

# California Water Quality: Is It Lower for Minorities and Immigrants?

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We examine the relationship between California water quality and the population share of racial minorities and immigrants at the county level. We find that, while for most of the water quality indicators minorities are associated with *lower* water quality relative to whites, for some pollutants, some minority groups are associated with *better* water quality than that for whites.

California contains a very diverse population, and its racial composition varies by region. As a result, it provides an excellent place to examine the relationship between an area's racial composition and its environmental quality. This study focused on water quality and examined the statistical relationships between water quality indicators and the percentage of various racial groups at the county level. The question of interest was: do the counties with lower water quality have larger shares of minority populations? The study also examined the relationship between water quality and the percentage of a county's population that has immigrant status. Here the question was: Are counties with lower water quality those with higher shares of immigrants in their populations?

Studies in the field of environmental justice suggest that racial minorities face poorer environmental quality than

Caucasians. There are several reasons why this may occur. First, minorities tend to have lower incomes than whites, and demand for environmental quality may increase as income increases. As a result, minorities may not demand as high a level of environmental quality than whites do due to income effects. Minorities may have more pressing needs to meet, so environmental quality gets pushed aside. Second, minorities may have less political voice, so areas with a high proportion of minority residents may not be high priority areas for government clean-up projects. Third, some economic sectors employ larger portions of minority workers, so these minorities will be subject to the pollutants associated with these sectors.

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For example, many agricultural workers are Hispanic, suggesting that there may be a correlation between agricultural production and an area's proportion of population that is Hispanic.

Of course, the relationship between water quality (or more generally environmental quality) and the population shares of racial minorities or immigrants could be a two-way relationship. Locations with lower water qualities may particularly attract minorities or immigrants, for example, because of greater job opportunities, lower residential rents, lower transportation costs, and lower prices in general. In

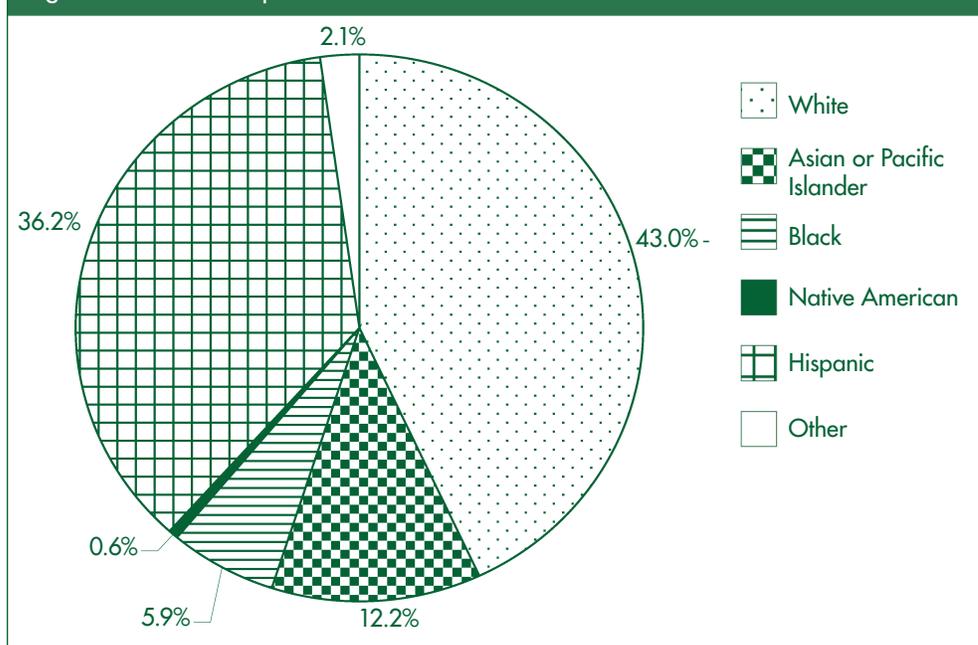
this case, instead of water quality deteriorating in areas where minority populations are already established, areas with poor water quality attract minorities by providing them with opportunities and accommodating polluting industries.

By itself, this study cannot determine the “cause and effect” relationship between water quality and population share of racial minorities or immigrants. Nor can it determine which of the above-mentioned economic and political factors drives any of the relationships found. However, it can illuminate geographic areas where further work should be conducted to determine if minorities are unjustly facing higher levels of pollution due to political forces.

## Data

The water quality data for the study came from the EPA's STORET (short for STORage and RETrieval) database. This database collects water quality data from a wide variety of sources such as the California Department of Water Resources, the EPA National Aquatic Resource Survey, the California Surface Water Monitoring Program, the California State Water Resources Control Board, and the National Park Service. Each sample in the STORET database represents one water sample that was taken from a specific location. Since most of the socioeconomic data are available at the county level, all samples were aggregated up to the county level by water body type and pollutant. For example, if county x had fifteen samples of nitrate levels in rivers, the mean, median, maximum, and standard deviation of these 15 samples were calculated. Similarly, if county y had 32 samples of sulfate levels in lakes, the mean, median,

Figure 1. Racial Composition of California in 2008



maximum, and standard deviation of these 32 samples were calculated. Each observation in the analysis that is reported below captures the underlying samples in this manner. At [www.agecon.ucdavis.edu/people/grad\\_students/info.php?id=143](http://www.agecon.ucdavis.edu/people/grad_students/info.php?id=143), a table can be found that lists all water pollutants included in the study, as well as the major sources for these pollutants.

