

Final Project DATA 23700

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Unpacking Chicago's Health Insurance Disparities: The Impact of Healthcare Access, Socioeconomic Conditions, and Temporal Trends

The accessibility and quality of healthcare services are connected to the types of health insurance coverage families or individuals have. In Chicago, as in many urban areas, disparities in healthcare access and insurance coverage are evident across different community areas. This is often shaped by socioeconomic factors and the distribution of healthcare facilities. One of the key questions that arises from this is: **how does the spatial distribution of healthcare facilities, in conjunction with socioeconomic factors and changes over time, impact private versus public health insurance coverage in Chicago?**

This final project tries to answer whether the spatial distribution of healthcare facilities—clinics and hospitals—affects the prevalence of private versus public health insurance in Chicago. Using data from the Chicago Health Atlas, the Chicago Data Portal, and the American Community Survey (ACS), the project also incorporates socioeconomic factors such as public assistance income and perceived neighborhood safety. It explores how these socioeconomic variables influence the likelihood of individuals having private or public insurance. This project studies not only spatial patterns, but also temporal trends in health insurance coverage and public assistance income. It analyses how the prevalence of different insurance types and cash welfare support have changed over time.

To explore these relationships, this project uses community area-level data and visualizes patterns using choropleth maps. Understanding the spatial distribution of healthcare facilities is important for studying their relationship with health insurance coverage. To visualize these patterns, Altair was used to create maps illustrating the distribution of clinics and hospitals across the city. Due to missing data on certain healthcare facilities, base maps were incorporated to present a more complete representation.

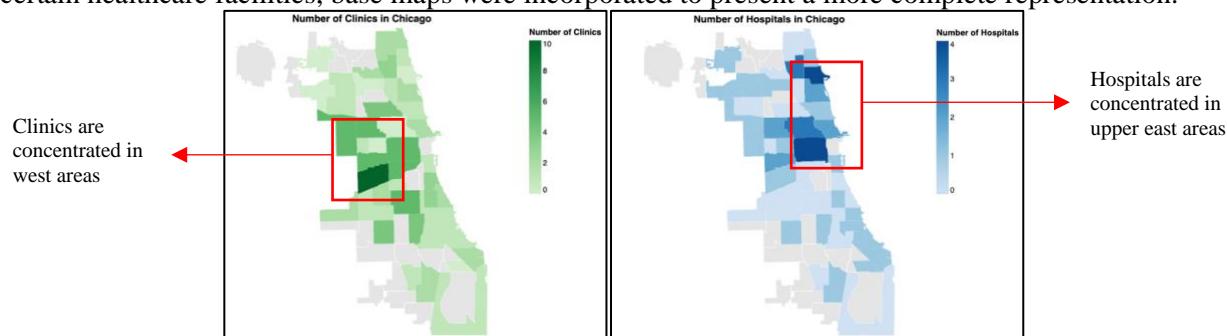


Figure 1. Clinics Distribution in Chicago (Left); and Figure 2. Hospitals Distribution in Chicago (Right)

Clinics are concentrated on the West Side of the city, particularly in South Lawndale, with a dramatic decrease in numbers as one proceeds southern. The number of clinics in each area goes from 0 to 10, with darker colours indicating higher clinic density. While the distribution of hospitals and clinics looks to be similar, the variation in hospital distribution is less than that of clinics. The number of hospitals spans from 0 to 4, with the maximum concentration located on the Near West Side and Uptown, as well as several others in adjacent neighborhoods. Furthermore, unlike the clinic distribution, which has a single peak in the middle-west region, the hospital distribution has two peaks, one in the central area and another in the upper East areas. While the South Side has fewer hospitals in general, some regions have higher concentrations, making the hospital distribution appear to be more even than that of clinics.

The disparity in clinic and hospital distribution may have an impact on the distribution of private and public insurance. The following charts investigate the geographic distribution of various insurance types across Chicago by mapping the rates of employment-based insurance, uninsured individuals, and Medicaid coverage. Medicaid, one of the largest public insurance programs, is frequently connected with low-to-moderate-income individuals¹. Employment-based insurance, on the other hand, is an indicator of

¹ Burns, Alice, Elizabeth Hinton, Robin Rudowitz, and Maiss Mohamed. 2025. "10 Things to Know About Medicaid." KFF, February 18, 2025. <https://www.kff.org/medicaid/issue-brief/10-things-to-know-about-medicaid/>.

