

Assessing the EPA's Priorities in Protecting the Human Health of Minority Populations With Regards to Remediating RCRA sites in California according to the GPRA Baseline

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ABSTRACT

Exposure to hazardous material from toxic waste sites can affect public health adversely in neighboring residential areas, many of which are communities of color. The potential exposure of these communities to contaminants at hazardous waste sites in California is a major concern. The Environmental Protection Agency (EPA) is required by law to act in ways that are consistent with the principles of environmental justice, ensuring that minorities living near hazardous waste sites are protected, but it is unknown whether these priorities are reflected in the agency's completed work. In this study, I first considered the relationship between the Resource Conservation and Recovery Act (RCRA) waste sites in California and the racial composition of population within a 1-mile radius, and compared that with the makeup in a 10-mile radius. Comparing the percentage of people of color living within a 1-mile radius of a toxic waste site to those living within 10 miles, I confirmed previous study findings that minorities were disproportionately likely to live nearby to a toxic waste site in California. Next, for the main investigation, I correlated the remediation status of all RCRA sites in California, with the percentage of minorities in populations within 1 mile of these sites. Finally, I assessed how effectively the EPA's use of the Environmental Justice Smart Enforcement Assessment Tool (EJSEAT), which measures inequality to establish priorities concerning which sites should be remediated first, has served as the basis for completing remediation of sites that require the most attention under the principals of environmental justice. I found that those sites of the greatest concern under EJSEAT guidelines have more human health redemdiation goals still incomplete, reflecting the disproportionately low level of remediation of RCRA hazardous waste sites near communities of color in California.

KEYWORDS

Environmental Justice, Racial Disproportion, Environmental Justice Smart Enforcement Assessment Tool (EJSEAT), Hazardous/Toxic Waste Remediation, Environmental Protection Agency (EPA)

INTRODUCTION

Exposure to hazardous material from toxic waste sites can adversely affect public health in neighboring residential areas, many of which are communities of color (US EPA 2009). The United States Environmental Protection Agency (EPA) has sought to reduce hazardous waste exposure to protect human health (Davidson 2000). The Office of Environmental Justice within the EPA states that, in pursuing these goals, it must act consistently with the principles of environmental justice, which can be defined in terms of the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies (US EPA 2010, Executive Order 12898). The EPA uses the Environmental Justice Smart Enforcement Assessment Tool (EJSEAT) to identify communities in areas with potentially high environmental and public health burdens (Morello-Frosch 2002). The EJSEAT uses data based upon environmental, health, compliance, and social indicators of vulnerability. Yet, while race is a significant indicator, it is not weighed heavily in EJSEAT (Baden 2007). Though it is the EPA's goal to ensure that minorities living near hazardous waste sites are protected, it is unknown whether these priorities are reflected in their completed work. If these priorities are not evident, an alternative to EJSEAT may need to be developed to ensure remediation of toxic waste sites in minority communities (Anderton 1994).

The potential exposure of communities of color to contaminants at hazardous waste sites in California is a major concern. Minority infants whose mothers potentially have been exposed to hazardous waste are at greater risk for birth defects than minority infants whose mothers have not potentially been exposed (Orr 2002). Environmental justice offers researchers new insights into the juncture of social inequality and public health, and provides a framework for policy discussions on the impact of discrimination on the environmental health of diverse communities in the United States. Results from a study in southern California indicate that communities of color bear a disproportionate burden in the location of treatment, storage, and disposal facilities (Morello-Frosch 2002). Future researchers should focus on the political economy and social inequality class structure to understand the origins of environmental racism and reasons for its persistence. Race is associated with multiple environmental risk factors such as hazardous wastes, all of which can be consequential to one's health (Bullard 1993, Capek 1993, Cutter 1995). Environmental regulations have not benefited all parts of society uniformly. People of

color are disproportionately harmed by industrial toxins on their jobs and in their neighborhoods (Davidson 2000 and Morello-Frosch 2002). Understanding that minorities are suffering the greatest, my investigation will seek to establish if the EPA is in fact appropriately attending to those toxic waste sites proximate to minority populations under their guidelines for achieving environmental justice goals.

EPA governance of hazardous waste sites as mandated by the Resource Conservation and Recovery Act of 1976 (RCRA) and Government Performance and Results Act of 1993 (GPRA), works to meet the needs of citizens first. The RCRA gives the EPA the authority to control hazardous waste generation, transportation, treatment, storage, and disposal (US EPA 1976). To monitor waste site remediation in EPA Region 9, the EPA monitors different stages of remediation for all toxic waste sites under GPRA baseline standards (GPRA 2009). This system is designed to ensure that all the requirements at each stage of remediation are fulfilled before continuing to the next stage, as established under the GPRA (US EPA 2009).

