

ANALYSIS OF CALENVIROSCREEN 1.1 SCORES AND RACE/ETHNICITY

The CalEnviroScreen 1.1 scores represent a combined measure of pollution and the potential vulnerability of a population to the effects of pollution. Unlike CalEnviroScreen 1.0, Version 1.1 scores do not include a measure of race/ethnicity in the calculation of the CalEnviroScreen score. The removal of race/ethnicity from the score does not minimize the importance of examining this issue in the context of environmental impacts and vulnerability. This section presents some of the scientific evidence related to the vulnerability to pollution of some racial/ethnic groups, and provides an analysis of the relationship between CalEnviroScreen scores and race/ethnicity.

Scientific research indicates that the relationship between pollutant exposure, stress, and health outcomes can vary based on the race and ethnicity of a population. For example, studies have shown that maternal exposure to particulate pollution results in a greater reduction in infant birth weight among African-American mothers than white mothers (Bell *et al.*, 2007). Another study found that African-American mothers of low socioeconomic status exposed to traffic-related air pollution had twice the likelihood of delivering a preterm infant compared to white mothers of low socioeconomic status (Ponce *et al.*, 2005). A study of traffic exposure and spontaneous abortion also found a greater effect for African-American women than other racial and ethnic groups (Green *et al.*, 2009).

For children, a study of the effects of nitrogen dioxide (NO₂) on children without health insurance in Phoenix found that Hispanic children had twice the risk of hospitalization for asthma from NO₂ exposure as white children. Black children showed about twice the risk of asthma hospitalization from NO₂ exposure as Hispanic children, regardless of insurance status (Grineski *et al.*, 2010).

Differences have also been observed for the effect of PM_{2.5} exposure on emergency department visits for asthma among patients of different races. The effect was found to be significant and greater in African American populations compared to Caucasians for the first three days following exposure (Glad *et al.*, 2012). Additionally, higher mortality has been observed among African-American populations exposed to ozone than other populations exposed to the same levels (Medina-Ramon and Schwartz, 2008).

In Native American children, rates of overweight and obesity are higher than among non-Native populations, potentially due in part to psychosocial stressors, lack of access to healthy food, and exposure to environmental obesogens (Schell and Gallo, 2012). Native Americans have lower life expectancy and higher rates of certain chronic diseases than the U.S. population as a whole.

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The mechanisms by which differences in race or ethnicity may lead to differences in health status and response to pollutants are complex and are not well understood. Some studies have explored the relationship between the experience of racism as a form of chronic stress and human health (Paradies, 2006; Kwate *et al.*, 2003), while others have looked at racial discrimination as an aspect of socioeconomic disadvantage, along with residential crowding, noise, poor housing quality, reduced access to health care, and exposure to violence (Evans and Marcynyszyn, 2004; Geronimus, 1996; Mertz and Grumbach, 2001, Williams and Williams-Morris, 2000; Clark *et al.*, 1999). A study of the effect of blood lead level on blood pressure found that there are significant racial and ethnic disparities, with the strongest association occurring in African Americans with symptoms of depression (Hicken *et al.*, 2013). The authors suggest that this finding presents evidence for the role that social stressors play in determining vulnerability to the health impacts of environmental exposures.