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private insurance coverage, which can help explain employment patterns—because only certain firms provide this sort of insurance, it indirectly reflects employment rates and job types in different community areas.

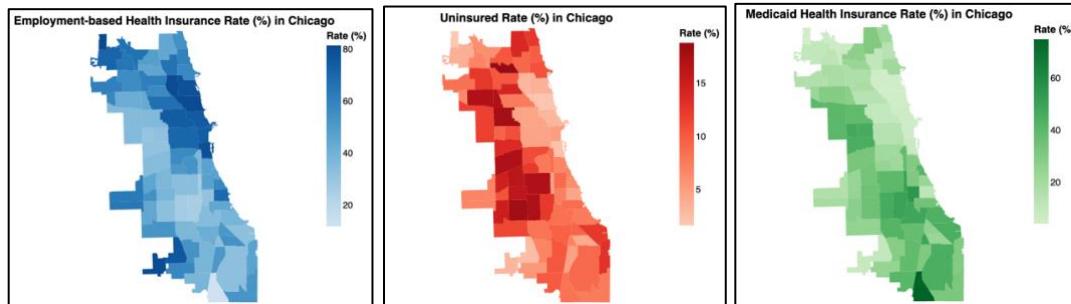


Figure 3. Employment-based Health Insurance Rate Distribution in Chicago (Left); Figure 4. Uninsured Rate Distribution in Chicago (Middle); and Figure 5. Medicaid Health Insurance Rate Distribution in Chicago (Right)

The distribution of employment-based health insurance coverages (Figure 3) resembles that of hospitals (Figure 2), with the highest concentrations in the upper East. The greatest employment-based insurance rate is up to 80%, mainly in the Upper East Side, while the lowest rates are often found on the South Side (20%). In contrast, the distribution of uninsured rates (Figure 4) and Medicaid health coverage (Figure 5) is similar to that of clinics in Chicago (Figure 1), with higher concentrations on Chicago's West Side. This implies that places with a greater number of hospitals may be positively connected with a greater proportion of employment-based health insurance, whereas areas with more clinics likely to have higher uninsured rates and Medicaid coverage.

To further analyse the claims made above, the following scatterplots are created. The ribbon of uncertainty (which is represented by the shaded region around the regression line) is included to show the confidence interval of the regression model.

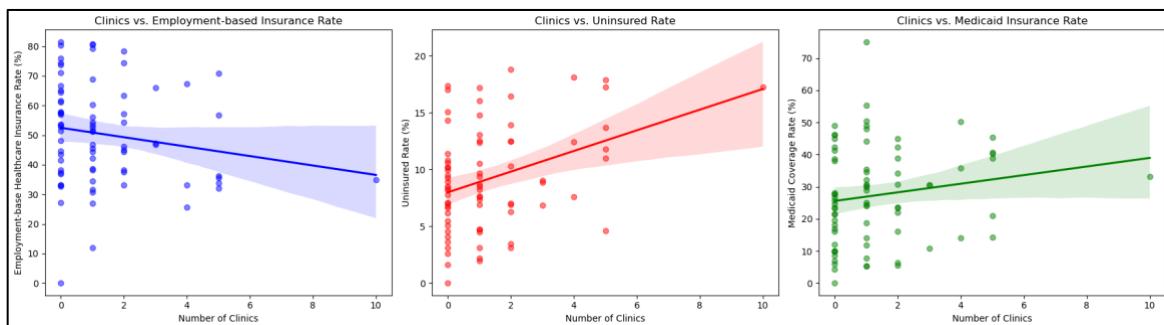


Figure 6: Scatterplots of Number of Clinics vs Different Types of Insurance

The scatterplots above describe a more detailed exploration of the relationship between the number of clinics and different types of insurance coverage. There appear to be positive relationships (indicated by positive slopes) between the number of clinics and both the uninsured rate and Medicaid insurance coverage. While both show positive relationships, the slope for the number of clinics versus the uninsured rate is steeper than that for clinics versus Medicaid insurance coverage, indicating that the relationship is stronger for the uninsured rate. These positive relationships align with previous findings, suggesting that areas with a higher number of clinics tend to have higher uninsured rates and higher Medicaid insurance coverage. Conversely, the number of clinics shows a negative relationship (indicated by a negative slope) with employment-based health insurance coverage. This also aligns with previous findings, where community areas with many clinics (dark green areas in Figure 1) tend to have lower employment-based insurance coverage (light blue areas in Figure 3).