GPRA baseline standards define a three-stage process to complete remediation of toxic waste sites. First, exposure to toxins must be controlled to protect human health (“Human Health Under Control”, US EPA, CA725). One means of achieving this goal is capping, which involves covering a contaminated area with thick concrete, providing a safe surface on which to walk and preventing people from coming in close contact with contaminated ground. Capping also stops toxins from coming into contact with the air, controlling exposure (Fukue et al. 2009). In the second stage, it must be established that groundwater flow from the area no longer causes problems, either by treating the water itself or simply stopping the flow altogether, in order to prevent people from consuming or touching the contaminated water (Fukue et al. 2009). In the third stage, the EPA works to complete all necessary construction and remove all waste, ensuring that the land is ready to be redeveloped (US EPA 2009). In this study, I considered the EPA's first goal to protect human health as a proxy to measure levels of completion.

There are some areas that show the lowest EJSEAT score of “10”, meaning an area of low environmental justice concern, but potentially should be a score of “1”, the highest concern. EJSEAT does not meet all public health needs of disproportionate minority populations, and the EPA's remediation activities may not be addressing the sites that require the most attention from an environmental justice perspective. Yet no studies have been conducted to determine the effectiveness of EPA's remediation programs in which EJSEAT is used to achieve

environmental justice goals. Nor have any studies determined whether California RCRA sites that pose to a health threat to minority communities are being remediated at the same rate as other RCRA sites in the state. My study presents the current status of these sites and determines if the EPA is attending to those proximate to populations with a greater density of minorities. The new information in my study concerns the relationship between the status of remediation at RCRA sites and the corresponding racial composition of neighborhoods. This fills these gaps by seeking to answer the question whether or not the EPA is meeting their environmental justice priorities. Additional factors, such as the size of a site, may be a contributing factor in achieving remediation in terms of human health objectives. Minorities in residential areas have a disproportionate likelihood of hosting various environmental hazards, with race being the number one indicator of hazardous waste (Sadd 2001), and people may be suffering as a result of this injustice. Building upon the current literature, in this study I will confirm current study findings that indicate the disproportion many minority groups face with regards to their proximity to RCRA hazardous waste sites. This research hopes to establish the EPA's priorities in protecting human health of all people, particularly minority populations, with regards to remediating RCRA sites throughout California according to the GPRA baseline by looking into both the demographics of the people living near the sites and the factors that contribute to their status of completion towards cleanup.

METHODS

Background

My investigation of the assessment of EPA's remediation priorities was twofold. I first looked at the relationship between the RCRA waste sites in California and the percentage of minorities in a 1-mile radius compared to those in a 10-mile radius, using census tract data collected from 2000. I expect to find a higher percentage of minorities in the nearby neighborhoods of hazardous waste sites than that of the state average. Then I investigated at which sites remediation projects have met their goals to protect human health and whether there is a linear relationship between the level of remediation and the racial makeup of the surrounding population surrounding. Utilizing GIS and statistical correlation analysis, I ran a correlation between minority populations surrounding the sites and the level of remediation completion in terms of protection of human health (complete, incomplete). Since the sizes of the

sites vary greatly, it may be a contributing factor. Thus I will look at how this factor compares to remediation status. Minority populations are suffering from exposure disproportionately, and EPA is responsible for protecting the health of the citizens first according to GPRA CA725 (US EPA 2010).

The sites

The EPA's 246 RCRA sites on the GPRA baseline vary greatly in size and are owned by many different entities, including companies that produce and manage their own waste to and others that dispose of waste shipped to them. A few sites are scattered in northern California, and a much denser proportion of sites are in Southern California.

Statistics

I used correlation statistics to analyze the linear relationship between several factors, and therefore answer my research question about the EPA's priorities, whether or not they are cleaning sites of greatest concern with regards to minority populations. I calculated the percentage of minorities in a 1-mile radius, and compared that with the percentage of minorities in a 10-mile radius around RCRA sites in California. Historically, communities of color have been known to be disproportionately closer to hazardous waste facilities than other communities. The 1-mile radius represents the area of greatest risk of exposure to hazardous material (Kearny 2009). I identified the site locations listed in RCRA using ArcGIS. Site addresses were converted into longitude-latitude points, and the percentage of minorities in the population within 1 mile of those points was calculated by dividing the number of minorities by the total number of persons in the area based on census tract data from 2000. Then the same procedure was used to calculate minority population percentages in a 10-mile radius. This ensured that the data is statistically significant. As it stands, California is a majority of minorities, with the state being 53.4% minority. This may lead us to believe that the communities in the 1-mile radius are just minority community neighborhoods. So in order to determine whether or not a true disproportion exists, I compared the percentage of minorities in the 1-mile radius with the surrounding 10-mile radius area.

