

University of Washington

# Examining How the Likelihood for Asthma-related Hospitalizations Varies Across Different Races in California Counties During 2019

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## Introduction

According to the Centers for Disease Control and Prevention, the 2020 total weighted number with current asthma was 25,257,138 in the United States (“Most Recent National Asthma Data”). This is concerning as the number of people with asthma will continue to increase as time progresses. As the number of people with asthma rises, it becomes increasingly important to determine who is most impacted and what may be causing this health disparity. As a result, I formed the research question: how does the likelihood of asthma hospitalizations differ by race in California on the county level and what environmental factor(s) may be causing this?

For my first three maps, I examined the likelihood of asthma hospitalizations for Asian people, White people, and Black people during 2019 to make comparisons across different races. I normalized the raw asthma hospitalization data by dividing the number of asthma hospitalizations for a given race by the population of that race. I then multiplied the normalized by 100 to get the percentage of likelihood for asthma hospitalization for that race.

For the last two maps, I looked at potential environmental factors that may explain why Black people have a higher likelihood of asthma hospitalizations in comparison to White and Asian people. I first looked at Air Quality Index (AQI) in relation to Black population to see if there was any correlation between the poor air quality and high densities of Black people within a given county. Additionally, I looked at the Black population and the quantity and placement of hazardous waste facilities to determine if point source pollution is primarily located in areas with higher Black populations. I chose to look at AQI and quantity/location of hazardous waste facilities because previous studies have shown that air pollution and proximity to hazardous waste sites were associated with asthma and other respiratory illnesses (Brender et al.).

Map 1 illustrates the likelihood of asthma hospitalizations for Asian people for each California county during 2019. It can be seen that Asian people have the lowest likelihood in comparison to their White and Black counterparts.

Map 2 portrays the likelihood of asthma hospitalizations for White people for each California county during 2019. White people are seen having a higher likelihood distribution than Asian people. Conversely, White people also have a lower overall asthma hospitalization likelihood than Black people.

Map 3 shows the likelihood of asthma hospitalizations for Black people for each California county during 2019. Black people are seen having some of the highest asthma hospitalization likelihoods in most counties where data was collected.

Map 4 examines the air quality index median ranking and Black population in each California county during 2019. It can be determined that areas more densely populated with Black people have moderate to unhealthy air quality.

Map 5 looks at Black population and the quantity of hazardous waste facilities in each California county during 2019. This highlights that counties with higher Black populations have large amounts of hazardous waste facilities. This can contribute to worsening air quality and increased asthma hospitalization likelihood.

The culmination of these maps shows the viewer that Black people disproportionately experience higher likelihoods of asthma hospitalizations compared to Asian and White people in

California counties during 2019. This may be explained by higher air quality index and high quantity of hazardous waste facilities that emit pollution in counties densely populated by Black people. With these findings, there should be efforts made in order to obtain a more health equitable and environmentally equitable society. One suggestion would be to limit or reduce the amount of hazardous waste facilities in California. This may improve overall air quality. This may also circumvent the disproportionate development of respiratory conditions like asthma in Black populations in California.

