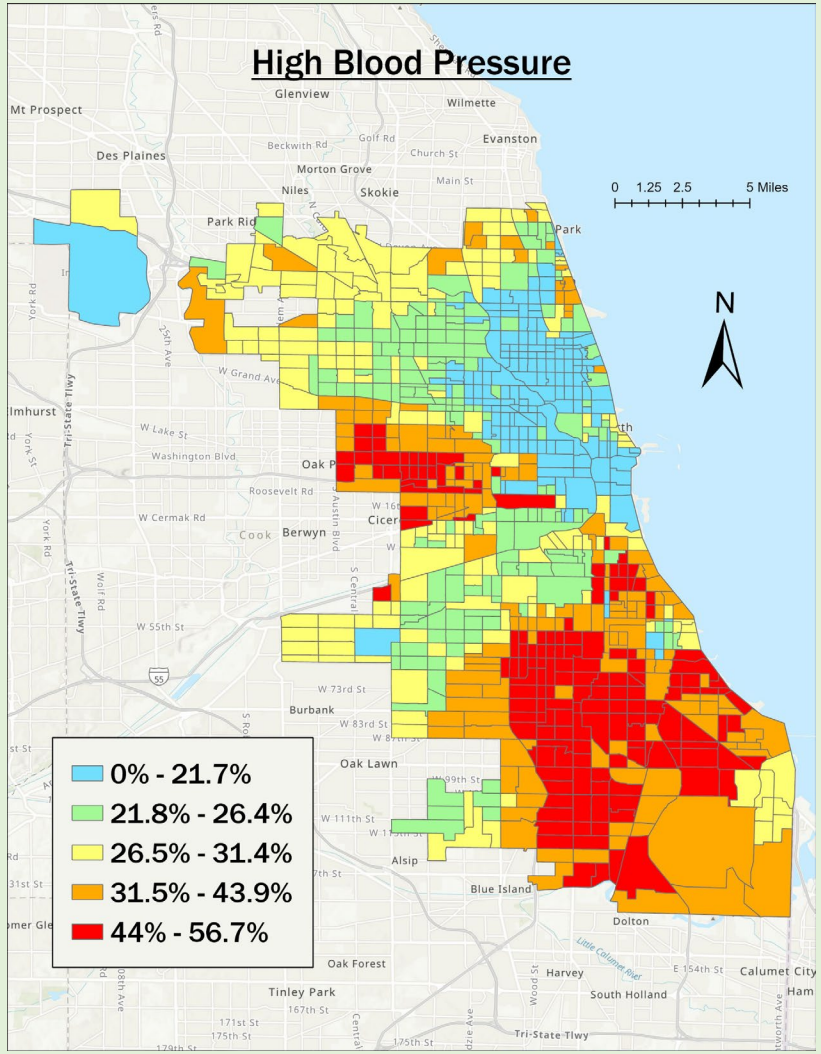


Map 2

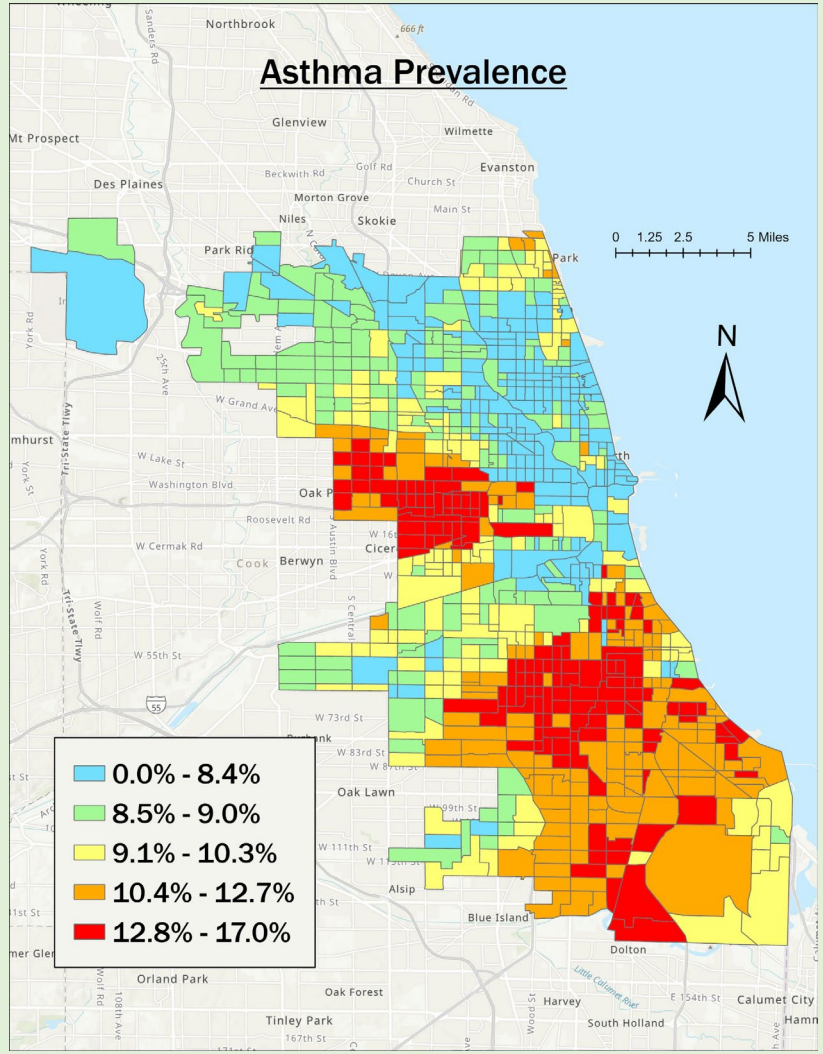
Maps of poor health indicators/risk factors