Correlations

Using SigmaPlot and Microsoft Excel I determined correlations between EJSEAT scores and the percentage of minorities in the 1-mile radius population, as well as between percentage of minorities and acreage of the site. I obtained the acreage of the sites by looking at the site descriptions in the RCRA Facility Assessment Report (US EPA). If there was not a documented lot size, I then drew out polygons around the facilities and measured the acreage in ArcGIS. I also considered the correlation between acreage and EJSEAT score, noting how many sites had met their human health goals and comparing this to site size.

Relationships

I compared percentage of minorities and completion rates of the EPA's "Human Health Under Control" (CA725) goal (stage one in the remediation process described above) using a scatter plot to visualize the spread of data. I calculated the average and median percentage of minorities within one mile of those sites that have and have not completed their goals. I also compared EJSEAT scores and completion rates of the "Human Health Under Control" goal (CA725). EJSEAT is the method by which the EPA prioritizes which sites to clean up, in order to meet the principles of environmental justice. EJSEAT prioritizes those sites facing the greatest environmental injustice issues on a scale from 1 to 10, 1 being the priority. I separated the sites into 10 groups based on EJSEAT score and graphed how many had been completed against how many were incomplete.

Maps

These findings were laid out in GIS to provide a visual representation. I compared the minority makeup and the completion of the human health objectives. A second map illustrates the sites' EJSEAT score and their location throughout California.

RESULTS

Cumulatively, there was a higher percentage of minorities in the 1 mile radius than the 10 mile radius around RCRA sites in California (Fig 1). Both the median and average percentages of minorities in the population are higher in the 1 mile radius. The average in California is 53.4%

minority. The average percentage in the 1-mile was almost 10% more, at about 60%; the median was 63%. For the 10-mile radius, the percentage of minorities in the population is only slightly higher than the state average at about a median of 59% and an average of 57%. A majority of the sites are above the state's average for the number of minorities in the 1-mile radius. A disproportion exists between those minorities living closest to the facilities and those located farther away.

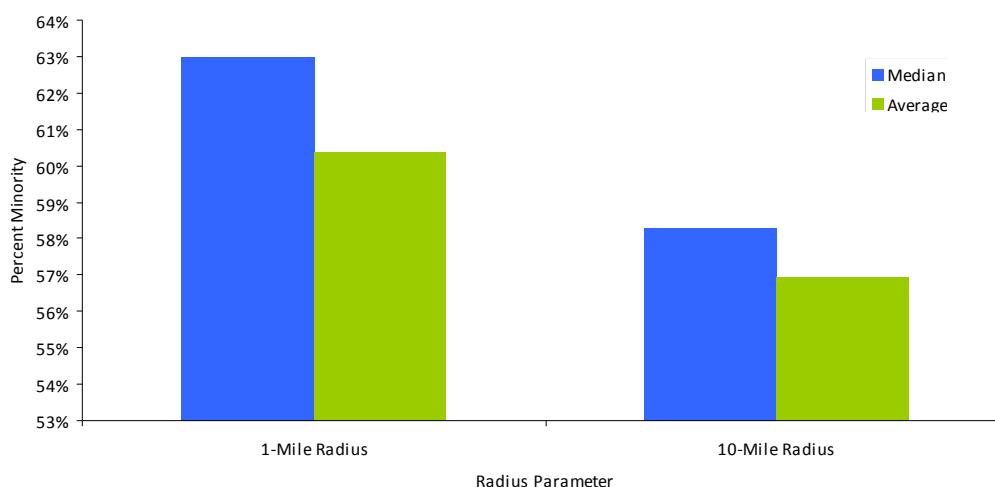


Figure 1. Comparing the median and average percentages of minorities in a 1-mile versus 10-mile radius. The measurements are based upon the coordinates of the hazardous waste facility.

Of those sites that have not completed stage one of remediation, “Human Health Under Control” goals (CA725), a higher proportion have a greater percentage of minority population than sites that have completed this stage of remediation (Fig. 2). The median percentage of minorities for those that had met their human health goals is 63%, and the average is 56.73%. The median and average percentage of minorities in the population near those sites that had not completed their goals were higher than in other sites, with a median of 77% and an average of 67%.

