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## ENVIRONMENTAL JUSTICE: Human Health and Environmental Inequalities

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■ **Abstract** In this review, we provide an introduction to the topics of environmental justice and environmental inequality. We provide an overview of the dimensions of unequal exposures to environmental pollution (environmental inequality), followed by a discussion of the theoretical literature that seeks to explain the origins of this phenomenon. We also consider the impact of the environmental justice movement in the United States and the role that federal and state governments have developed to address environmental inequalities. We conclude that more research is needed that links environmental inequalities with public health outcomes.

### INTRODUCTION

Although the United States spends more money per capita on health care than does any other nation in the world, the overall health of the population lags behind that of most industrialized countries largely because of persistent and growing disparities in mortality, morbidity, and disability between whites of high socioeconomic status (SES) and people of color who are less advantaged (61, 62, 78, 127). Although these health disparities are frequently attributed to individual health behaviors such as smoking, diet, and exercise, these factors account for only a fraction of the disparities (67, 68, 128). Thus the investigation of macrolevel social and environmental factors that sustain or diminish health has become a growing area of public health research (60). As this body of research has matured, it has focused on a number of related variables, including SES (124), access to health and social services (102), and neighborhood or community characteristics (98, 104).

Recently, public health researchers have also begun to explore the role of disparate exposures to environmental pollution as a major contributing factor in the production of health inequities (40). Research on this topic reveals that, in many communities, it is people of color and the poor who tend to live near

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environmentally hazardous facilities and who bear a larger share of the health burden from exposures to toxins (9, 80, 97, 113). Although the various lines of research on macrolevel factors identify promising correlates of health disparities, studies of environmental inequality and health disparities remain largely separate realms. Thus little is known about the attributable risk of social and environmental factors or ways in which social and environmental risks may combine to create synergistic or cumulative burdens on the health of the most vulnerable populations.

To advance our understanding of the causes and possible resolution of health disparities between demographic groups in the United States, there is a need to integrate environmental inequality and its health impacts into the existing research on health disparities. In this review, we provide an introduction to the topics of environmental justice and environmental inequality. In the first section, we provide an overview of the dimensions of unequal exposures to environmental pollution. In the second section, we discuss the theoretical literature that seeks to explain the social production of environmental inequality. In the third section, we provide an overview of the rise of the environmental justice movement in the United States and the role that federal and state governments have assumed to address environmental inequalities. In the fourth section, we provide an assessment of the overall impacts and future of the efforts to redress environmental injustice. We conclude with a discussion of the implications of environmental justice for public health and social science research.

## EMPIRICAL PERSPECTIVES ON THE DISTRIBUTION AND IMPACTS OF ENVIRONMENTAL INEQUALITY

As defined by Bullard (21, p. 495) environmental justice is the principle that “all people and communities are entitled to equal protection of environmental and public health laws and regulations.” The Environmental Protection Agency (EPA) (123) definition further elaborates on this principle by defining environmental justice as

[t]he 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. Fair treatment means that no population, due to policy or economic disempowerment, is forced to bear a disproportionate share of the negative human health or environmental impacts of pollution or environmental consequences resulting from industrial, municipal, and commercial operations or the execution of federal, state, local and tribal programs and policies. (p. 1)

Environmental justice can be distinguished from environmental inequality (or environmental injustice), which refers to a situation in which a specific social group is disproportionately affected by environmental hazards (28, 35, 90). A specific form of environmental inequality is the phenomenon of environmental racism.

Chavis (19) first defined the term environmental racism in the following manner: “Environmental racism is racial discrimination in environmental policymaking, the enforcement of regulations and laws, the deliberate targeting of communities of color for toxic waste facilities, the official sanctioning of the life-threatening presence of poisons and pollutants in our communities, and the history of excluding people of color from leadership of the ecology movements” (p. 278). Thus environmental racism “refers to any policy, practice, or directive that differentially affects or disadvantages (whether intended or unintended) individuals, groups, or communities based on race or color” (21, p. 497).

Beginning in the early 1970s, a substantial body of literature was developed that documents the existence of environmental inequalities in the United States (25, 47, 69). These early findings were later amplified by a series of studies focusing on the location of hazardous waste sites, beginning with a study conducted by the U.S. General Accounting Office (GAO) in 1983. This study documented that African American communities in the southern United States were playing host to a disproportionately high number of waste sites (122). This regional study was followed in 1987 by the United Church of Christ Commission on Racial Justice’s groundbreaking national study titled *Toxic Waste and Race in the United States* (118), which documented the unequal and discriminatory siting of toxic waste facilities across the United States. The United Church of Christ study concluded that race was the most important factor in predicting where these sites would be located. In 1990, Bryant and Mohai organized the Conference on Race and the Incidence of Environmental Hazards at the University of Michigan. The Michigan conference brought together researchers from around the nation who were studying racial and socioeconomic disparities in the distribution of environmental contaminants to discuss their findings and implications. The scientific analyses presented clearly documented and “overwhelmingly corroborated the evidence of the General Accounting Office and the United Church of Christ reports” (18, p. 3). The proceedings of the conference were forwarded to the U.S. EPA and influenced the agency to begin its own examination of the evidence and begin drafting policy proposals. In 1992, the EPA published its findings and recommendations in a report entitled *Environmental Equity: Reducing Risks for All Communities* (120). The proceedings of the 1990 Michigan conference were also formally published in 1992 in an edited volume entitled *Race and the Incidence of Environmental Hazards* (18). In 1990, Bullard published his now classic book, *Dumping in Dixie* (19). This was the first major study of environmental racism that linked hazardous facility siting with historical patterns of spatial segregation in the southern United States. It showed that communities of color were being deliberately targeted for the location of society’s unwanted waste. This may have also been the first study to consider the social and psychological effects of environmental racism on local communities.