Map 3



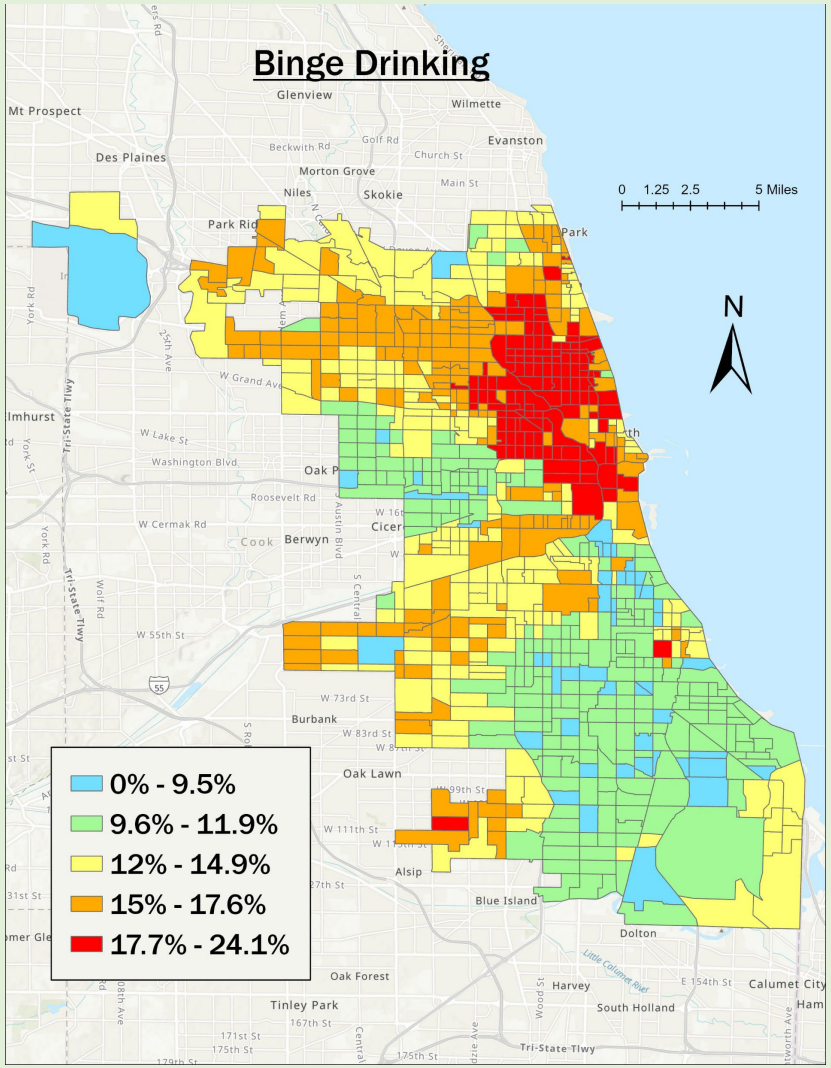
Map 4



Map 5

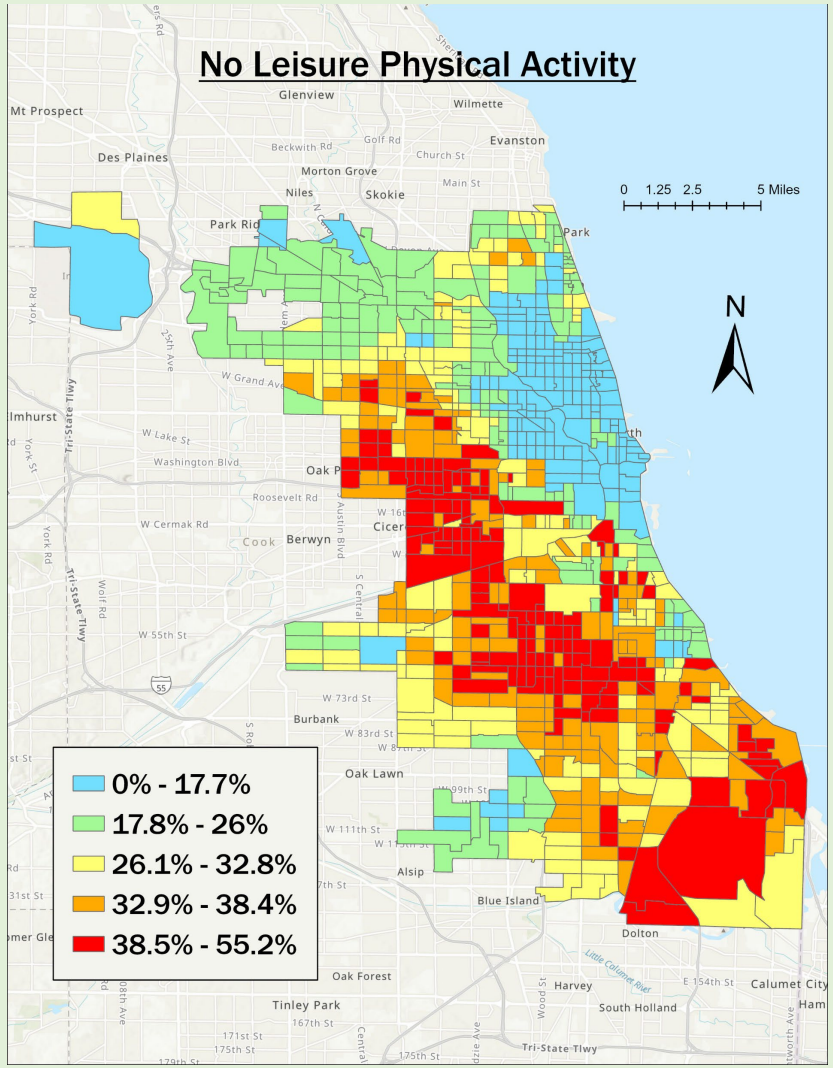
All single variable maps were made in ArcGIS Pro using choropleth mapping with a custom gradient and quantile breaks, sometimes slightly manually adjusted to display each class more clearly.