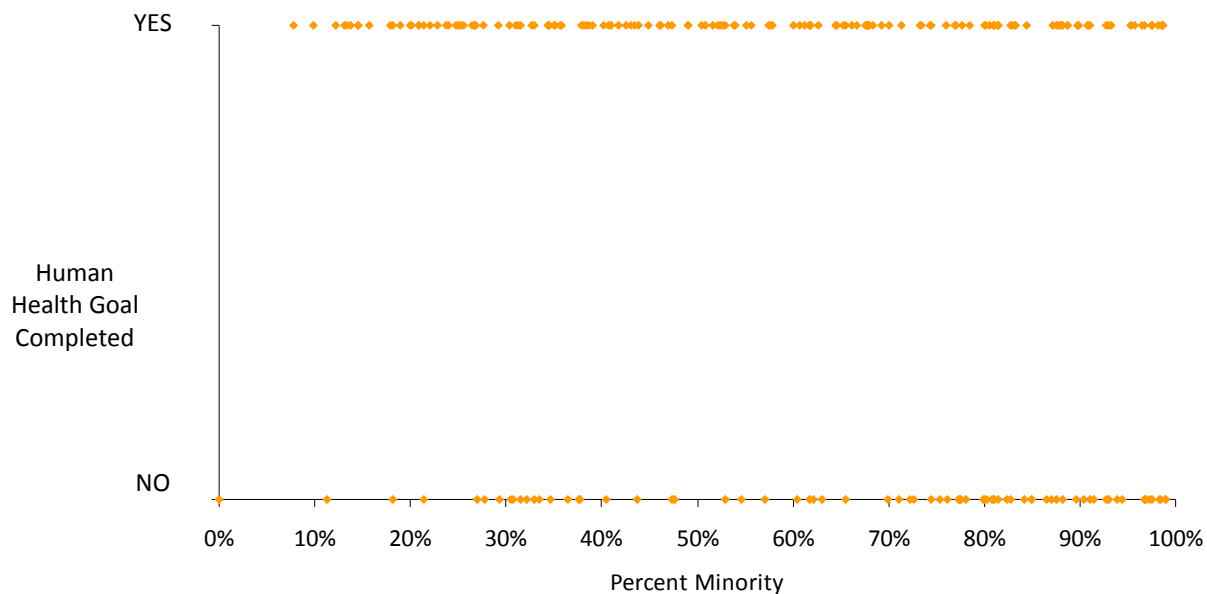


Figure 2. Percentage of Minorities versus completion of Human Health Under Control Goal.

I graphed the relationship of percentage of minorities in a 1-mile radius against the EJSEAT score assigned by the EPA (Fig. 3). There is a correlation of -0.2196 between Percentage of Minorities and EJSEAT score. Note that the relationship between EJSEAT score and percentage of minorities is not a strong one. However, the slight correlation means that as the EJSEAT score increases, the percentage of minorities decreases.

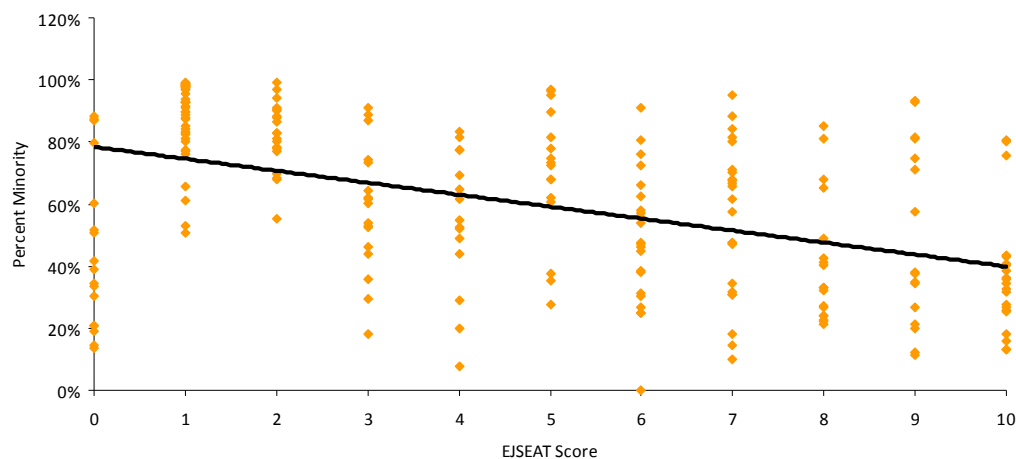


Figure 3. Correlation between Percentage of Minorities in a 1-mile radius and EJSEAT Score. EJSEAT score of “10” indicates lowest concern and “1” indicates highest concern.

There is a correlation factor of -0.0033 between facility size and the percentage of minorities. This is virtually insignificant and thus there is no linear relationship between the two factors.

