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*The Impact of
Hazardous Waste
Disposal Sites on
Low Income
Communities:
An Environmental
Justice Concern*

By Ujunwa Okeke
Fellow, Environmental Sustainability
G.L.O.B.A.L. Justice
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ACKNOWLEDGEMENTS

G.L.O.B.A.L. Justice is dedicated to inform, impact, and inspire the generations to learn, lead, and do justice. Our programs address a range of local, national and international human rights and humanitarian concerns. Our Economic Justice and Environmental Stewardship Program is focused on economic empowerment and environmental sustainability.

G.L.O.B.A.L. Justice launched its Fellows program in Fall 2019 to provide opportunities for post-graduate and seasoned academics and professionals to partner with us on timely and significant research projects addressing justice issues worldwide.

Ujunwa Okeke served as a G.L.O.B.A.L. Fellow in Environmental Sustainability for Fall 2019. She is the author of this research paper. Ujunwa was born in Nigeria, Africa and holds a Master's degree from Colorado State University with a concentration in Environmental Communication and a BSc degree in Environmental Sciences from Nigeria.

Ujunwa's topic on the impact of hazardous waste sites on low income communities as an environmental justice concern is an important discussion on how policies and decisionmaking can adversely impact not only the environment but also specific groups of vulnerable populations.

G.L.O.B.A.L. is grateful to Ujunwa for her work on this important topic. We are also thankful for the research support provided by Emily Winn, Research Associate, and the oversight and editorial support provided by Sosamma Samuel-Burnett, Founder & President, G.L.O.B.A.L. Justice.

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The Impact of Hazardous Waste Sites on Low Income Communities: An Environmental Justice Concern

I. PURPOSE

According to the E.P.A., Environmental Justice (E.J.) is 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. However, E.J.'s goal has not been achievable because most people, especially the low income and minority populations, are not receiving the benefit of environmental justice. Their specific concerns have been ignored and have received inadequate attention.

In the past, there has been an unprecedented national concern over the problem of hazardous waste. People have focused this concern on the dangers of toxic chemicals and dangerous substances coming from the hazardous waste sites and their environmental and health effects close to the neighborhoods where they were situated. In 1982, the Commission for Racial Justice joined forces with residents of predominantly Black and poor Warren County, North Carolina, in opposing the establishments of polychlorinated biphenyl (P.C.B.) disposal landfills. (43) The protest was a nonviolent civil disobedience campaign and had more than 500 arrests.

Following the demonstration, in 1987, the United Church of Christ (U.C.C.) released the report *Toxic Waste and Race in the United States: A National Report on the Racial and Socioeconomic Characteristics of Communities with Hazardous Waste Sites*.

This report stimulated substantial research and activism concerning the disproportionate exposure of minorities to environmental hazards.(43) Although the issue of disproportionate siting of hazardous waste in poor neighborhoods has been debated over three decades, and different research has been carried out at the state (5) (10), international (26), and national levels, (3) (45) the problem of race as the most important factor determining the siting of dumpsites persists. (11) One example in recent times is Globeville and Elyria-Swansea—the most polluted zip code in the United States. This zip code, which is situated in North Denver, consists of 84% Hispanic residents. (20)

A. Goal

This research paper will analyze studies that have been done since the inception of the concept of environmental justice in the 1980s through the 2010s. The goal will be to determine if there has been a change in the factors that drive the siting of hazardous waste sites. Are race and income still the most critical factors? Or, are there other factors influencing the siting of hazardous waste after years of research and advocacy?

B. Objectives

- To determine the main factors that influence the siting of hazardous waste dumpsites
- To determine if there has been a change in dumpsite siting in recent years
- To examine what the government has done to regulate environmental injustice over the years

II. LITERATURE REVIEW

A. Scope:

Environmental justice research is developing. Different scholars from a broad set of disciplines such as history, geography, political science, demography, and economics have made contributions. Over the years, researchers have realized that different size units, such as distance-decay functions, produce different results. (31)(32) There has been an improvement on the methods to adopt while carrying out such research. Researchers now use multiple indicators of an area's economic character, such as level of education, race, employment rate, poverty, price of housing, and not just a single index like income. (32) (43) Various studies have accessed these multiple indicators, mostly in the affected counties of different states. (1) (5) (10)

B. Environmental Justice Trend Over the Years

In the 1980s, there were three empirical studies of the population characteristics of the areas where waste sites are located. These studies were known to define environmental justice research, and they brought the attention of the public to it. (2) The first research was done at the request of the General Accounting Office (45) to determine the correlation between the location of hazardous waste landfills and the racial and economic status of surrounding communities" (p.2). G.A.O. researchers examined zip-code-level population data for areas proximate to four hazardous waste facilities in E.P.A. Region 4, composed of South Atlantic states.