Binge Drinking



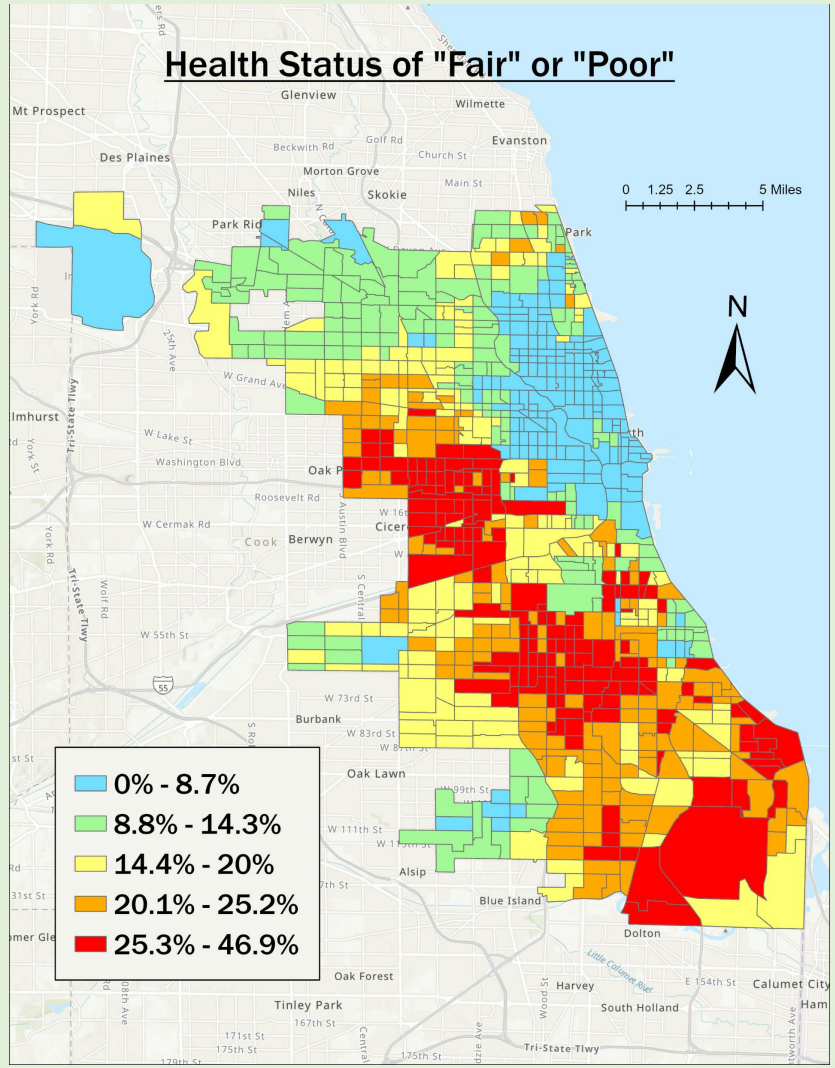
Map 6

No Leisure Physical Activity



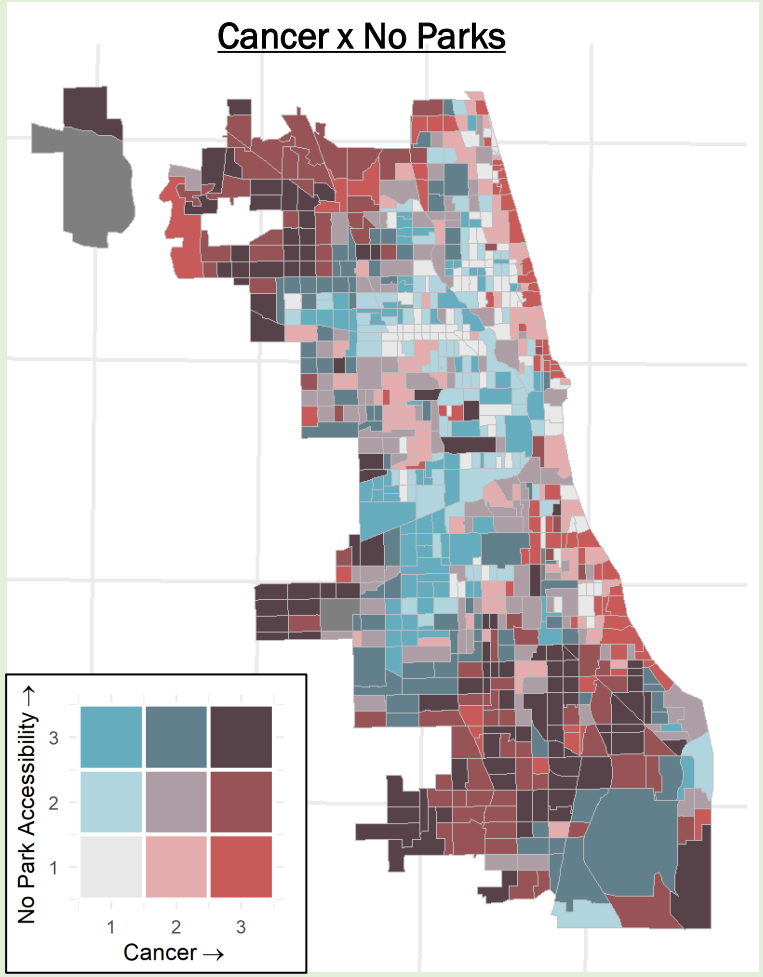
Map 7

Health Status of "Fair" or "Poor"