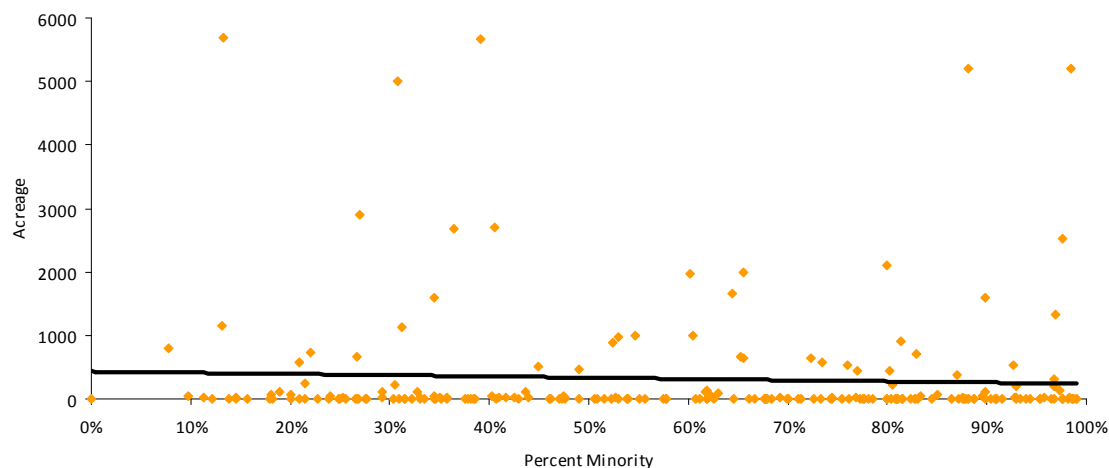


Figure 4. Correlation between size of site and EJSEAT score. EJSEAT score of “10” indicates lowest concern and “1” indicates highest concern.

The sites were classified by EJSEAT score, and rated on a 1 through 10 scale. All but the ones with a score of 1, of greatest concern, have more completed than uncompleted. When looking at a comparison between the least concerning score 10, versus score 1, those with a score of 10 have fewer sites to complete step one in the remediation process than those with a score 1. For sites with an EJSEAT score of 10, 19 are completed and only 3 uncompleted. Those with a score of 1 have about 20 completed and 24 uncompleted. This suggests that sites with EJSEAT scores of 10 and 1 are being cleaned at the same rate, with more uncompleted in the score 1 category. 86% of those with a score of 10, lowest environmental justice priority sites, had met the human health objectives, while only 45% of the greatest priority sites (score of 1) had met their goals.