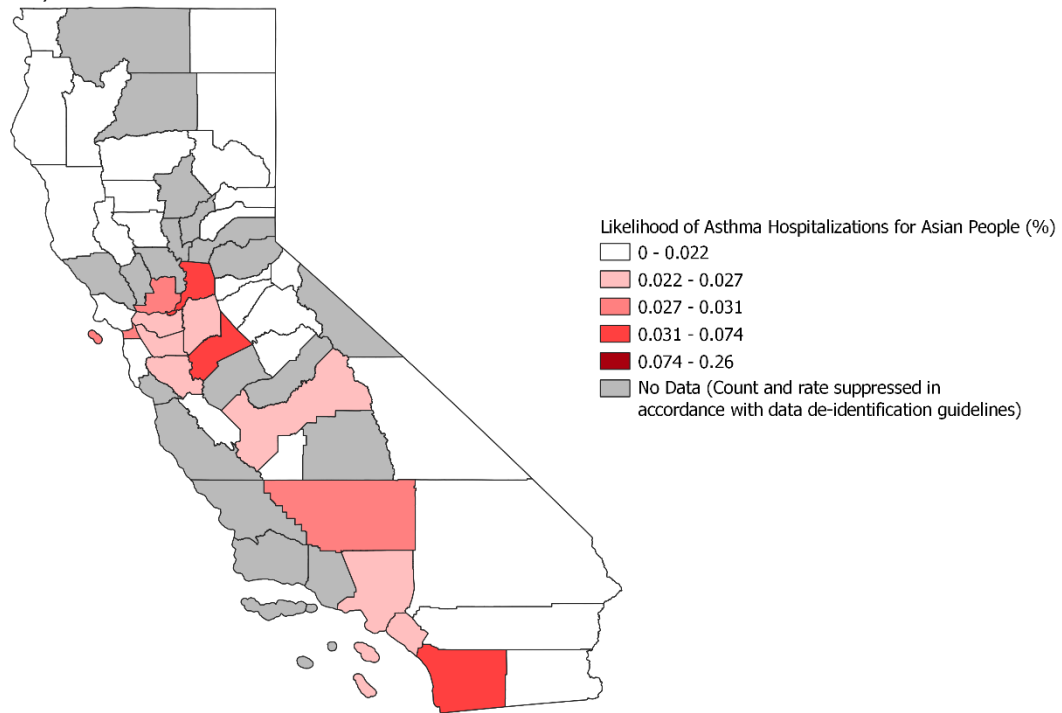
## Maps

### Map 1

This map illustrates that the asthma hospitalization likelihood for Asian people in most counties are relatively low. Many of these counties have a likelihood that is between 0 and 0.022%. The counties located in the center of California do see a slight increase in asthma hospitalization likelihood at 0.022 to 0.027%, however, this is still low. It should be noted that there are 3 outliers that have higher asthma hospitalization likelihood that falls between 0.031 and 0.074%, but there are no counties that contain the highest likelihood class of 0.074 and 0.26%. In sum, Asian people have the lowest asthma hospitalization likelihood compared to White and Black people.

### Likelihood of Asthma Hospitalization for Asian People (%) for each California County during 2019

(California Department of Public Health, 2019; California State Census Data Center, 2020; California Department of Technology, 2019)

