Introduction

The dataset used in this project is titled "Emergency Department Volume and Capacity." It was created by the Department of Healthcare Access and Information, and contains data collected from California hospital emergency departments to evaluate the relationship of hospital encounters to treatment stations. This dataset contains 12,849 observations of 18 variables. Each observation represents a different hospital and the variables in the dataset are the OSHPD ID, hospital name, county, hospital system, range of emergency department treatment stations, ownership category, area designation, whether it is teaching or non-teaching, health condition category, total number of emergency department encounters, number of treatment stations, number of patients for health condition category, latitude, longitude, if it is in a primary care shortage area, if it is in a mental health care shortage area, number of patients per station, and the year of the data.[1] The variables of interest in the dataset are number of treatment stations (EDStations), and total number of emergency department encounters (Tot_ED_NmbVsts), both of which are numerical variables.

This project is guided by the question: how does capacity to treat patients in emergency departments in urban areas with restricted access to primary care vary based on hospital ownership, year, and county? To answer this, I have condensed the Emergency Department Volume and Capacity dataset into a smaller dataset titled Urban Shortage Areas (urban_shortage_areas.csv). This dataset contains 1691 observations of 10 variables, with no missing values. This dataset only contains data from urban hospitals in primary care shortage areas. The variables in Urban Shortage Areas are number of patients per station, if it is in a primary care shortage area, number of treatment stations, total number of emergency department

[1] Field names: oshpd_id, FacilityName2, CountyName, system, LICENSED_BED_SIZE, HospitalOwnership, UrbanRuralDesi, TEACHINGDesignation, Category, Tot_ED_NmbVsts, EDStations, EDDXCount, LATITUDE, LONGITUDE, PrimaryCareShortageArea, MentalHealthShortageArea, Visits_Per_Station, Year

encounters, area designation, ownership category, year, county, average number of emergency department encounters, and average visits per station.[2] The variables of interest for this project are number of treatment stations and total number of emergency department encounters, both of which are numerical variables.

Plot 1

Plot 1 displays the relationship between the number of stations in an emergency department and the average number of patients per station in emergency departments. This plot shows that emergency departments with less stations tend to take on higher quantities of patients. This indicates that emergency departments in urban areas with restricted access to primary care may be overcrowded, as hospitals with fewer stations likely are unable to accommodate large quantities of patients. Overcrowding likely decreases the quality of care provided, increases wait times, and causes hospital workers to be overwhelmed.

Plot 2

Plot 1 told us that hospitals with a low number of stations and a higher quantity of patients likely results in a decreased quality of care, plot 2 indicates whether hospital ownership has any correlation to quality of care by examining the relationship between the average number of patients per facility and number of stations for hospitals that are owned by the government, nonprofits, or investors. This plot shows that government hospitals likely have the greatest capacity to provide higher quality care, as they have a comparatively high number of stations for the number of patients treated. Nonprofit hospitals likely have a worse capacity to provide high quality care as they have a comparatively high number of patients for the number of stations available.

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[2] Field names: Visits_Per_Station, PrimaryCareShortageArea, EDStations, Tot_ED_NmbVsts, UrbanRuralDesi, HospitalOwnership, year, CountyName, avgTotEDVsts, avgEdStationVisits

Plot 3

Plot 3 shows the relationship between the number of emergency department stations and the total number of patients treated in the emergency department by year. The three boxplots show a decline in the quality of care provided by emergency departments between 2021-2023. In 2021 there was a higher number of emergency department stations with a lower number of patients, and in 2023 there was a lower number of emergency department stations with the highest total number of patients.

Plot 4

Plot 4 displays the average number of emergency department visitors per station in 15 different California counties. This plot shows that Los Angeles county had the highest number of emergency department patients per station by a large margin. Knowing that Los Angeles county is the most populous county in California, and considering that the data is only from hospitals in areas with restricted access to primary care, the plot indicates that people living in more populated areas may have worse access to primary care, and are likely being provided a lower quality of care in emergency departments.

Conclusion

Through the four data visualizations, I have found that emergency departments with less stations and higher numbers of patients are more likely to provide patients with a lower quality of care. Based on that, it can be seen that in California, from 2021-2023, quality of care in urban hospitals in restricted primary care access areas has declined. This decline in quality mainly affects those living in more populated areas, as they are more likely to have restricted access to primary care and overcrowded emergency departments. I have also found that government owned hospitals are likely to provide a higher quality of care than nonprofit or investor owned

hospitals, from this we can guess that in Los Angeles, it is likely that many hospitals are not government owned. Though this data does provide helpful insight into how factors like location and restricted access to primary care can affect the quality of treatment in emergency departments, the data is skewed as over half of the hospitals from where data was taken were in Los Angeles county. By having a majority of the data be concentrated in one location, an accurate picture of the state of emergency departments in the whole of California. I also do not provide a comparison between hospitals in areas with adequate access to primary care, which could provide beneficial insight into whether or not the treatment in the hospitals I evaluated is comparatively worse.