Results showed that Blacks make up the majority of the population in three of the four communities where the facilities are located. At least 26 percent of the people in all four communities have income that is below the poverty level, and most of them are Black.

The second empirical study is the most widely discussed, and it was commissioned by the United Church of Christ's (U.C.C.) Commission for Racial Justice in 1986. This was the first Nationwide study to examine the extent to which Americans (Africans, Asian, Pacific, Native) and others are exposed to hazardous waste in their communities. Similar to the G.A.O. research, this study compared zip codes that have dangerous waste treatment, storage, or disposal facilities (TSDFs) to zip codes that do not have TSDFs. Zip codes with no TSDFs had 12.3 percent minority populations; zip codes with more than one TSDF had about double that figure. Also, 37.6 percent of minorities were situated in one of the five largest landfills in the U.S.A. (44)

These results led U.C.C. to conclude that, "Race is the most significant among variables tested in association with the location of commercial hazardous waste facilities in the United States." The U.C.C. study also found that 'three out of every five Black and Hispanic Americans lived in communities with uncontrolled toxic waste sites.' (44)

The third study (10), found that solid waste sites were not randomly scattered over the Houston landscape but were located in predominately black neighborhoods and near black schools. Specifically, 21 out of 25 of Houston's solid waste sites were found in African American neighborhoods.

C. Subsequent Research- Two Decades Later (1990s and 2000s)

After the inception of E.J.'s research, the 1990s and 2000s saw exponential growth in environmental justice research. Many studies have analyzed the different types of environmental hazards, including hazardous material that is present and disposed of on land, air pollution, and pollutants discharged into water. However, the U.C.C. study was concerned with the distribution of hazardous waste sites on land and did not focus on pollutant emissions.

The current study follows the U.C.C. study approach, only analyzing studies that have investigated the distribution of hazardous waste sites. Several studies have been conducted regarding the national distribution of land-based environmental hazards. Some of these studies are in support of the U.C.C. study results while others counter it. Researchers (49) analyzed the waste disposal sites in the metropolitan areas of Texas at the tract level using Chi-square and Cramer's V statistical tests, they found that hazardous waste sites were more likely to be sited in poor, low population density areas, but that the minority population is not disproportionately exposed. Evidence of minorities being discriminatorily exposed during waste siting decisions is not definitive.

Experts (5) conducted a research project in Chicago and found that Hispanics are disproportionately exposed, but there is no evidence that African Americans are disproportionately exposed to the most dangerous hazards either currently or historically. Taken as a whole, their research considered the historic relationship between minorities and hazardous waste. The growth of the Hispanic community in Chicago's history is recent. The study indicated that this growth has been in the areas where there is more concentrated waste in the city. In the past, waste-generating activities in Chicago were located in less populous, lower-income areas with good access to highways and waterways. Whereas, nowadays, waste sites tend to be found in less populous, wealthier neighborhoods, with easy access to transportation infrastructure. (5)

There is no evidence that African Americans of any income class are more likely to live in areas with more concentrated waste sites in the city of Chicago. In addition to race, there are several indicators to the distribution of hazardous waste sites. Experts (2) analyzed Resource Conservation and Recovery Act (RCRA) corrective sites and T.S.D. facilities at the census tract level, with logistic regressions. They found that employment in the industry was the most significant predictor of whether a waste site would be in a tract, considering race in their study. The percentage of African Americans was not essential, but the percentage of Hispanics was. When considering the distribution of T.S.D. sites in Los Angeles County, using the tract as a level of analysis, they found that the presence of an industrial labor force, higher percentages of industrial land use, and the presence of minorities were strong predictors of the existence of environmental hazards.