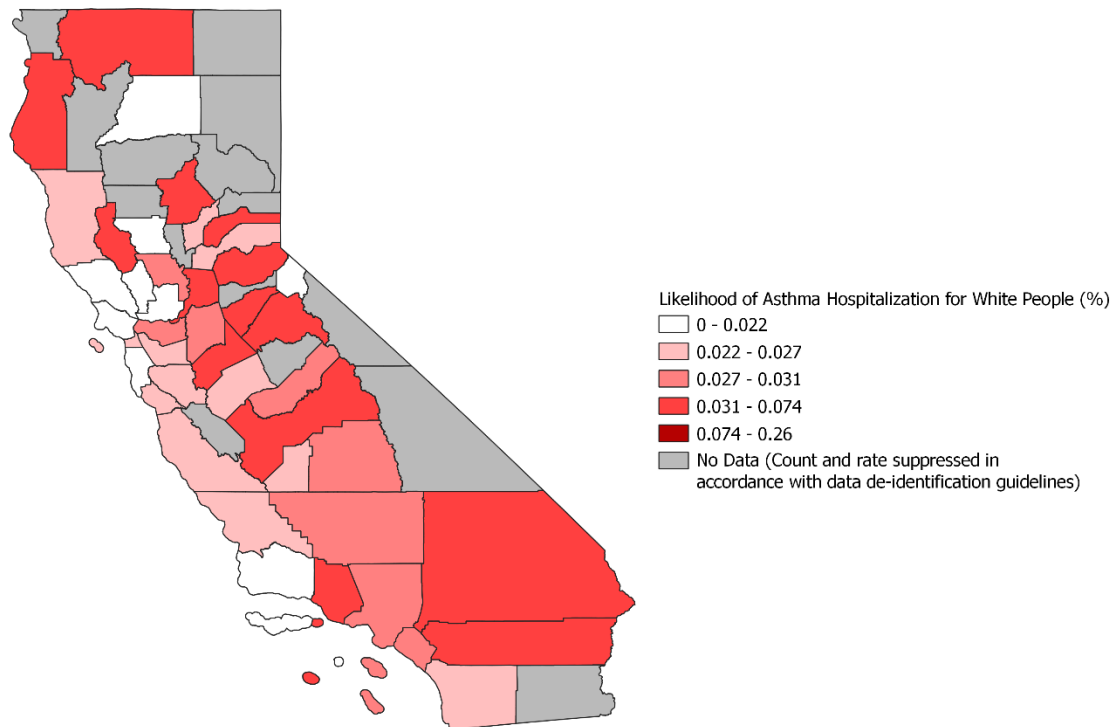


*Map 2*

This map portrays the idea that White people have very distributed asthma hospitalization likelihoods that are relatively moderate. Unlike Asian people, there is an almost even distribution of the different asthma hospitalization likelihoods for White people across the counties. Most of the asthma hospitalization likelihoods fall between 0.022 and 0.074%. This means that White people may experience a greater likelihood of asthma hospitalization compared to Asian people. It is worth bearing in mind that White people do not have asthma hospitalization likelihoods that fall in the highest likelihood class of 0.074 and 0.26%. Therefore, White people have a medium/moderate asthma hospitalization likelihood compared to Asian and Black people.

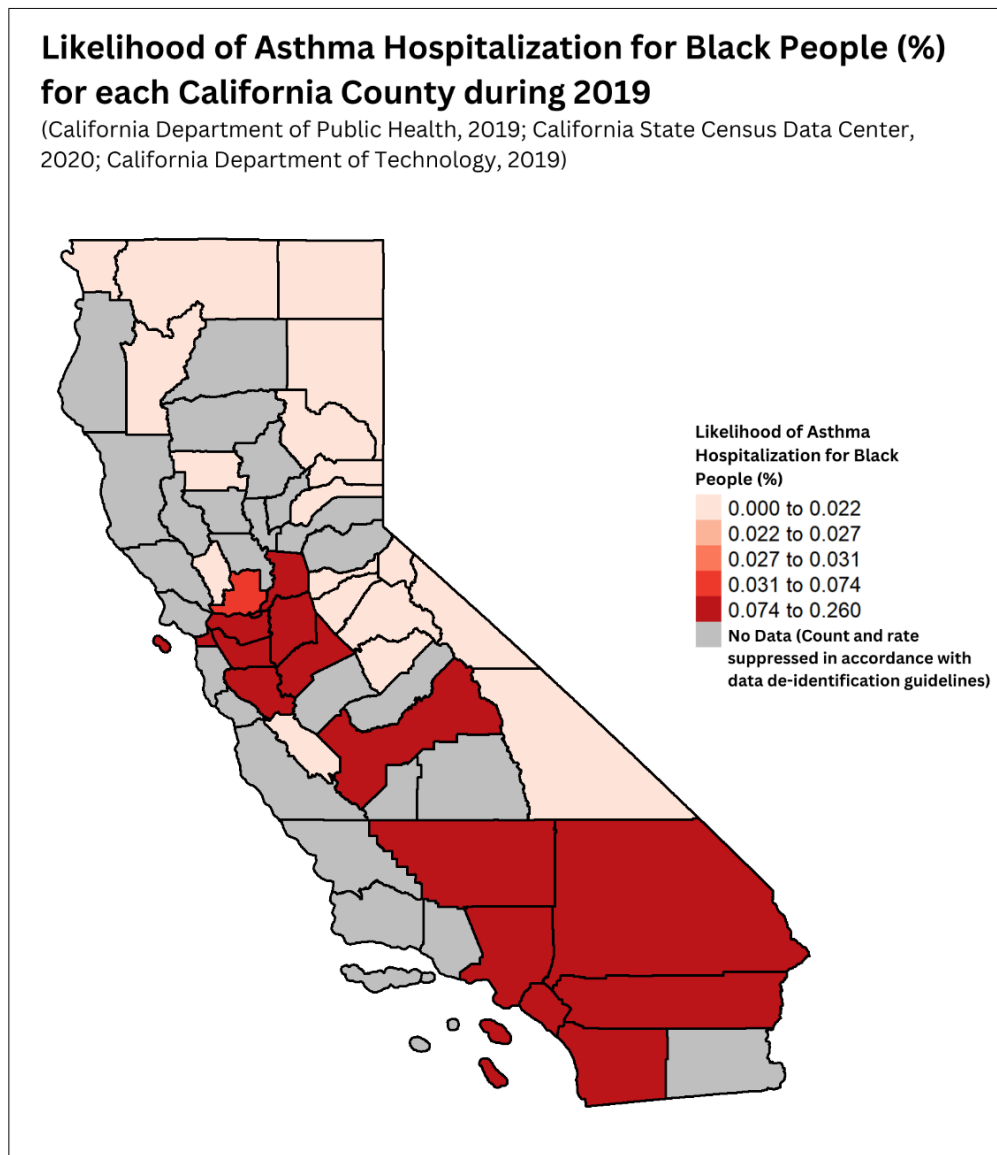
### **Likelihood of Asthma Hospitalization for White People (%) for each California County during 2019**

