Impact of Socio-Economic Factors on Readmission Rates

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1 Background

There is substantial evidence that patient outcomes are impacted by socio-economic factors. In particular, patients with low socio-economic status face challenges with post-hospital transition, leading to poor results [1]. As such, we aim to identify particularly significant disparities in readmission rates in California. We assess what factors are most important for improving this outcome and identify suggested areas of improvement and further study.

2 Methodology

We primarily analyzed a dataset tracking readmission rates per county in California over time [5]. California includes 58 counties, which vary in population density, ethnic diversity, and economic disparity. We obtained datasets detailing each factor, aggregated the data, and used a regression model to determine the significance. In particular, we studied data tracking the poverty levels [3], population density [2], hospital counts [4], ethnic diversity [6], and hospital bed counts [7].

Next, we used multiple regression to understand the synergy between relationships. We determined the optimal predictive model from the adjusted R^2 value (penalized for more variables to prevent overfitting).

We used this model to create a predictive framework, which we invoked to deepen our understanding of the trends we identified.

3 Results

Our models detected statistically significant correlations between readmission rates and ethnic diversity, hospitals per capita, and z. We analyze several examples below.

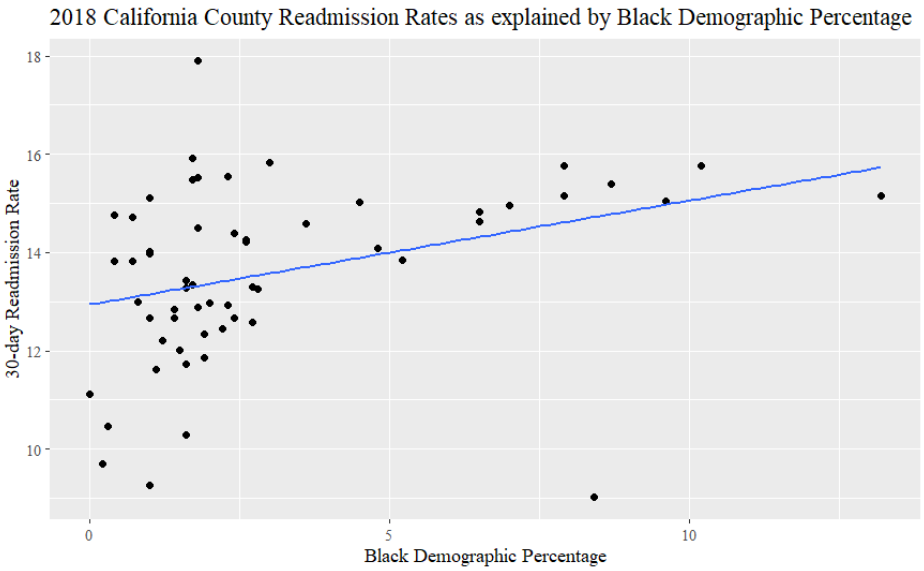

Figure 1: We note there is a correlation between the African American demographic percentage and hospital readmission rate within 30 days. These results imply that for every additional percent of the population constituated by African Americans, we expect a .1994% increase in readmission rates. We note a p value of 0.0145.

Similar results were observed for other minority groups. We found the most significant factor to be percent of white population.

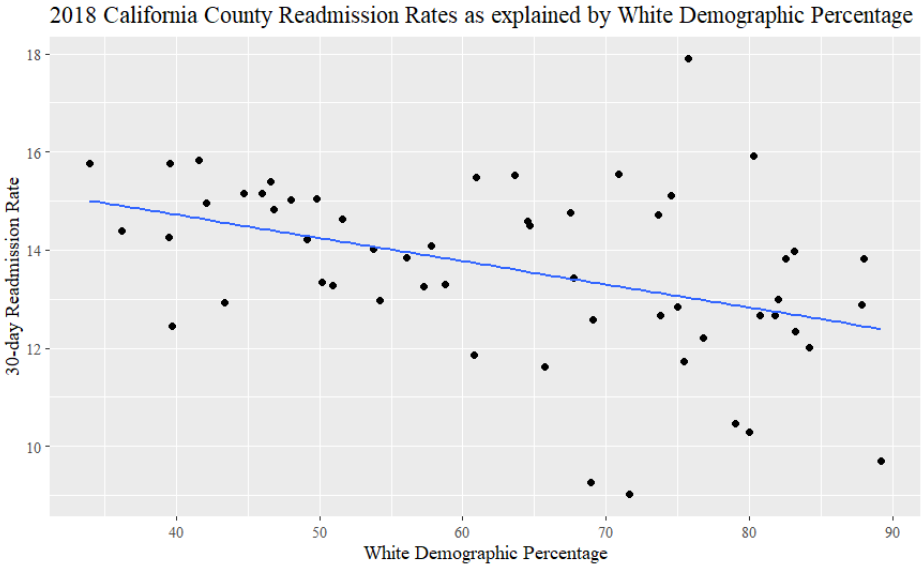

Figure 2: The most significant trend, the relationship between percentage of white population and readmission rates, had a p value $p = 0.001$.

To find explanatory measures for these trends, we also compared readmission rates to a variety of other factors. From these, we confirmed the following factors were not significant predictors:

Metric	p value
Population density	$p = 0.076$
Hospital beds per capita	$p = .897$
Percentage of population below the poverty line	$p = .827$

However, we found a significant trend between hospitals per capita and readmission rates as shown in Figure 3.