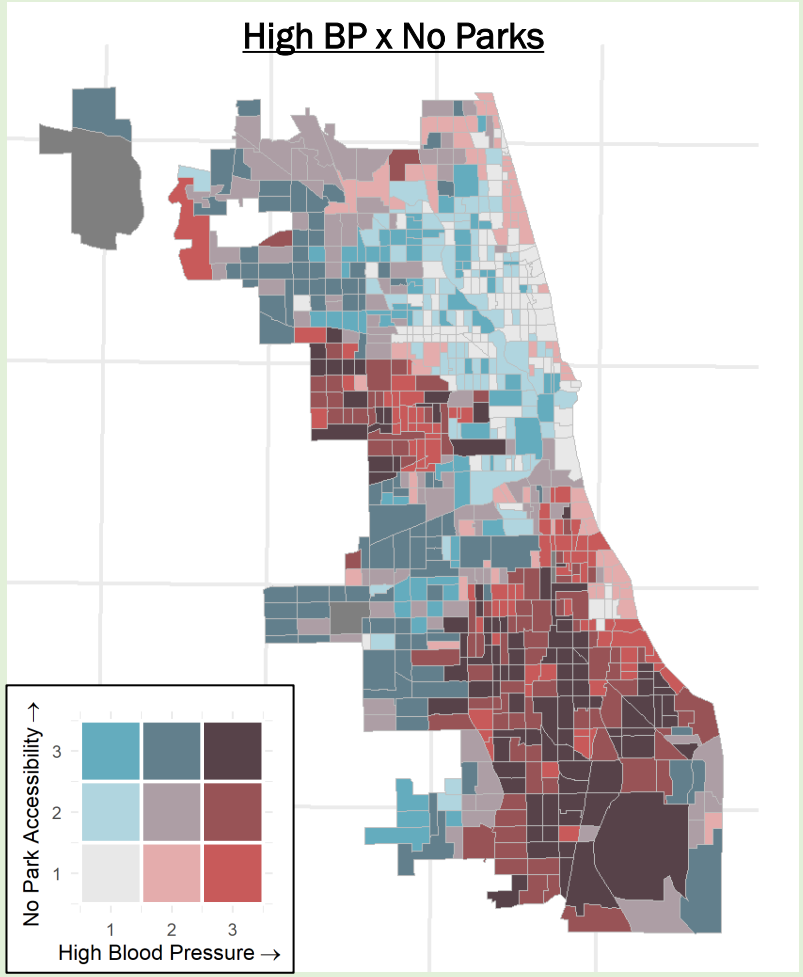


Map 8

Bivariate correlation maps



Map 9



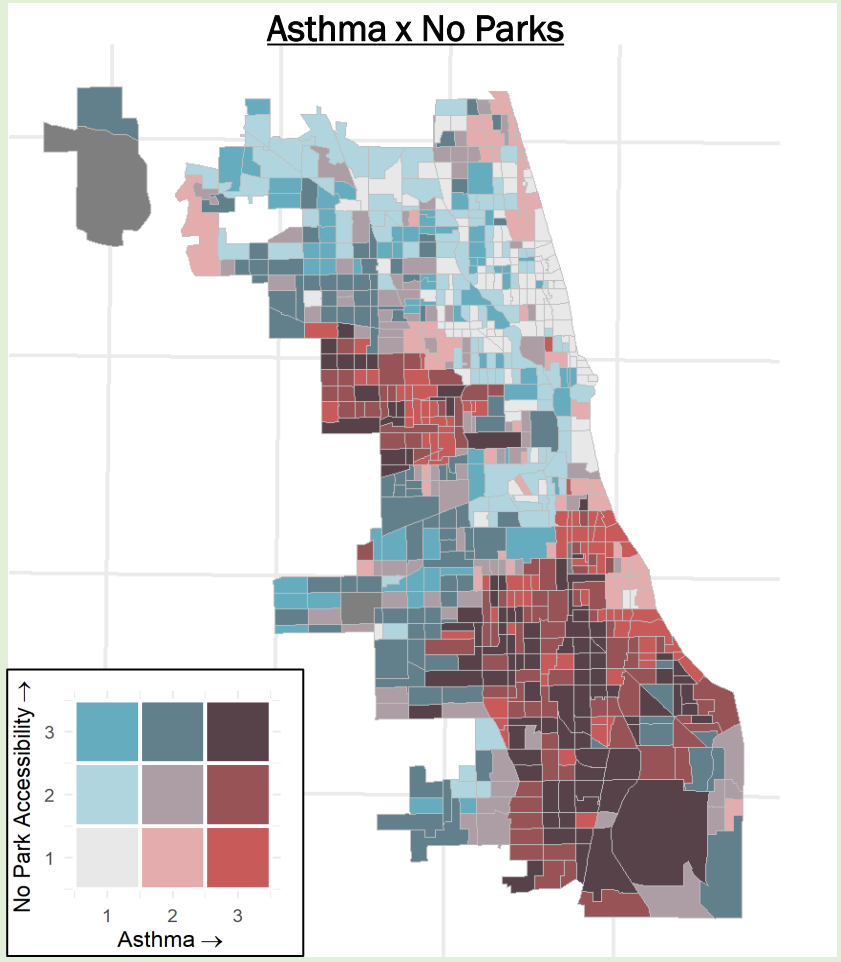
Map 10

Many of the negative health outcomes – cancer, high blood pressure, and asthma – share very similar distribution patterns and correlation patterns. The north side area is relatively consistently white/light grey and blue, meaning that the area has doesn't have a high prevalence of the measures of poor health, and a mix of high and low park access.