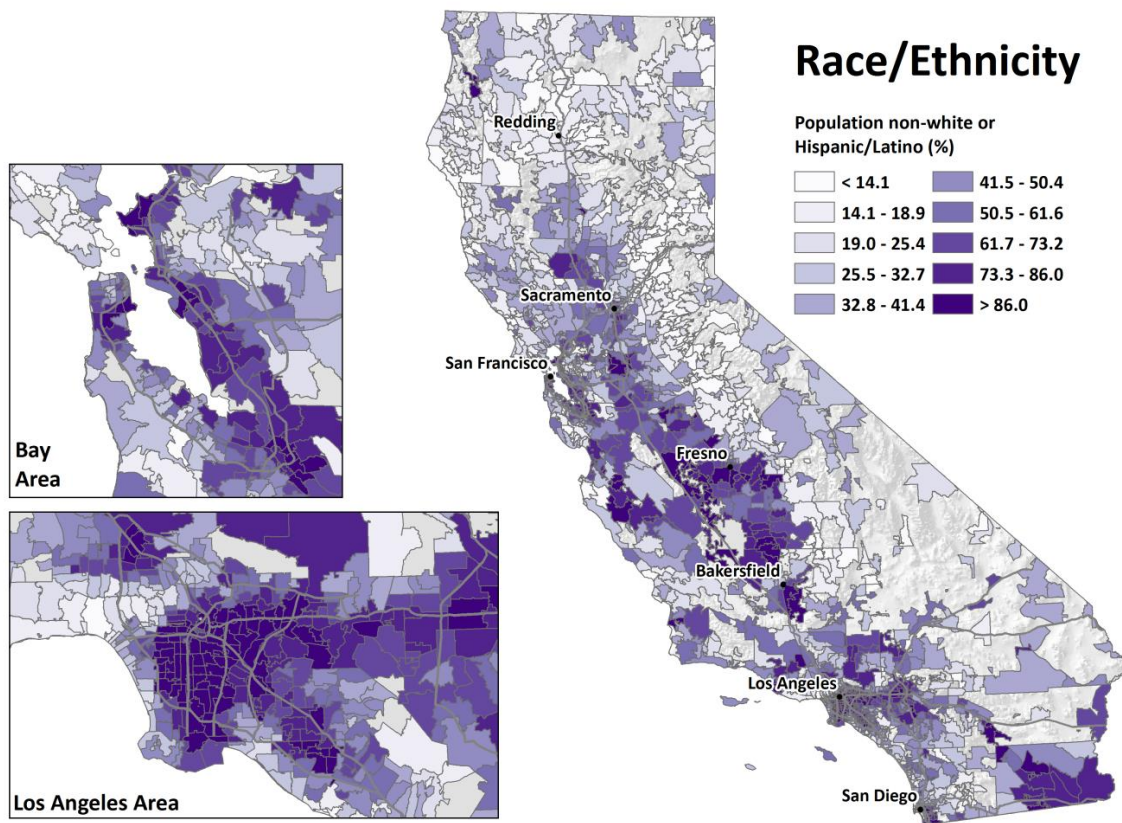
We evaluated potential associations between race/ethnicity and CalEnviroScreen 1.1 scores using data from the 2010 decennial census. The U.S. Census Bureau questionnaire asked all census respondents to identify if they were of Hispanic, Latino or Spanish origin and in a separate question, their race. Datasets describing the number of individuals in different race and ethnicity categories are available for California at different geographic scales. The data are made available using the American FactFinder website (<http://factfinder2.census.gov/>). Differences in racial and ethnic composition across California can be estimated using these data.

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Our analysis examined race/ethnicity using the following steps:

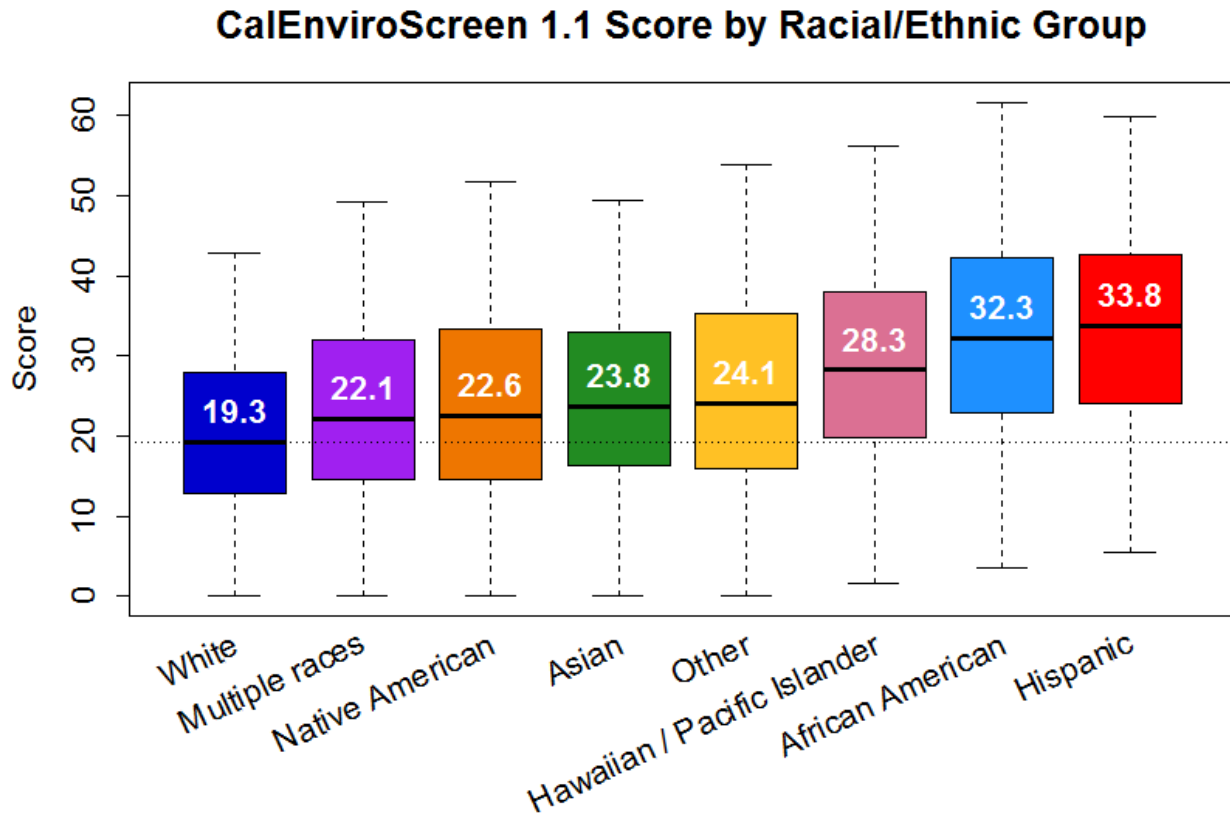
- A dataset containing the number of people by race/ethnicity was downloaded by census ZIP codes for the State.
- The non-white percentage of the population in each ZIP code was calculated as the total number of people identified as non-white or Hispanic/Latino in the ZIP code divided by the total population of the ZIP code.
- ZIP codes were ordered by the percentage of the population that is non-white or Hispanic/ Latino). A percentile score for a ZIP code was determined by its place in the distribution of all ZIP codes.

The mapping results of the statewide analysis of race/ethnicity are shown below:



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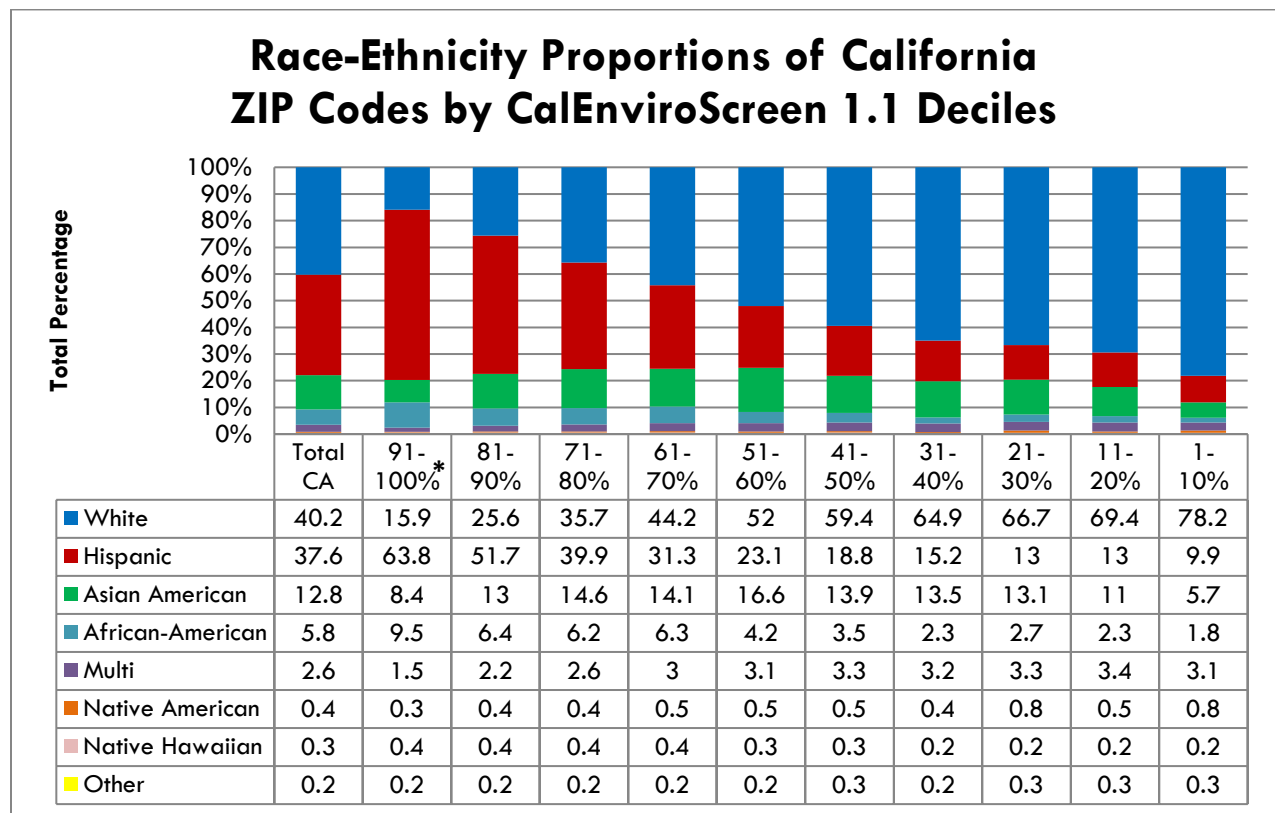
The following chart shows the typical range of CalEnviroScreen 1.1 scores pertaining to Californians of different races and ethnicities. The dark horizontal lines in each box plot, and the numbers above them, indicate the median (average) CalEnviroScreen score for each racial or ethnic group. The shaded boxes correspond to the “Interquartile Range” (IQR), or the range of values between the 25th to 75th percentile. The dashed vertical lines coming off each box show extreme values experienced by the groups.



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The chart below examines how the racial/ethnic composition of ZIP codes varies by CalEnviroScreen scores. ZIP codes across the state were divided into ten categories with equal numbers of ZIP codes (deciles), sorted from highest (91-100 percentile) to lowest CalEnviroScreen scores (1-10 percentile). The overall racial/ethnic composition of the California population is represented by the first vertical bar on the left side of the chart. The second vertical bar represents the ten percent of ZIP codes with the highest CalEnviroScreen scores, the third vertical bar represents the ten percent of ZIP codes with the next highest CalEnviroScreen scores, and so on. The percent of the population of different races/ethnicities in each decile is shown in the column below each bar.

If all racial/ethnic groups were equal in terms of CalEnviroScreen score, the proportion of each group in each decile would be equal to its overall proportion in the California population. That is, an even distribution of pollution burden and population vulnerability across racial and ethnic groups would mean that all the bars would resemble the left-most bar in the chart. However it is clear from the chart that this is not the case, implying that pollution burden and population vulnerability are not distributed evenly across different racial/ethnic groups.



* The “91-100%” column shows the population composition of the ZIP codes with the highest CalEnviroScreen 1.1 scores. The 1-10% column represents those ZIP codes in the lowest scores.

These results also show broad trends in differences by race/ethnicity across CalEnviroScreen scores. Hispanic, African-American, and to some extent Native Hawaiian /Pacific Islander populations tend to have higher CalEnviroScreen 1.1 scores than other groups and are proportionally overrepresented in the highest scoring ZIP codes (81-90 and 91-100 percentiles) relative to their proportion of the California population. The white population tends to have a lower score and is underrepresented in the highest scoring ZIP codes relative to its proportion of the statewide population.

References

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