Racial composition data came from the California Department of Finance's Demographic Research Unit. For each

county, we computed the percent of the population that was African American, Asian or Pacific Islander, Native American, Hispanic, or non-white other. Additionally, we included the number of new immigrants to a county in a given year as a percent of each county's total population (Table 1).

Other socio-economic-demographic variables, such as agricultural production intensity, per capita income, educational attainment, gender composition, and age structure, may also influence

water quality, so we included variables capturing these effects. The inclusion of these variables allowed us to isolate the relationship between racial composition and water quality. We included a time trend to account for statewide improvements or deterioration due, for example, to changes over time in water pollution standards, monitoring, enforcement, or related technologies. Finally, we account for the naturally occurring variation of pollutants among different types of bodies of water such as rivers, oceans, lakes, and estuaries. All data are at the county level for 1993 to 2006.

### Empirical Analysis

To determine the relationships between water pollution on the one hand and racial composition and immigrant share of populations on the other, we estimated three regression models for each of the water quality indicators listed in the Table 1. These three models examined the statistical relationship between the mean, median, or maximum level of a pollutant and variables that one might expect to affect the pollution level. For example, we estimated the relationship between the mean level of ammonia and various measures of county and water body characteristics that might affect ammonia levels.

Table 2 presents the relationships between measures of racial composition and new immigrant share of populations and water quality indicators. From Table 2, we see that counties with high proportions of African American, Hispanic, or "other" populations have higher levels of several pollutants than those counties with high proportions of white populations. Every minority group, however, is associated with lower levels of some water pollutants, too.

Counties with higher percentages of African Americans, such as Alameda and Solano, tend to have higher levels

Table 1. Summary of Racial Composition Statistics

Variable	Number of Observations	Mean	Standard Deviation	Minimum	Maximum
% New Immigrants	2446	0.45%	0.39%	0.00% Alpine, 2004	1.78% San Francisco, 1993
% White	2471	64.26%	18.14%	19.15% Imperial, 2002	93.78% Nevada, 2000
% African Americans	2471	4.12%	3.80%	0.17% Sierra, 2000	16.83% Alameda, 1993
% Asian or Pacific Islander	2471	7.35%	8.18%	0.25% Sierra, 2000	32.45% San Francisco, 1999
% Native American	2471	2.22%	3.21%	0.23% San Mateo, 2002	17.02% Alpine, 2004
% Hispanic	2471	20.22%	14.34%	2.14% Alpine, 2000	74.83% Los Angeles, 2006
% Other	2471	1.87%	0.87%	0.26% Lassen, 1993	4.38% Solano, 2004

Source: State of California, Department of Finance. 2007. Population Projections for California and Its Counties 2000-2050. Available: <http://www.dof.ca.gov/html/DEMOGRAP/ReportsPapers/Projections/P1/P1.php>

of fecal coliform, lead, magnesium, nitrites, and alkalinity in their water. These pollutants are associated with plumbing-system corrosion, industrial runoff and dumping, septic tank leakages, and agricultural runoff. Counties with higher proportions of African Americans may allow more industrial activity in order to create jobs for communities that are poorer than predominantly white communities. They may also have inadequately maintained plumbing and septic units, leading to higher pollution levels. These poorer areas may also receive less state-level funding for clean-up projects. Interestingly, counties with higher proportions of African Americans have lower levels of cadmium, a pollutant associated with pipe corrosion, metal refineries, and phosphate fertilizer runoff. If fertilizer runoff is the main source of cadmium in surface water in California, then this relationship is likely due to the paucity of African Americans in the agricultural workforce. This racial group makes up only 0.3% of the agricultural workforce while it makes up 6% of the non-agricultural workforce.

Counties with higher percentages of Hispanics, such as Imperial and Tulare, also experience worse water quality than counties with high percentages of whites. These counties have higher levels of manganese, nickel, nitrates, nitrites, alkalinity, phosphorous, and selenium. Many of these pollutants are agricultural pollutants, and Hispanics make up 68.7% of the agricultural workforce in California (compared to 32% of the non-agricultural workforce in the state). In these instances, people experience a lower level of water quality due to the type of work chosen by or available to them. Some of the pollutants associated with Hispanic communities are commonly caused by corroding pipes, power plants, industrial emissions and dumping, and septic tank leakage. Again, Hispanic communities are generally poorer than