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Several decades of research have yet to answer the "chicken and egg question" of environmental justice research. "Are hazardous waste sites, polluting industrial facilities, and other locally unwanted land uses disproportionately located in nonwhite and poor communities? Or are such gaps the result of facility owners deciding to build in communities dominated by the poor and minorities? Or did the establishment of hazardous facilities cause post-siting demographic changes that led to disproportionately high concentrations of low-income residents and minorities?" (32)

To show the present-day racial and socioeconomic disparity in environmental justice research around hazardous waste, researchers. (32) conducted a national level longitudinal study. They studied 319 commercial hazardous waste treatment, storage and disposal facilities sited in the United States from 1966 to 1995. They also considered the demographic composition of neighborhoods around the time commercial hazardous waste facilities were built, as well as the demographic changes that occurred afterward. Their results showed that hazardous sites are usually placed on neighborhoods where poor people and people of color live. Their study is the first national study to demonstrate that contrary to earlier beliefs about post-siting demographics change, neighborhood modification tends to attract hazardous facilities, rather than the facilities attracting people of color and low-income populations. (32)

III. IMPACTS OF TOXIC WASTE ON HOUSING VALUES AND HEALTH

The disposal of toxic waste has caused enormous harm to the environment and the people. Across the United States, dangerous waste dumps and traces of past practices of freely disposing of toxic wastes still exist. In 1980, the Environmental Protection Agency passed the Superfund legislation, initiating the movement for a major environmental cleanup effort. The E.P.A. arranged with state agencies to identify the fixed location of waste sites in the U.S.A. in 1981.

These initiatives led to the identification of 24,000 uncontrolled hazardous waste sites with 703 being the most toxic. Only these 703 toxic sites made it to the National Priority List (NPL) and are eligible for Superfund dollars. Ever since this revelation in 1986, national attention and publicity have been focused on these 703 NPL sites. (23) The E.P.A. announcement had an impact on housing values, especially on the states that had the most numbers on the NPL sites. Property values declined based on the distance to the toxic waste and the perceived health risk. (23) (28) (40) (41)

Proximity to a toxic site is classified as a disamenity. The housing sales in Harris County, Houston (23), and Uniontown, Ohio (40) were analyzed after the publicity by the E.P.A. Harris county contains ten sites on the EPA NPL sites, and is one of the most toxic urban counties in the United States. According to Kohlhase (23), housing prices (all distances up to 6.2 miles) declined after the E.P.A. has discovered and publicized homes that are close to toxic waste dumps.

Researcher Reichert(40) concluded that the properties that are close to landfills had a diminished value ranging from approximately 5% for the most distant property to 15% for the closer properties. Toxic waste landfills have a relatively quick, economically significant, and permanent impact on housing values. (40)

Planting trees and building berms to make toxic waste sites invisible is one way to make property value loss less extreme.(28) Unfortunately, as much as property price decline is reversible after the toxic site has been cleaned up, there is an ultimate effect in the value of the property. (28) (40) The high decline of property value can be attributed to the perceived health risks that are associated with living close to a toxic site. (23) (28) Experts believe that there are minimal risks attached to some sites than others. However, homeowners find that once a site is close to their property, the chances of cancer and other health-related diseases loom large.

Economists investigate the connection between pollution and location through the study of hedonic pricing. (27) Hedonic pricing attempts to calculate the monetary value of environmental factors by looking at variations in the cost of marketed goods, such as houses or land. When an economist compares some factors in property values between two neighborhoods that are similar, for example, the home size, access to schools, and other factors. If discrepancies are found, the most polluted area will have a lower property value. In most cases, buying a house in an area like that will be cheaper. Hence, attracting minorities and low-income people. People place a monetary value on being away from polluted areas.