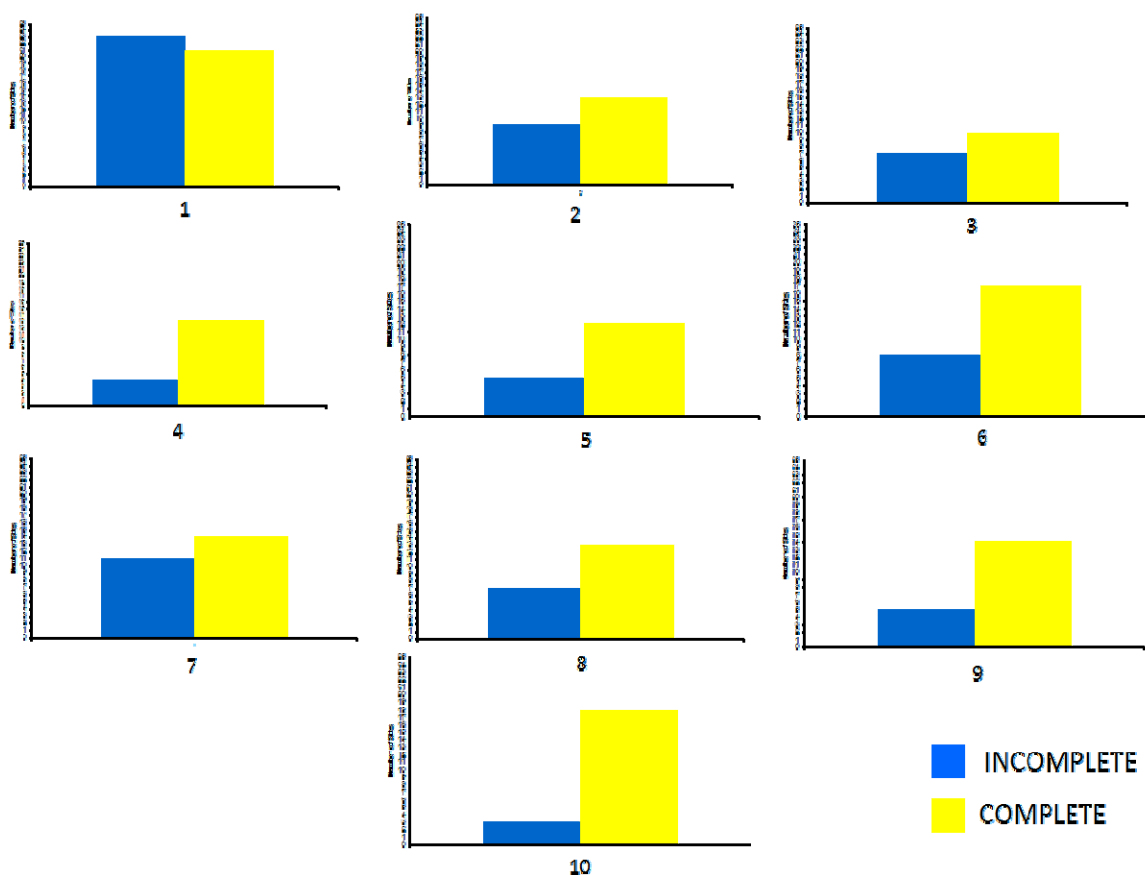


Figure 5. Comparison between EJSEAT score and the number of sites completing and not completing the human health goal. EJSEAT score of “10” means of low concern and “1” of highest concern.

Correlation between size of the hazardous waste facility and EJSEAT score is 0.0185. Though a slightly positive correlation, this implies that as EJSEAT score increases, site size also increases. When looking at which sites are meeting their human health goals with regards to size, those that are greater than an acre have 128 completed and only 3 uncompleted. For those that are less than an acre, 28 are completed and 81 uncompleted. This shows that the larger sites, which tends to have the higher EJSEAT scores (lower priority), are being cleaned up first.

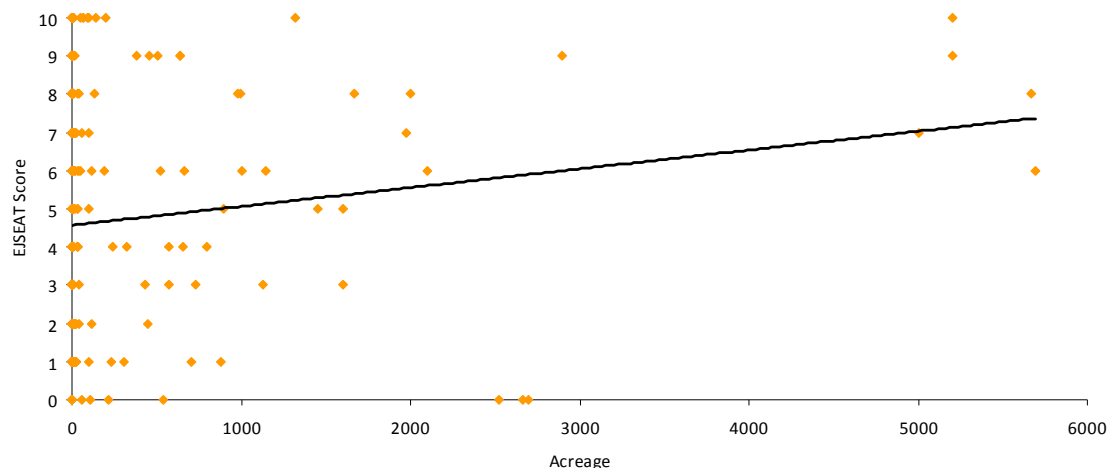


Figure 6. Comparison between Acreage and EJSEAT score. EJSEAT score of “10” means of low concern and “1” of highest concern.

Appendix I and II map out the RCRA sites in California. Appendix I shows that there are a larger proportion of sites with incomplete human health objectives and above 53.4% minority in the Los Angeles region than any other part of the state. Few are in the East Bay Area. Those with completed human health objectives and above 53.4% minority are also found in both the East Bay Area and Los Angeles region. Those with completed human health objectives and below 53.4% minority are scattered all throughout the state. Incomplete human health objectives and below 53.4% minority is also scattered. Appendix II shows a spread of the RCRA sites based on EJSEAT score. Those sites with the highest EJSEAT priority are denser in the Los Angeles region, with few scattered in the East Bay Area. This suggests that the Los Angeles region and the East Bay Area two important regions.

