

Distribution of Active Superfund Sites in Low Socioeconomic and Minority Populations in the Northwest United States

Background

Superfund sites are categorized as areas of land contaminated by hazardous materials resulting from various industrial processes or environmental disasters. Living in close proximity to these sites increases the risk of being exposed to potentially dangerous substances or radiation.¹⁻² Previous research has suggested that superfund sites are disproportionately located in areas of high minority populations and low socioeconomic status.³ Understandably, residing near a superfund site is considered undesirable but may cost less than living in a safer environment. Typically, any form of environmental contamination will reduce the cost of land, making it more affordable for low income populations. Additional studies suggest that there are increased medical costs that can occur from living in close proximity to these locations. This can exacerbate the cycle of poverty for low SES individuals who live near superfund sites for financial reasons, and cause additional financial burden.¹

Despite the potential health concerns associated with superfund sites, little research has been done on the communities that are at risk.⁴ In order to properly care for at risk populations, it is pivotal to know who may have environmental exposure to potentially hazardous chemicals generated by superfund sites and determine where action is needed.

In order to address this gap in knowledge, this project was conducted to examine the relationship between SES and minority status in relation to the distribution of active superfund sites in Washington, Oregon, and Idaho. The main research question of this study is to see if there is a larger amount of active superfund sites located in regions of high minority populations and in regions of low socioeconomic standing.

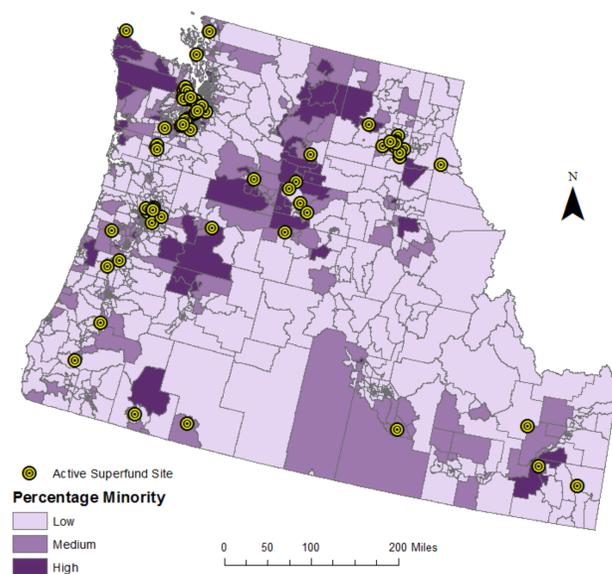


Data

Three datasets were utilized in this geospatial analysis. The first was The FOIA 4 all final National Priorities List Sites put out by the EPA. The second data source was the 2014 US Census data from the American Fact Finder five year estimate. Both data sources were in the form of Excel files and were of good quality. The third dataset was the shapefiles of the census tracts in the Pacific Northwest (Oregon, Washington, and Idaho) from the 2014 TIGER program. The EPA dataset provided latitude and longitude of each superfund site in addition to the name and status of the site. The census data provided mean income and percentage minority for each of the census tract.

These three datasets were combined to visualize the locations of active superfund sites superimposed on choropleth maps showing the demographic information found within the census data. The census data was joined with the TIGER shapefiles and the locations of the superfund sites were placed in the X-Y coordinate plane and projected. Two main choropleth maps of the Pacific Northwest were created using the mean income and percentage minority layers, while six smaller maps zoomed into cities with high concentrations of superfund sites. For percentage minority maps, the data was distributed in three quantiles and was re-labeled as low (0.00%-9.23%), medium (9.23%-18.74%), and high (18.75%-93.61%). Income data was split into five quantiles. A basic query was performed to determine the number of superfund sites in each quantile for both income and minority percentage. The results were placed in a table for visual comparison.

Distribution of Active Superfund Sites and Minority Populations



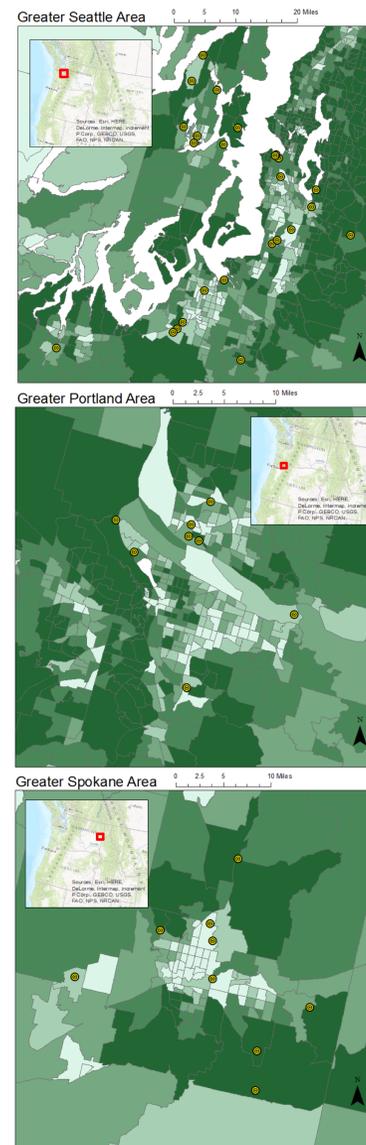
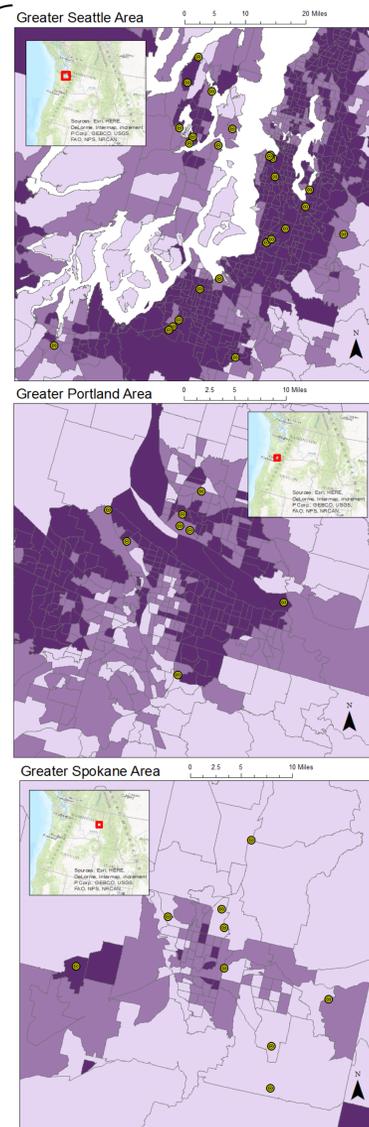
Results