(California Department of Public Health, 2019; California State Census Data Center, 2020; California Department of Technology, 2019)



*Map 3*

This map shows that the asthma hospitalization likelihood for Black people is relatively high. The highest likelihood for Black people is between 0.074 and 0.260%, which is not observed for the other races. Only around half of the counties fall in the highest asthma hospitalization likelihood. But, it is important to consider that the highest likelihood class encapsulates a wide range of likelihood percentages (0.074 to 0.260%), while the other likelihood classes in the legend have smaller ranges and are relatively similar to one another. This means that Black people may experience an upwards of 3 times the likelihood of asthma hospitalization compared to the other races since the maximum likelihood for both White and Asian people is between 0.031 and 0.074%. Thus, Black people have the highest asthma hospitalization likelihood compared to Asian and White people.

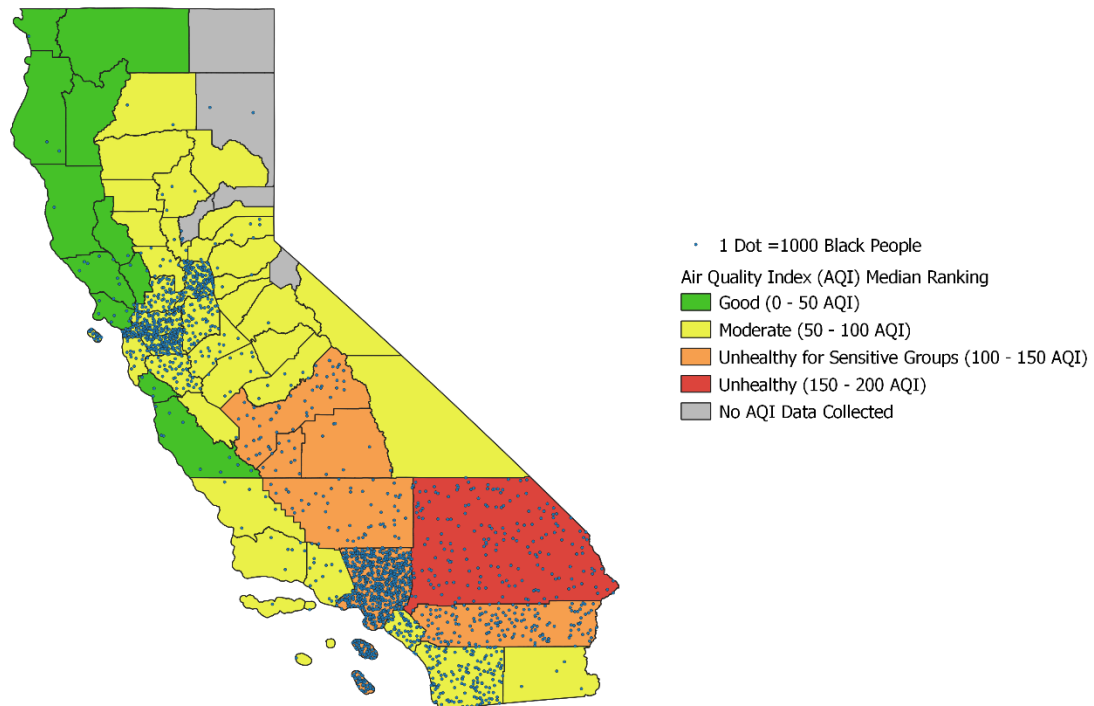


*Map 4*

This map shows that the California counties where most Black people reside have moderate to unhealthy air quality indexes. These counties that are densely populated by Black residents also overlap with the counties from Map 3 that have an asthma hospitalization likelihood that falls between 0.074 and 0.260%. This may indicate that poor air quality might be contributing to the higher asthma hospitalization likelihood for Black people.