Lincoln Park (as in the Chicago Park District park, not to be confused with the adjacent neighborhood) makes a big difference in the northeast side's park access, with the park spanning a large part of the lakeshore area. Comparatively, the southside is both high in no park access and the negative health outcomes. Reasons for these correlations can be a discrepancy in income, which affects access to both health care in general and preventative health care. Other reasons could be correlations with pollution sources and toxins in the soil from previously industrial areas on the south shoreline.

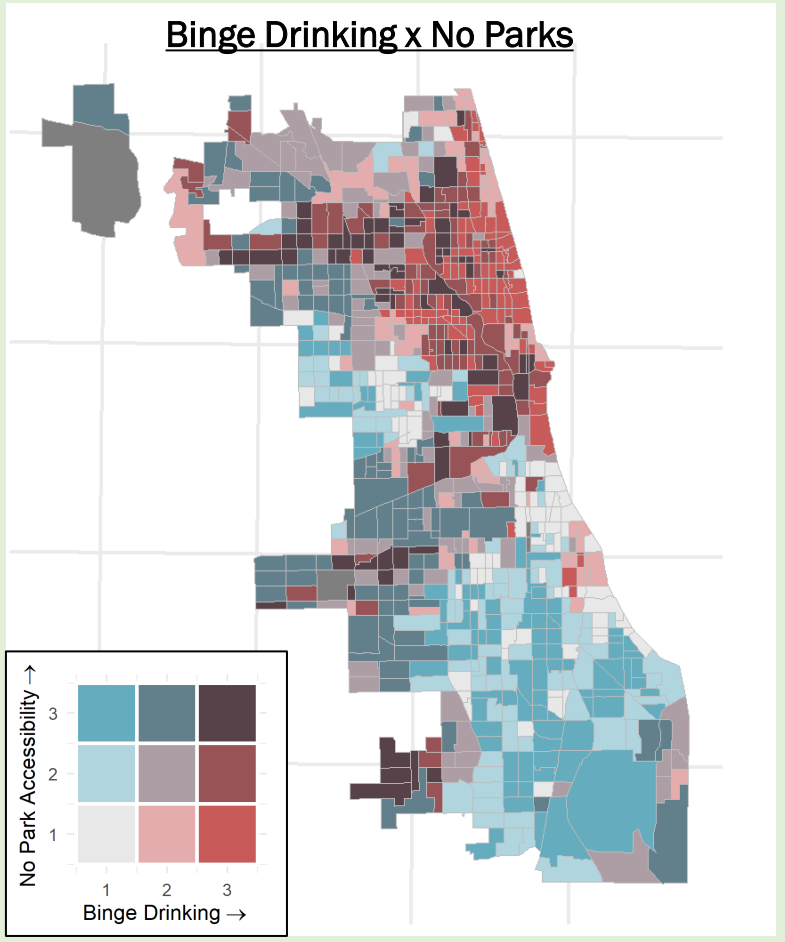
Cancer prevalence patterns differ slightly from the others, as there in increased prevalence near the shoreline and increased prevalence by O'Hare, possibly due to pollution, but this would have to be explored further.