Since 1990, scholars have produced an extensive and sophisticated literature on the dimensions of differential environmental risks based on race and socioeconomic class position (17, 79). Bryant & Mohai (18) were the first to perform a systematic meta-analysis of empirical studies shedding light on race and class

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disparities in the distribution of environmental hazards. At the time of their review, they found 16 such studies. All these studies found environmental disparities based on either race or income or both. Where it was possible to weigh the relative importance of race and income, Bryant & Mohai found that, in six out of nine studies, race was a more important predictor than income of where environmental hazards are located, confirming the UCC's 1987 findings. In his summary of the empirical evidence for environmental inequality contained in 54 separate studies, Brown (9) similarly noted that both race and class were significant determinates of proximity to known and prospective environmental hazards and the timing and extent of remediation actions. These conclusions were verified by a further review of the literature conducted by Szasz & Meuser in 1997 (113) and by the Institute of Medicine in 1999 (123, pp. 61–62). In a more recent review of the literature regarding differential exposures to environmental pollution, Evans & Kantrowitz (40) found that significant relationships exist between the ethnic and class characteristics of a community and levels of exposure to environmental risk. Across a wide variety of environmental components, including proximity to hazardous waste sites, exposures to air and water pollution, high levels of ambient noise, residential crowding, quality of housing, quality of local schools, and the work environment, communities composed of people of lower SES and people of color were consistently exposed to higher levels of environmental risk. In summary, the authors concluded that “the poor and especially the nonwhite poor bear a disproportionate burden of exposure to suboptimal, unhealthy environmental conditions in the United States” (40, p. 323). In the most recent systematic meta-analysis of environmental inequality studies conducted to date, Ringquist (97) found that the pattern of evidence continues to corroborate this finding. Recently, research on environmental inequality has moved toward longitudinal analysis of the creation of environmental inequalities. In one important study, Pastor et al. (88) show that, over a 30-year period, the correspondence between polluting facilities and minority communities in the Los Angeles Basin was based primarily on deliberate siting of facilities in existing minority communities rather than on geographic shifts in minority populations. In other words, toxic facilities tend to be located in particularly vulnerable communities rather than the other way around, as the minority move-in hypothesis predicts. These communities were being systematically selected for the location of noxious facilities.

Although the vast majority of studies of environmental inequality conclude that racism is the major driving factor, there has been considerable debate in some corners about the degree to which this phenomenon is a function of racial inequalities or class-based market dynamics (3, 6, 36). This controversy has become known as the race versus class debate. It has helped to sharpen the methodological and conceptual approaches to the problem; however, some have argued that the debate misses the point and that the production of industrial toxins and their generally unequal distribution deserve to be the main focus of research efforts (93).

Although it is clear that there is significant environmental inequality, and that these exposures likely portend adverse health consequences, the research on

community health impacts of differential exposures to environmental risk is much less extensively developed (9, pp. 22–24; 40, pp. 319–25). Existing research on health outcomes for residents of highly segregated, low-SES neighborhoods reveals a higher incidence of cardiovascular disease and asthma and higher adult and infant mortality (33, 34). For African Americans, poor health outcomes due to segregation are not linked exclusively to inner-city, high-poverty neighborhoods. This population tends to live in poorer-quality neighborhoods even in the suburbs; suffer greater stress from coping with racial discrimination; and do not live as long as others of the same race who reside in more integrated neighborhoods, even when they enjoy higher SES and fewer health problems (66, 70). However, a definitive link between environmental inequality and health outcomes has not yet been established.

Some studies have made limited progress in this direction. For example, in one study, researchers found that not only was race a strong predictor of the location of hazardous waste facilities (and areas of high concentrations of air pollution) in Southern California, but also it was a significant factor in explaining cancer-risk distributions, even after controlling for SES and other demographic factors (82). Other studies of toxic exposures on the job (100) and the impact of toxins on child development (54) are equally helpful in suggesting a future research agenda. Finally, Fox et al. (46) use the relatively new method of cumulative risk assessment to suggest that there may be significant differences in the exposures to multiple environmental risks between demographic groups.

In general, however, research on establishing a clear link between environmental inequality and health disparities is hampered by a number of complexities, including the lack of appropriate statistical measures, varying individual exposure levels, lengthy incubation periods, and confounding influences on health, such as access to health care and individual behaviors (87). Thus researchers know very little about the ways in which health risks from environmental hazards may interrelate with and contribute to health disparities between different communities (40).