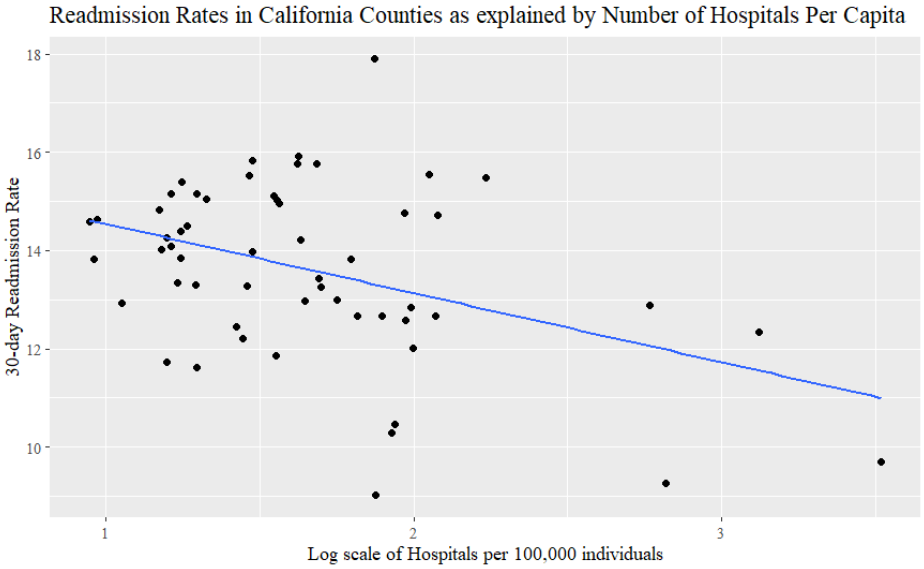

Figure 3: p value of non logarithmic scale was $p = 0.001$

Since the number of beds available per capita was not a significant trend, we hypothesize that this correlation originates from a potential focus on specialized or personalized care in a community hospital.

We also noted that counties with a higher population of white individuals also had higher number of hospitals. This may be a potential explanatory factor for the trend observed in Figure 3.

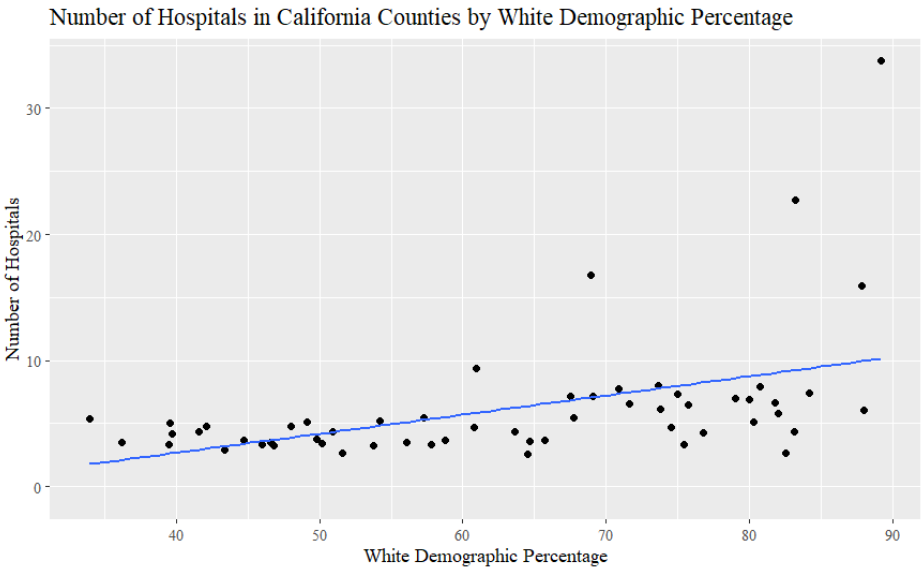

Figure 4: Observed correlation between white demographic percentage and number of hospitals per capita.

We then performed multivariate regression on the prominent predictors to determine the best possible predictive model. After testing possible combinations, we determined that aggregating statistics of percentage of white population and hospitals per capita produced the best model, accounting for 25% of the variance.

Using this, we created a predictive model to help better understand the impact of the hospital availability and population composition on readmission rate outcomes.

We analyzed Arapaho County, Colorado. which has a population of 656,000, an African American population of 71,815, and roughly 33 hospitals. We found that out of every 100 patients admitted to hospitals, 14.88 would be predicted to be readmitted unexpectedly in the next 30 days. Further, in a similarly sized county without minority representation, the model would predict to only see 12.57 of these.

4 Conclusions

Ultimately, we see the most significant trends between population demographic and number of hospitals per capita in 30-day unplanned readmission rate. To make progress in combating these trends, we emphasize the importance of prioritizing racial equality and ensuring there are plenty of accessible hospitals capable of navigating patients through their journey.

5 Sources

References

[1] Kangovi et al. "Challenges faced by patients with low socioeconomic status during the post-hospital transition". In: *J Gen Intern Med.* (2014).

[2] *California Population Density County Rank.* Accessed Feb 15, 2025. USA Ranks. URL: `http://www.usa.com/rank/california-state--population-density--county-rank.htm`.

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[4] *Department of Health Care Access and Information - Facility List.* Accessed Feb. 15, 2025. California Health and Human Services. URL: `https://data.chhs.ca.gov/dataset/facilitylist`.

[5] *Facility List*. Accessed Feb. 15, 2025. URL: https://data.chhs.ca.gov/dataset/facilitylist.

[6] *HDPulse: An Ecosystem of Minority Health and Health Disparities Resources*. Accessed Feb. 15, 2025. National Institute on Minority Health and Health Disparities Resources. URL: https://hdpulse.nimhd.nih.gov.

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