Asthma x No Parks



Map 11

Binge Drinking x No Parks



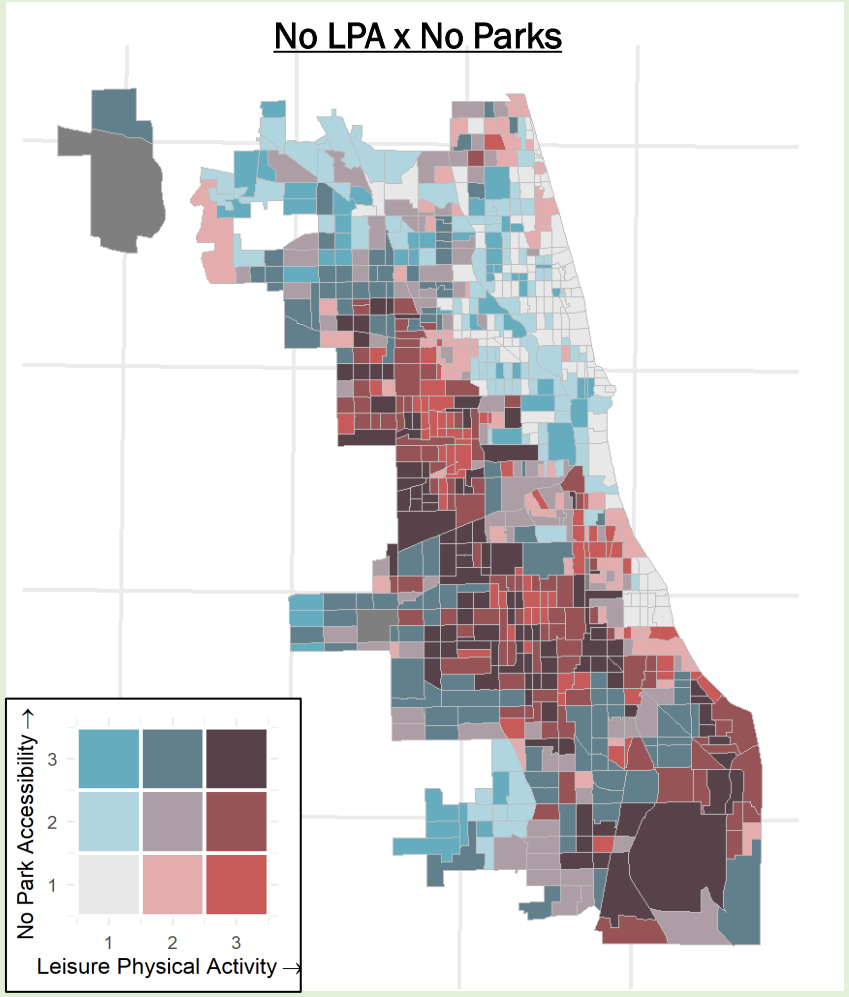
Map 12

Binge drinking is probably the most different of all the maps which makes sense as it isn't necessarily a health outcome but instead was chosen for being a variable of a health risk factor. The correlation is inverse and the opposite of all the rest. Binge drinking clusters mostly around the northside, DePaul and UChicago campuses, and the Loop.

This pattern makes sense, as being busy and having less disposable income to spend on alcohol or going out would likely correlate to less drinking. I feel this also almost emphasizes disparities in privilege, because drinking a lot is a health risk factor for other health measures included such as high blood pressure and cancer, but it still isn't correlated. This further emphasizes how it is more on the structural inequities and disparities in access and resources rather than personal choices that causes such health inequalities.

Asthma prevalence shares the similar correlations with the other negative health outcomes, but I also wanted to mention the additional factor of genetics, especially in relation to an autoimmune disease like asthma. But cancer and high blood pressure can also have genetic causes. While Chicago is a diverse city, it is still very segregated by racial and ethnic groups, and this might play some part in the correlation patterns.