Final Project DATA 23700

Enrico Madani

The following analysis explores the relationship between the number of hospitals with different types of insurance.

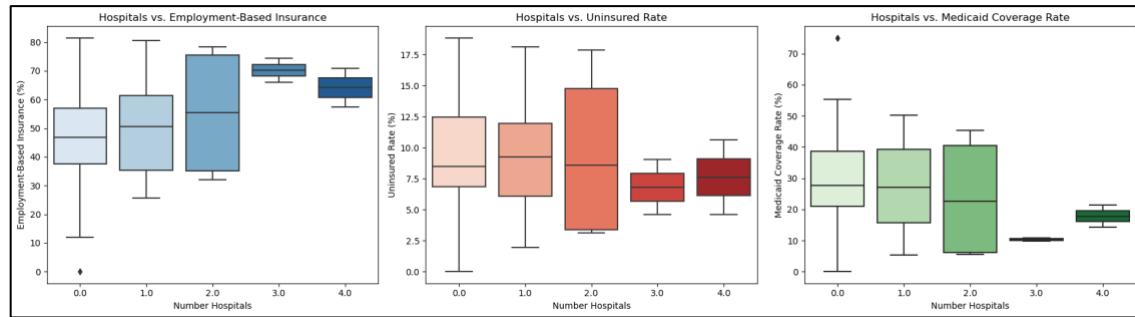


Figure 7: Box Plots of Number of Hospitals vs Different Types of Insurance

From the Hospitals vs. Employment-Based Insurance box plot, there appears to be a positive relationship, with the mean level of insurance coverage increasing as the number of hospitals increases. This aligns with previous findings that community areas with a higher number of hospitals tend to have higher employment-based insurance coverage. In contrast, the number of hospitals shows a slight negative relationship with Medicaid coverage and almost no relationship (the means remain linear) with the uninsured rate. These patterns suggest that the distribution of hospitals may be influencing the types of insurance coverage, particularly employment-based insurance.

To better understand these relationships, it is necessary to explore the potential role of socioeconomic factors. Therefore, the following analysis will examine how variables such as cash welfare/public income assistance and perceptions of public safety correlate with the distribution of different types of insurance. By investigating these social determinants, the following analysis look into how socioeconomic conditions shape health insurance coverage patterns across the city.

The upper two scatter plots in Figure 8 explore how Medicaid coverage relates to employment-based insurance coverage and the uninsured rate. The plot comparing Employment-Based Insurance (%) vs. Medicaid (%) shows an almost perfect negative relationship, which makes sense because individuals with employment-based insurance are less likely to be enrolled in Medicaid, resulting in a negative correlation.

This near-perfect negative relationship is beneficial for the analysis, as it allows for a focus on socioeconomic factors related to Medicaid, with the relationship to employment-based insurance inferred in the opposite direction. It is also interesting to note that the Uninsured (%) vs. Medicaid (%) scatter plot shows a positive, but not perfect, relationship. This indicates that in community areas with higher uninsured rates, there is also a tendency for higher Medicaid coverage.