Several researchers have concluded that property values tend to diminish as pollution increases. This principle means that the wealthy pay a lot to avoid pollution. (27)

Health risks belief has a substantial negative correlation to property values. In as much as the relationship between race and hazardous waste was brought to public attention in 1982, public health concerns around the disproportionately siting of hazardous waste sites came to the forefront of media in 1978. This was the same time residents who live in New York Love Canal neighborhood protested because of the diseases believed to be associated with chemical wastes that had been buried there years before. (34) (39) This incidence is regarded as the "tip of the iceberg" in alerting society to the health problems associated with hazardous waste disposal practices (34). Chemicals detected at Love Canal were primarily organic solvents, chlorinated hydrocarbons, and acids, including benzene, vinyl chloride, P.C.B.s, dioxin, toluene, trichloroethylene, and tetrachloroethylene.(47) Several researchers conducted different studies to determine if the residents of the Love Canal suffered adverse health effects. (19) (21) There was no increase in cancer rates for Love Canal residents when they compared it to data from the entire state from 1955 to 1977. (21) This included leukemia, lymphoma, and liver cancer; these diseases are known to be most likely associated with the chemicals found at the site. Also, there was no difference in frequencies of chromosome damage found when compared to the control group from a socioeconomically similar census tract. (19)

However, when infants and children were studied, there was an increased prevalence of seizures, learning problems, hyperactivity, eye irritation, skin rashes, abdominal pain, and incontinence in children living close to the Love Canal site compared to controls from other areas, as reported by the parents of the children. (37)

Subsequent research has shown that children are profoundly affected when they are exposed to toxic waste sites. (6) (22) (37) Children who spent about 75% of their childhood in the Love Canal area had significantly shorter stature for their age than control children after allowing for factors such as birth weight, socioeconomic status, and parental height. (37) Low birth weights (less than 2500g) were found in children who live close to toxic landfills— within a radius of 1 km. (6) For example, in the Love Canal area in New York, and B.K.K. hazardous disposal sites in Los Angeles, California during the period of active dumping (1940-1953) that were prevalent in children who live there than those in control groups. (22) (46) Numerous community surveys have investigated a wide range of self-reported health symptoms, often triggered by smells and odors from the sites. (47) Health problems such as headaches, psychological disorders, respiratory symptoms such as; irritation of skin, nose, and eyes, and allergies have been reported by health surveys through questionnaires and interviews. (14) (15) (25) (30) (36). From the public health point of view, the high symptom reporting in the exposed area shows the impact that stress related to a landfill can have on ill-health and perceived ill-health. (47)

According to a study, (36) residents who were worried about the neighborhood pollution reported more symptoms than those who were not concerned both in the exposed and control area. There was an increased symptom prevalence in residents who showed that they were concerned about, or knowledgeable of, an environmental problem in their neighborhood. (17) (30) Almost all self-reported symptoms were associated with a higher perception of threat. (47)

In a study done in California, the researchers found that among all the self-reported diseases and symptoms, cancer, and pregnancy outcomes they analyzed from a medical register at the Stringfellow waste dump, self-reported diseases and symptoms were the only outcomes that differed between exposed and unexposed areas. (15) It is likely that residents of such neighborhoods were stressed and as such perceived a health risk in their lives. Being aware of the risk posed by hazardous landfill sites is highly relevant. Toxic waste sites can pollute groundwater. Chemicals in toxic sites can migrate to groundwater and drinking water.

A study that was conducted in Woburn, Massachusetts, detected industrial solvents, especially trichloroethylene from a waste disposal site in municipal drinking water wells. Residents report a cluster of 12 leukemia cases in children, and this was significantly higher when compared to national rates (24). There was an association between self-reported pregnancy outcomes with eye/ear congenital anomalies central nervous system, oral cleft, chromosomal anomalies (mostly Down syndrome), spontaneous abortion, congenital heart defects and contaminated well water. (16) (24) (42) In Hardeman County in Tennessee, the well water that was used as drinking

water was contaminated with a high concentration of carbon tetrachloride and other chlorinated compounds, (13) because of the nearby landfill where 300,000 barrels of pesticide waste had been buried. Investigation showed that residents who had used contaminated water had abnormally high levels of liver enzyme, indicating liver damage compared to controls. Carbon tetrachloride has been identified by various toxicology research as a potent liver toxin. (47)

Numerous researchers in the field of environmental justice have established evident racial and socioeconomic inequalities in the distribution of a large variety of environmental hazards. (31) There is credible evidence of racial or economic inequality in health outcomes concerning residential proximity. Experts (9) conducted a study and found that chromosomal anomalies, causing an increased risk of Klinefelter variants were notable in births among Hispanic women who live near hazardous waste sites.