DISCUSSION

It was uncertain whether the EPA had met its priorities to remediate the sites prioritized under the EJSEAT scoring system, and whether those sites with the greatest minority populations were being cleaned up first. EJSEAT was implemented to bring EPA's practices in line with the principles of environmental justice. I reviewed the details of the hazardous waste sites and their status in terms of achieving "Human Health Under Control" (CA725) objectives, and confirmed that the disproportion many minority groups face with regards to their proximity to RCRA hazardous waste sites. I analyzed how their remediation status relates to their EJSEAT score, the percentage of minorities surrounding the site, and the size of the site. An overview of the RCRA sites in California reveals that they are not evenly distributed. There are a denser proportion of these sites in the southern part of the state. Further, a greater proportion of the population within 1 mile of sites in southern California is above 53.4% minority, the state average. Because of this, there is the possibility of discrimination when making site remediation decisions (Baden 2007). A visual GIS map shows this (Appendix I and Appendix II). My findings suggest that there is a disproportion as to which sites are cleaned up, as many sites with above state average minority populations have still not yet met their "Human Health Under Control" (CA725) objectives. The study informs us that EPA has not fully attended the minority populations that are suffering disproportionately.

Comparing the percentage of minorities of people living within a 1 mile radius of a toxic waste site to those living within 10 miles, I found that minorities were indeed disproportionately likely to live nearby to a toxic waste site in the state of California. As the literature points to a heavier density of minorities living closer to the sites, I too found higher percentages in the 1-mile than the 10-mile radius. Through the use of GIS, I was able to clearly lay out these findings for visual analysis (Unwin 1996). My findings differ than a study by Anderton et al. (1994), which found no consistent and statistically significant difference between the racial or ethnic composition on tracts that contain hazardous waste and those that do not. Yet, my results show there are 54.5% of sites with over 53.4% minority in the 1 mile radius. Further research shows that California has the highest percentage of minorities living near toxic, hazardous waste facilities (Bullard 2007). I found the disproportion I had expected to find, and my findings support that race is a strong factor as to where these facilities are located, not income level (Bullard 2007) as it is nationally. EPA is aware that minority and low-income communities are

frequently disproportionately and adversely exposed to environmental harms and risks, but there is room for new siting policies (Bullard 2007). This research contributes to the existing literature by noting the racial disparities surrounding environmentally hazardous facilities in California. The maps particularly point that the Los Angeles region is the area of greatest concern. Another area of concern is the East Bay Area. These two are ones wherein the EPA should prioritize remediation.

My methodology is akin to a recent study in Florida (Kearny 2009), in which researchers used a similar distance-based method to demonstrate that race continues to be an independent predictor of where hazardous wastes are located, and a stronger one than any other indicators. My findings for the state of California support this. All in all, this distance based approach is a new one to reveal the demographics of the populations located near these sites, and is still a powerful tool (Mohai 2006). Baden et al. (2002), found that evidence of environmental injustice could be sensitive to the data used, as results can be influenced by the choice of the spatial scale and scope of analysis (Baden 2002).

Both the average and the median percentage of minorities are higher than those of the sites that have met the “Human Health Under Control” (CA725) objective, which indicates that sites with a lower percentage of minorities are being cleaned up first. Many of the sites that have not met their environmental justice priorities are in areas that have a higher percentage of minorities, and thus these groups are still facing exposure. This finding is not in line with the priorities under environmental justice. There is a slight correlation between EJSEAT score and percentage minority. What we should be finding is that as the percentage of minorities increase, the EJSEAT score should decrease, as a score of 1 is of greater priority than a score of 10, leading to a correlation of -1. Instead, it is -0.2196. These results suggest that an alternative method to approaching prioritization of these waste facilities could be implemented. As it currently stands, the EPA works to remediate those sites with the lowest EJSEAT score, in the hopes of meeting the needs of environmental justice. However, those with the lower percentages are being cleaned up before those with the higher percentages.

Environmental equity and justice may be understood as a debate about everyone having equal access to environmental protection (Gragg 2002). The EPA should review and assess the current methodologies for measuring environmental justice and put forth an argument for a new health-based measurement paradigm, as suggested by Gragg (2002). Another system that should

be investigated further is the tool to measure Social Vulnerability Indications (SVI). This is more comprehensive than EJSEAT, the national standard. Though it will not replace the EJSEAT, using SVI will be a good addition to assessing the sites with greatest minorities (Ringquist 2005). EJSEAT does not always take into account what is of most importance when concerning hazardous waste (Baden 2007). Much of the environmental indicators concerned with EJSEAT rely on air toxins and air quality, not waste contamination. The first finding shows that race is a strong factor for determining where these sites are located. The additional SVI scoring guide can be customized and can give scores based on various social factors, while being able to putting a stronger emphasis on the more important ones, such as race. Further changes to be made go beyond the priority for remediation; there should be change in the siting process of these facilities as well.