### **Air Quality Index Median Ranking and Black Population in each California County during 2019**

(Environmental Protection Agency, 2019; California State Census Data Center, 2020)

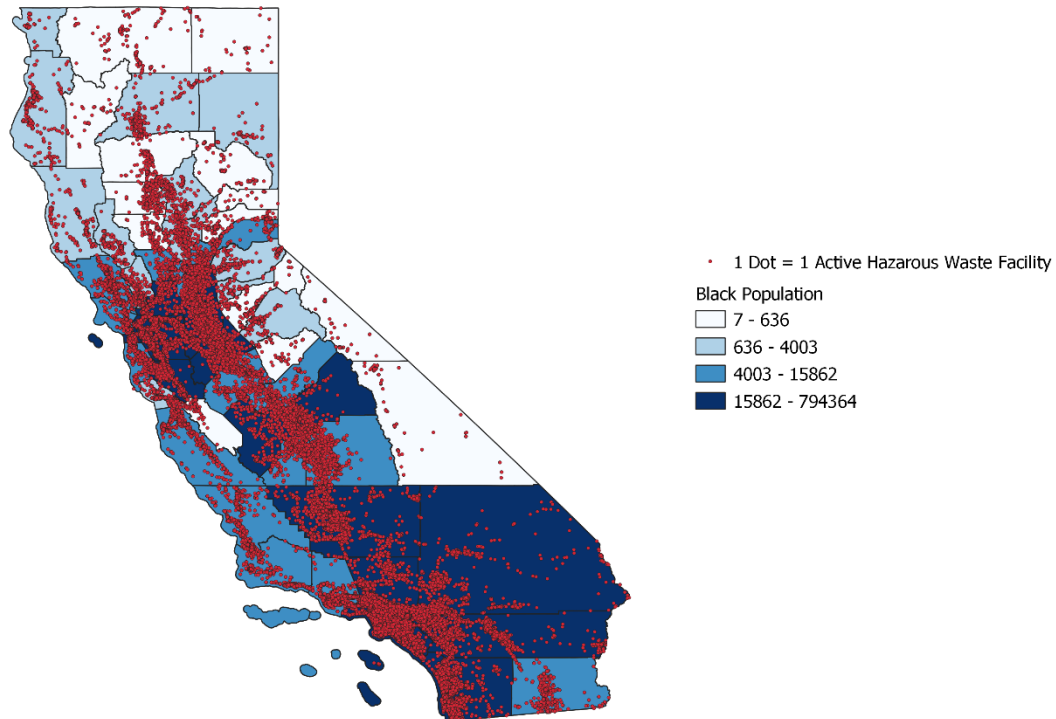


*Map 5*

This map demonstrates that California counties with high Black populations see large quantities of hazardous waste facilities clustered within them. Many hazardous waste facilities are clustered in the center of California and the southern part of California where many of the counties contain high Black populations that fall between 4003 and 794364. Unsurprisingly, the counties that contain a lot of hazardous waste facilities correspond with the counties in Map 4 that have moderate to unhealthy air quality. This suggests that the accumulation of poor air quality and emissions from hazardous waste facilities may be exacerbating asthma hospitalization likelihoods for Black people in California.

### **Black Population and Quantity of Hazardous Waste Facilities in each California County during 2019**

(California State Census Data Center, 2020; California Department of Toxic Substances Control, 2019)





## Citations

### *Introduction Sources*

Brender, Jean D, et al. “Residential Proximity to Environmental Hazards and Adverse Health Outcomes.” *American Journal of Public Health*, Dec. 2011, [www.ncbi.nlm.nih.gov/pmc/articles/PMC3222489/](http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3222489/).

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### *Map Sources*

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