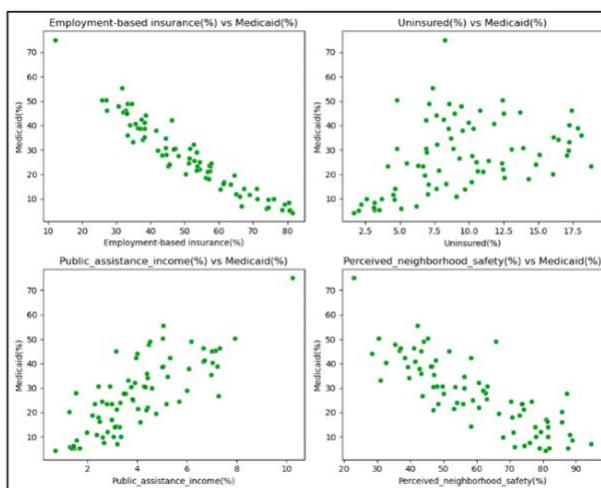


Figure 8. Scatterplots of Socioeconomic Factors vs. Medicaid Coverage

The bottom two scatter plots in Figure 8 investigate the relationship between socioeconomic factors and Medicaid coverage percentage. The left plot suggests that public income assistance (cash welfare) has a positive relationship with Medicaid, meaning that in areas with high Medicaid coverage, the proportion of people receiving cash welfare also tends to increase. In contrast, Medicaid has a negative relationship with perceived public safety, indicating that areas with high Medicaid coverage tend to have lower perceptions of safety. This relationship can be mirrored in the context

The bottom two scatter plots in Figure 8 investigate the

Final Project DATA 23700

Enrico Madani

of employment-based insurance, where communities with high employment-based insurance coverage tend to have lower cash welfare assistance but higher perceptions of safety.

To expand on the differences between public and private insurance, the following temporal analysis shows some interesting patterns. The chart depicts trends in health insurance coverage, with employment-based insurance expanding over time while public insurances like Medicare and VA (Veteran Affairs) coverages remain stable. Medicaid, as one of a big public insurances, saw a minor growth until 2018, after which it declined. Employment-based insurance increased from under 50% in 2015 to over 55% by 2023, most likely due to rising employment rates. Public insurance trends, particularly Medicaid, and cash

assistance exhibit diverging patterns. Cash welfare decreased from 2015 to 2019, then grew until 2021 before decreasing again, while Medicaid increased until 2018 before dipping. This implies that when employment rates and incomes rise, reliance on cash welfare declines, whereas Medicaid membership may take a different path.

A factor that might influence Medicaid enrolment is Illinois' decision to expand Medicaid eligibility under the Affordable Care Act (ACA) in 2014², making coverage

Figure 9. Line Plot of Insurance and Cash Welfare Trends over Time

available to more low-income and non-elderly adults. This expansion contributed to an early increase in Medicaid enrolments, from 2015 to 2018. However, as employment increased (as seen by the gradual growth in job-based insurance), and potentially incomes increased, fewer people may have qualified for Medicaid, resulting in its drop after 2018. While both Medicaid and cash welfare help low-income populations, Medicaid's expansion and policy changes are likely to have allowed more people to keep their coverage even while their reliance on direct financial aid decreased.

CONCLUSION

The distribution of hospitals and clinics in Chicago reflects socioeconomic disparities in access to healthcare. Clinics are more common in poorer (high public assistance income rate), less safe neighborhoods, which is associated with higher Medicaid and uninsured rates. Clinic density declines, however, in wealthier community areas with greater employment-based insurance coverage, suggesting reliance on private healthcare coverages. Hospitals show the opposite trend, more prevalent in wealthier community areas (lower cash welfare rate and safer neighborhoods) with more employment-based insurance and less Medicaid enrolments. This suggests hospitals are more concentrated where private insurance access is greater, while clinics play a vital role in lower-income communities, where they rely more on public insurance in the form of Medicaid.

The temporal examination demonstrates trends in private and public coverage over time. Private employment-based coverage and Medicare continued to increase, with other public insurances such as Medicare and VA coverage plateauing. Medicaid coverage increased through 2018, when it decreased, mirroring the trend of cash welfare, which decreased from 2015 to 2019, then increased through 2021, then decreased. The Illinois expansion of the Medicaid program under ACA in 2014 contributed to the initial enrolment growth. But as employment rates and pay rose, more individuals possessed employer-provided insurance and fewer qualified for Medicaid, leading it to decline after 2018. These trends suggest that while Medicaid and cash welfare support low-income populations, policy changes and economic factors affect their trajectories differently.

² Healthinsurance.org. n.d. "Medical Eligibility and Enrolment in Illinois." Accessed March 9, 2025. <https://www.healthinsurance.org/medicaid/illinois/>.