There is a strong association of congenital disabilities in American Indians and Alaska Native women who live in a census tract with one or more National Priority List (35). In most cases, people who earn low incomes and inadequate access to health care may also be disproportionately exposed to environmental contamination that endangers their health. (27) Unequal exposure to environmental factors that leads to diseases and disabilities are exacerbated in minorities because they often receive a lower quality of health care, and most times do not go for a routine checkup. (27) Low-income and minority populations are more likely to live in areas that are significantly exposed to lead chemicals, as a result of lead paints and soil contamination (27)

A recent study examined the distribution of toxic air pollutants in Southern California. The researchers found a strong relationship between race and exposure to hazardous sites. Residents of the neighborhood experienced elevated cancer risk due to toxic air pollutants. About 1/3 of the minority population of southern California lived in the areas with the highest cancer risk, whereas 15% of the white people lived in such areas. (33) Also, minority children who went to public schools in Los Angeles experience the most exposure to air pollution. Of schools that were ranked in the bottom fifth for air quality, 92% of the children in those schools were minorities. The rate of air pollution exposure also affected their achievement in school. (33) Asthma is a chronic illness in which the lungs can become constricted, making breathing difficult. According to U.S. E.P.A. in 2003, children from all socioeconomic backgrounds can have asthma, however, it is more prevalent in low-income and minority communities.

One study that was done in Washington state shows that in families with incomes below \$20,000 per year, childhood asthma prevalence is about twice that of other families[1]. Subsequently, another study looked at asthma rates in low-income preschoolers and found that nearly a third of these young children had this debilitating disease. (29) Most children do not smoke. Hence the only significant factor that leads to asthma in their case is the toxic exposure during fetal and infant development. (8) (27) Asthma is worse in low-income and minority populations because they have limited access

[1] U.S. E.P.A., The Cost of Illness Handbook, available at <http://www.epa.gov/oppt/coi/2003>.

to health care, and controlling asthma requires regular medical care. According to the American Lung Association, a black child is likely to be hospitalized 3 times more than a white child, and the rate of emergency room treatment for asthma is four times as great for black children as for white children. When one compares the death rates from asthma in black and white children, black children die more from asthma than white children. In the U.S., African American children ages 10 to 14 are six times more likely to die of asthma than white children.

In Denver residents of Globe Ville and Elyria Swansea who are predominately Hispanic people experience a higher incidence of chronic health conditions than other Denver neighborhoods. Research shows that individual genetics only account for about 30% of one's health status. About 70% of one's health is attributable to the physical environment, access to health care, socioeconomic factors including education, income, employment, and community safety, and individual health behaviors such as tobacco use, diet and exercise, and alcohol use [2]. The children and youth of Globeville and Elyria Swansea visit emergency rooms for asthma-related treatment more often than their counterparts in Denver as a whole. This is as a result of their neighborhood.

Protecting the environment shouldn't be viewed as a luxury; people shouldn't just care about it when they have time and disposable income. The environment should be protected at all times because

[2] Human Impact Partners

[https://www.google.com/search?q=Human+Impact+Partners\(2013\)&rlz=1C5CHFA_enUS848US848&oq=Human+Impact+Partners+\(2013\)&aqs=chrome..69i57.1300j0j7&sourceid=chrome&ie=UTF-8](https://www.google.com/search?q=Human+Impact+Partners(2013)&rlz=1C5CHFA_enUS848US848&oq=Human+Impact+Partners+(2013)&aqs=chrome..69i57.1300j0j7&sourceid=chrome&ie=UTF-8)

it impacts our lives significantly. Without any question, public health and environmental structures need to respond to environmental health challenges of the future.