**Table 2. Correlation between Water Quality Indicators and Racial Composition and Immigrant Share**

Water Quality Indicator	% Immigrants	% African Americans	% Asian or Pacific Islander	% Native American	% Hispanic	% Non-White or Other
Biological O2 Demand						
Cadmium			-			
Dissolved Oxygen		-		-		+
Fecal Coliform		+				
Lead		+				
Magnesium		+		+	-	-
Manganese	-		-		+	
Nickel					+	
Ammonia						
Nitrate	-				+	+
Nitrite		+			+	+
pH		+			+	
Phosphorous					+	
Total Suspended Solids						
Specific Conductivity						-
Sulfate						-
Zinc						
Iron						
Total Coliform						
Mercury						
Arsenic						
Copper		-		-		+
Chromium						
Selenium					+	+

*Notes: Blanks indicate no statistically significant correlation.  
 (-) indicates a negative correlation between the ethnic group's share and the pollution level. This correlation is statistically significant at the 90% confidence level.  
 (+) indicates a positive correlation between the ethnic group's share and the pollution level. This correlation is statistically significant at the 90% confidence level.*

predominantly white communities so they may be more apt to accept polluting industries to attract jobs and may be less apt to have high-functioning septic tanks. While a higher percentage of African Americans is associated with lower levels of cadmium, a higher percentage of Hispanic people is associated with lower levels of magnesium—a pollutant caused by electrical-industry emissions, construction, and fertilizer runoff. Hispanic workers make up a significant portion of both the agricultural and the construction industry work forces. Since they most likely make up a very low portion of

the electrical industry workforce, and because this industry is one of the main sources of magnesium discharge in California, the Hispanic employment patterns may well explain our finding of a negative correlation.

Native Americans, a group of people historically allocated marginal lands, are associated with higher levels of magnesium and lower levels of dissolved oxygen. Lower levels of dissolved oxygen can be caused by runoff from forests, pastures, and cropland, thermal pollution, and wastewater treatment plant effluent, while elevated magnesium can be



It appears that much of the worsened water quality is due to pollution from various industries.   
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caused by construction, the electrical industry, and fertilizer runoff. Most likely the association between this ethnic group, which is higher in population share in counties such as Alpine and Inyo, and these two pollutants are due to allowing industry to enter their communities to create jobs.

The conglomeration of “other” racial groups, found in higher amounts in counties such as Solano and Sacramento, is associated with both higher and lower levels of water quality than whites. This group is associated with higher levels of dissolved oxygen and lower levels of magnesium, specific conductivity, and sulfates—pollutants generally caused by industry, mining, agriculture, and fossil fuel combustion. The group is also associated with higher levels of nitrites, pH, copper, and selenium—pollutants also caused by industry, mining, and agriculture, as well as septic tanks and wastewater treatment plants.

Interestingly, while most minority groups are associated with poorer water quality, Asian and Pacific Islanders are not associated with higher levels of any pollutants, relative to white populations. However, the Asian and Pacific Islanders are associated with lower levels of cadmium and magnesium—pollutants associated with metal refineries, pipe corrosion, construction, the electrical industry, and fertilizer runoff. There are two similar explanations for why we observe this pattern. First, counties with higher levels of Asian and Pacific Islanders, such as Santa

Clara and San Francisco, tend to have higher per capita income levels. So, demanding higher water quality, these communities may not allow polluting industries since they are not in urgent or acute need of low-paying and highly polluting employment opportunities. Second, and also related, this group may tend to work mostly in less polluting industries and/or service activities.

In regard to the relationship between water quality and the new immigrant population, we find, somewhat surprisingly, that counties with high percentages of new documented immigrants are associated with lower levels of manganese and nitrates than counties with low levels of immigrants. These pollutants are associated with corroding pipes, septic tank leakages, sewage, and fertilizer runoff. The breakdown of immigrants by racial category is not available, but a high percentage may be Asian and Pacific Islanders, a group associated with higher water quality. Additionally, San Francisco contains the highest concentration of new immigrants in the country, and this area tends to attract those who are highly skilled. The skill level of new California immigrants may be one factor leading to the correlation between immigrant concentration and improved water quality. One should, however, keep in mind that California has a sizeable undocumented immigrant population, which is not included in our data.

## Conclusions

We found that minority populations are, indeed, associated with worsened water quality relative to white populations for most of the water quality indicators. But with respect to some pollutants, some minority populations are associated with better water quality than white populations. Thus, the environmental justice picture is not as bleak as expected. It appears that much of the worsened water quality is due to pollution from various industries.

If minority groups welcome industry into their communities in order to create employment opportunities, they could be trading lower water quality in exchange for employment and earning incomes. To address higher pollution levels in this case, policy should be targeted at (1) providing low-polluting employment opportunities in areas with high levels of minorities, and (2) undertaking greater pollution mitigating measures in such areas.

Future work should be conducted to determine if the same industries located in areas with different racial compositions vary in their pollution emissions. If this is the case, then it is likely that the lack of political voice by minorities can explain the poor water quality associated with minorities. If so, policy should address the political facets of the problem and re-target pollution-control funds to areas with high levels of minorities. It should also work on ways to politically empower minority groups to more effectively voice their environmental preferences.

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