A correlation between human health objectives and percentage of minorities suggests that the EPA is not following through with their priorities, and is possibly cleaning the sites that are the easiest and of the least concern, while still cleaning some of the greatest priority sites. A graphical distribution of EJSEAT scores and completion of the human health goal shows that of the sites with an environmental justice priority score of 1, there are more incomplete than complete. However, when looking at the sites with a score of 10, lowest environmental justice priority, fewer are incomplete than complete. Those sites with a score of 10 have the least amount of uncompleted goals compared to the rest. It appears as though they are remediating sites with score 1 and 10 at the same rate, with about 20 sites of each of the two completed, when those of score 1 show greater environmental justice disproportion. This suggests that those with the greater percentage minorities were being remediated last. 86% of the lowest priority sites have now met the human health objectives, while only 45% of the greatest priority sites have met their goals.

With no real linear relationship between percentage of minorities and acreage, we are not more likely to find a higher percentage of minorities around a larger site than a small site and vice versa. They still tend to be situated in close proximity to hazardous waste facilities, but this may be due to the fact that facilities are erected in these communities after they have been established. Studies show little evidence of minority populations flocking to these sites. Rather, they tend to grow and develop in these particular neighborhoods (Anderton 1994).

Acreage and EJSEAT score share a slight positive correlation. As the size increases, so does the EJSEAT score, with 1 being of greatest priority and 10, the least. We should expect that those less than an acre would have more completed, as the EJSEAT score tends to be lower in those sites. Instead, it is the larger sites with the higher EJSEAT scores that are meeting their goals. This suggests that the EPA cleans the larger sites first, which happen to have the higher EJSEAT scores. This is not in line with their environmental justice priorities. One reason may be convenience. Since the EPA needs to meet annual goals in numbers, they may opt to do those that do not necessarily meet environmental justice practices. It is important to note that larger areas may be a priority because these areas could potentially pose a greater threat due to their magnitude.

This study is limited by the use of data from 2000. This is rather old, but is the latest set of census data available as we are in a census year (2010) ourselves. The makeup of these communities may be much different today. However, the EPA uses this same data set which still makes the study's findings significant. It would of interest to repeat this study with new data from Census 2010. I am also limited on the addresses listed in RCRA. If they are not accurate, my calculation of minority percentages will also be inaccurate. I have relied on this to gather the geographic longitude and latitude points with which I measured the minority percentages from. This same methodology can potentially be used to explore the status of remediation on minority populations elsewhere. However, we can still assume that a disproportion exists and it is well documented by past studies.

Future studies may want to interview people who live in these areas. Lipscomb et al. (1991) asked about the health conditions of those living in the areas surrounding. Minorities are in the greatest need because they lack immediate access to resources. The EPA needs to ensure that these people are attended to first. Findings indicate that many had indeed been prone to these existing health conditions due to their exposure to toxins (Lipscomb 1991). This is important, as medical documents can be an effective way to see how potential exposure to hazardous waste has been directly affecting their health. Those suffering from asthma or toxic poisoning as a result of living near sites over long periods of time can argue for more immediate changes to those locations. These medical inquiries are just another way to see how much minorities are suffering disproportionately. Other potential studies may want to look at which races are being

discriminated against. Another can look into the specific companies and identify other potential reasons for the EPA not following directly with EJSEAT.

This research has meaningful contribution to the existing literature by detailing the current statuses of the sites in California and providing as a spring board for future in-depth studies to more closely examine racial disparities surrounding environmentally hazardous facilities in California and elsewhere. This study reveals which sites are being cleaned up, showing the effects of those priorities in terms of the different rates of remediation across demographically differentiated areas in California. California is first in the nation with regards to the percentage of minorities living near these waste facilities (Bullard 2007). My findings expose the disproportion many minority groups face with regards to their proximity to RCRA hazardous waste sites. There are a greater proportion of minorities living within 1-mile than 10-mile radius of RCRA sites. Moreover, looking at the demographics of the environment reveals that other sites may be of more concern in than others with regards to the population, bringing to light the disparities that exist between which sites are being remediated. The EPA attempts to solve this environmental justice issue through the use of EJSEAT, but fails. EJSEAT uses data based upon environmental, health, compliance, and social indicators. However race, more than income level (Bullard 2007), is the major predictor as to where the sites are located in California, and EJSEAT needs to take that into consideration. New siting legislation would be very beneficial and ensure that these people are not being unfairly treated. Further, changes in prioritizing remediation are better done based on race. As it stands, EPA prioritizes based on EJSEAT score. Yet the correlation between EJSEAT score and the percentage of minorities shows a weak relationship, as racial minority is not stressed. Further, a comparison EJSEAT and completion of human health goals shows a favor for remediation sites with a higher EJSEAT score. Environmental injustice is prevalent in California, and the EPA finds itself in a predicament with many of its citizens suffering disproportionately. There is room for improvement and the possibility of a new tool may help identify which sites are of greatest concern.

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APPENDIX I – RCRA Sites in California



APPENDIX II – EJSEAT Scored Sites in California