IV. METHODOLOGY

This study adopted a meta-aggregation approach, a type of systematic qualitative review. It analyzed and summarized individual relevant studies in terms of their practical consequences. This approach enabled the researcher to summarize quantitative data obtained from the chosen studies. The step by step process for meta-aggregation is:

- To develop a review question. The review question is: has there been a change in the factors determining the siting of hazardous waste dumpsites since the 1980s?
- The researcher conducted a comprehensive search for literature using Google Scholar, Web of Science, and Science direct, and relevant papers were found. In addition, articles were traced through references listed in previous reviews. Some papers that were found in this manner studied the health impacts that residents face by living close to a hazardous waste site. This research filtered out any study that wasn't conducted in the United States.
- A critical evaluation and retrieval of the selected studies that studied the National Priorities List were analyzed.
- The researcher extracted findings for chosen relevant studies with the inclusion of studies that used different methodologies. Self-reported health problems that were accessed by other researchers were identified.

With respect to cancer, only childhood cancer was identified. Adult cancer was left out because of the relatively long induction and the latent period of solid tumors in adults.

- A meta-aggregation of results was done, and conclusions and recommendations were suggested.

V. RECOMMENDATIONS

The growing interest in health and environmental hazards not only transcends the academic, scientific, and different regulatory bodies; the public who often identify a relationship between the environmental hazards and health are also concerned, especially the ones living close to the waste sites. In minority communities, almost everyone, government agencies, educational programs, grassroots networks, and the legal systems are all involved in assessing the health impacts of hazardous waste sites.

People who live in areas that are affected by hazardous facilities should form a grassroots movement in the community that will help halt the siting of new hazardous waste facilities in the neighborhood by engaging in a peaceful demonstration. They can also seek legal settlement of their citizens' illnesses. For example, according to (4) mothers who lived in East Los Angeles, they succeeded in stopping the installation of a hazardous waste incinerator even though experts have reassured them that the emissions from the site will have minimal to no risk involved and would not cause any congenital defects or cancer to nearby residents.

Organizations that have public health and environmental health professionals who have the resources and expertise to lead the way with the development of policy and social change that shows innovative sets of public values around the issues of preventive health care and waste reduction should step in and suggests remedial ways to the injustice done to the minority groups.

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The government should fund epidemiological research in minority communities to access the relationship between exposure to hazardous wastes and the occurrence of particular illnesses even though the site is not on the National Priorities List.

The education system should consider changing its curricula. Higher education should integrate minority environmental health concerns with broader socioeconomic, political, cultural, and economic issues that impact the environment in their curricula. Environmental departments in the university should recruit and retain minority groups in the environmental fields. Afterward, people who are in the minority group should be recruited in environmental and occupational health, environmental law, public health, and health planning. This strategy will help solve the problems associated with the dumping of hazardous waste in minority neighborhoods. When minority professionals are in management ranks of government and industry, it may instigate scientific and public health communities to be considerate to the health of its ethnic members. (48)

Also, researching and finding private and governmental organizations that will link minority and nonminority groups on issues that cut across geographic boundaries and political spheres, for example, issues like environmental justice, is essential. These organizations should provide communication networks to serve as an advocacy group that will expose the information that the media is not covering regarding such issues. Promoting the use of collaborative, innovative, and cooperative models for the problem-solving and dispute resolution will raise concerns about environmental equity issues. (18)

Non-profit and advocacy groups should participate in the health assessments, epidemiological studies, and programs in risk communication that are tailored to the political, economic, and cultural situations of the vulnerable communities. They should consider validating the health concerns of homeowners and people who live close to waste dump even in the absence of a definitive cause and effect data. (18)

Members of the community should also become active participants in the fight for a better environment. They should be open-minded while being

VI. CONCLUSION

The current exploratory review showed that among other factors - income, employment, and level of education - race is a significant predictor when it comes to the siting of hazardous waste sites. According to the works of literature that were reviewed in the current study, there has been no significant change in recent times when corporations dump hazardous substances. Minority and low-income people, especially children, bear the adverse effects of their decisions. The government has supported environmental justice since the 80s. They identified the worst sites (National Priority List) and allocated funds for the cleanup of such sites. This step has minimized the negative effects of property values on houses close to the sites. However, these hazardous waste sites remain an environmental justice concern. Without more significant, concerted, and coordinated efforts to address the economic and health impacts of the siting of hazardous waste sites in low income areas, these communities remain disproportionately vulnerable to these impacts.

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