A total of 67 active superfund sites were found within the boundaries of Washington, Oregon, and Idaho. Three sites fell within a census polygon (2225) that did not have any data on either minority status or mean household income and these sites were classified as unreported. The spatial distribution of these sites suggest that there are clusters within large metropolitan areas. These were looked at in greater magnitude and the sites were primarily landfill or industrial origin.

Table 1: Active Site Distribution in Minority Quantiles

Percentage Minority	Active Sites	Percentage of Sites
Unreported	3	4.5%
Low	15	22.4%
Medium	18	26.9%
High	31	46.3%

The results from the query show that there is an association between percentage of minorities within the population and the



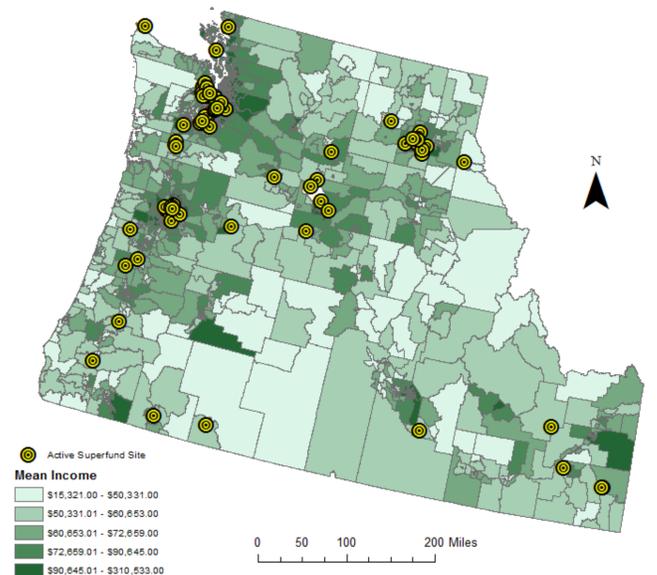
number of active superfund sites. As the minority density increases from low to high, so does the percentage of sites, with almost 50% of sites in the Pacific Northwest residing in the highest quantile of minority density.

Table 2: Active Site Distribution in Income Quantiles

Mean Annual Income	Active Sites	Percentage of Sites
Unreported	3	4.5%
\$15,321-\$50,331	22	32.8%
\$50,331-\$60,653	14	20.9%
\$60,653-\$72,659	10	14.9%
\$72,659-\$90,645	7	10.4%
\$90,645-\$310,533	11	16.4%

When examining the percentage of sites located in income brackets, it was found that the highest number of sites were located in locations of the lowest mean income. The number of sites continues to decrease as income increases until it reaches the highest quantile. Here there is a slight increase in number of active sites, however it is still half that in the lowest income quantile.

Distribution of Active Superfund Sites and Mean Household Income



Discussion

The data from this analysis supports previous theories that active superfund sites are disproportionately located in regions of high minority and low socioeconomic status populations.⁴ This could be explained by the lower cost associated with living near an undesirable superfund site. An additional possibility is that more affluent communities have enough political sway to speed up remediation of superfund sites nearby, thus reducing the number of active sites within their census tracts.

This analysis was useful for visualizing potentially problematic areas, such as the Southwestern Greater Seattle Area which contains a large amount of superfund sites in a region of high minority density. Additionally, as the EPA superfund data was updated in April 2016, it can be assumed that the status of the superfund sites are indeed accurate at this time.

One limitation of this study could be the accuracy of the income and minority data. As this data was collected on the census tract level, it is possible that greater details regarding the distribution of these populations were missed. Another limitation was that this study only looked at active superfund sites. By comparing information on active and resolved sites, it would be possible to see which regions were most successful in remediating active sites, potentially highlighting further disparities.

Future studies could look at data on the census block level, giving policymakers a better understanding of vulnerable populations in addition to highlighting sites that should be targeted for remediation. Improvements in understanding the spatial relationship between populations and superfund sites may also impact the health of exposed populations. By alerting health professionals to at-risk locations, they could recognize environmental exposure symptoms that were previously missed and provide patients with improved medical care.



References

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