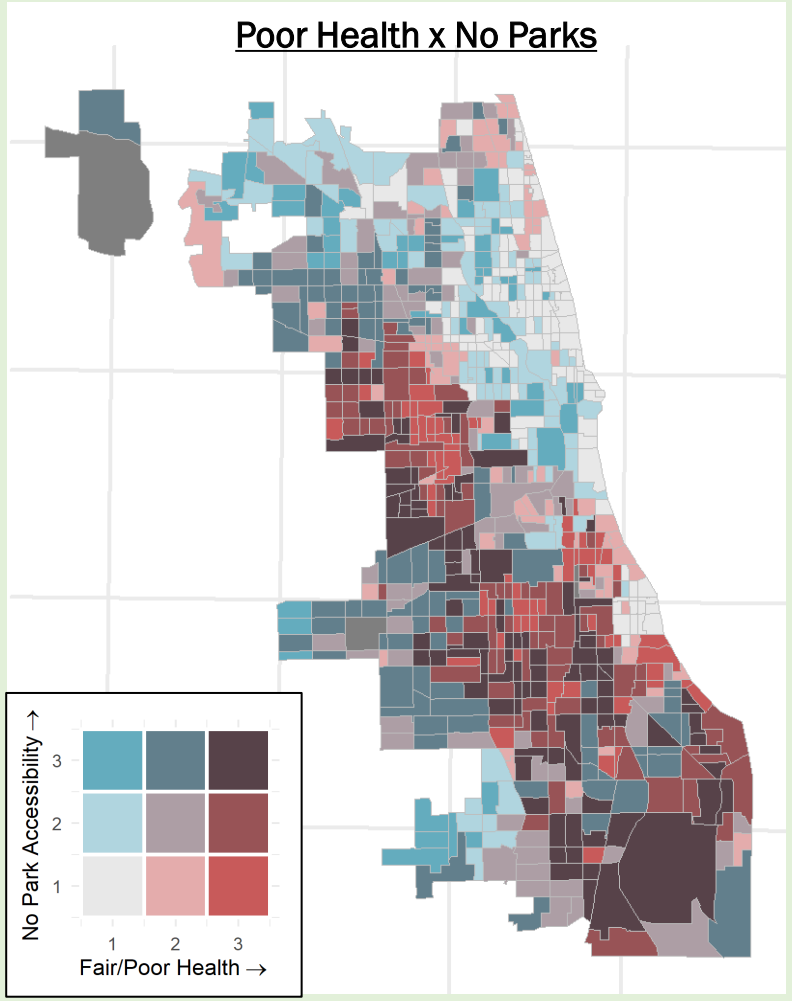
No LPA x No Parks



Map 13

The correlation between having no leisure physical activity and no or low park accessibility is the most simple and direct of the correlations. This observation is emphasized by the correlation coefficients in Figure 3. Not being able to easily and safely access a place to move around and get adequate exercise such as a large park means that it will be harder to get exercise as often or doing so would be more time consuming – a resource not everyone has. This is unfortunate because the communities who are most in need of the resources that parks can provide are also the most lacking.

Poor Health x No Parks



Map 14

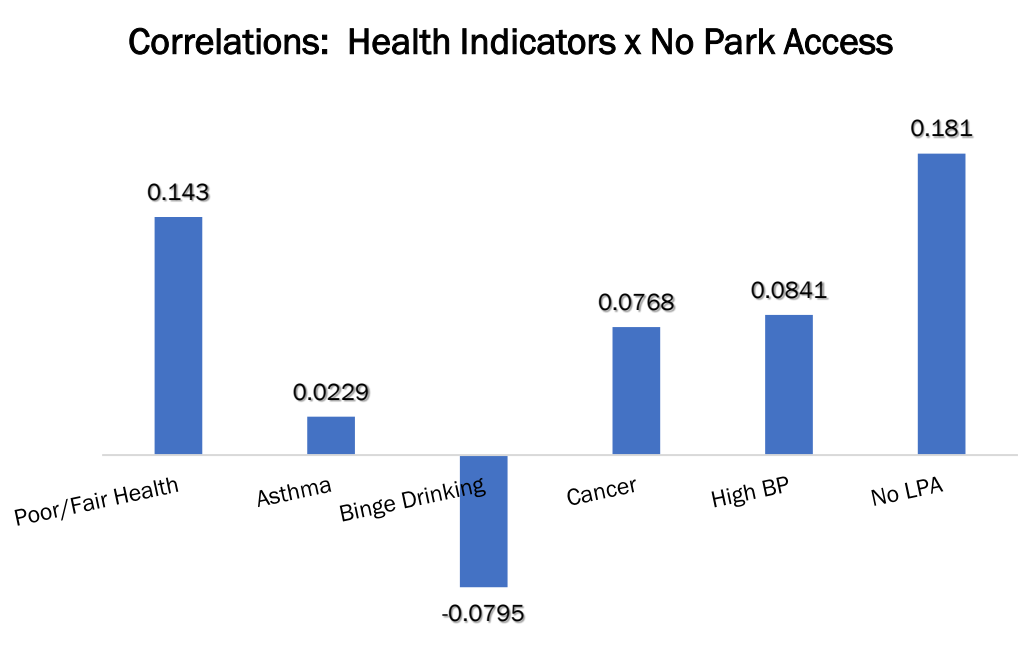


Figure 3

Conclusions & Implications

- Data shows how overall health is correlated to accessibility to parks.
- Park accessibility can be seen as an indicator of marginalization, low income, structural disadvantages, social vulnerability.
- Points to a need towards focusing more on the communities most lacking resources, and how not doing so may perpetuate already existing structural disadvantages.

Limitations & areas for further exploration

- Actual correlation coefficients are present but relatively low, which makes sense as there are many factors not included that affect both the health ad parks variables.

- Definitions of PLACES data – for example, the poor/fair health includes both statuses – would the correlations be higher or lower if only "poor" health was included?

- Maps of basic demographics, population, and income data would be necessary to include if presented in other contexts (i.e., contexts outside of a classroom composed of students who live in and have previously studied Chicago)

- Parks shapefiles and data could be more specific/detailed
    - public vs private
    - frequency of use
    - different amenities
    - quality of parks + usability

- Inclusion of different measures of distance/accessibility such as a wider radius or mode of transportation

- Not all areas are equally walkable and pedestrian friendly. Adding in some type of walkability measurement or walkscore would help in giving a more accurate representation of the communities.