## THE SOCIAL PRODUCTION OF ENVIRONMENTAL INEQUALITY

The creation and maintenance of environmental inequality are fundamentally outcomes of the social dynamics of society. Although early explanations focused on the perpetrator-victim model, this focus on the individual has been replaced by an analysis of the underlying social structural dynamics that systematically create and maintain environmental inequality and of the connections between social hierarchies and exposure to environmental risk (90, 92). The first step toward understanding the origins of environmental inequality is to situate this phenomenon within a larger social dynamic of the social production of inequality and environmental degradation. We agree with Beck (4), who argued that “[e]nvironmental problems are fundamentally based in how human society is organized” (81). Thus,

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exploitation of the environment and exploitation of human populations are linked (22, 95). To understand and develop meaningful measures to mitigate ecological degradation, this analysis begins with the development of a theoretical perspective on the social processes by which these problems originate. The two key social dynamics that systematically create environmental inequality are (a) the functioning of the market economy and (b) institutionalized racism.

#### The Treadmill of Production

The first and most widely discussed social origin of environmental degradation and inequality is the functioning of capitalism (106, 107). Schnaiberg argues that the capitalist economy forms a “treadmill of production” that continues to create ecological problems through a self-reinforcing mechanism of ever more production and consumption. The treadmill of production identifies an “economic growth coalition” including business, labor, and the government, all of whom benefit from economic expansion. The logic of the treadmill of production is an ever-growing need for capital investment to generate goods for sale in the marketplace. From an ecological perspective this process requires continuous and growing inputs of energy and material. The expansion of the economy drives two fundamental dynamics of a market economy: first, the creation of economic wealth, and second, the creation of the negative byproducts of the production process. Thus the treadmill operates to maintain a positive rate of return on investments and externalizes the environmental costs of its activities. The social and economic benefits of the treadmill are unevenly distributed in favor of business and affluent communities, whereas the environmental risks associated with the treadmill are disproportionately concentrated among specific groups of people with the least ability to resist the location of polluting facilities in their community. Thus polluting facilities are sited among “the most vulnerable groups: the poor, unskilled laborers, and the skilled blue collar” residents (58, p. 13).

Beck (4, 5) further expands this idea with a model of the interaction among technology, social dynamics, and the process of ecological degradation. For Beck, the continued expansion of industrial production is based on the dynamics of modernization and industrialization. These processes are “blind and deaf to consequences and dangers” (4). At the center of the process of modernization is the application of scientific research and knowledge to spur economic growth. The power to determine the course of technological development has become concentrated in private corporations that control and direct much of society’s research and development (5, p. 73). Driven by the need to maximize profits, corporations in turn continue to develop new technologies that produce unforeseen risks for the entire society. This process breaks down the ability of society to ensure the safety of its citizens from the production of industrial hazards (5, pp. 22–23), creating a “risk society” in which the politics of the distribution of the fruits of economic production is overlaid with the politics of the distribution of environmental pollution, producing

environmental injustice (4, p. 53). Beck notes that “[w]hat is denied collects itself into geographical areas, into ‘loser regions’ which have to pay with their economic existence for the damage and its unaccountability” (5, p. 29). This trend creates differential “risk positions” (4, p. 23) corresponding to variation in the levels of exposure to environmental degradation. The resulting stratification follows the social distribution of power in which “like wealth, risks adhere to the class pattern, only inversely; wealth accumulates at the top, risks at the bottom” (p. 35). Thus although the entire society faces increased risks, some segments confront more intense exposure than others do.

### Racial Segregation

This “class pattern” is also complemented by a “race pattern” that influences the unequal distribution of environmental risk. In the United States, the dynamic of racism has created a substantial differentiation in both occupational characteristics and community of residence between white and nonwhite populations. Persistent discrimination in educational opportunities and employment has restricted nonwhites to lower SES (45) and thus limits these populations’ access to residence in more affluent communities. In addition to lower SES, people of color—especially African Americans—are restricted in their choice of residence by a series of mechanisms that result in racial segregation (30). As demonstrated in the study *American Apartheid* (74), such mechanisms are numerous and include real estate agents steering people of color into racially segregated neighborhoods, discrimination in lending practices, and the phenomena of “white flight” to the suburbs. As a result, many people of color are concentrated in highly segregated communities that are significantly more disadvantaged than those of the white population. Racial segregation is a major contributor to the creation and maintenance of environmental inequality because governments and corporations often seek out the path of least resistance when locating polluting facilities in urban and rural settings. Thus polluters can site locally unwanted land uses in such neighborhoods because they are more isolated socially and relatively powerless politically (23, 74).

## THE POLITICS OF ENVIRONMENTAL JUSTICE

Concern over the inequitable health impacts of environmental problems has a long history within the field of public health. Concern over the health of the urban poor led to the Sanitary Movement and the origins of public hygiene in the middle of the nineteenth century (101). Urban environmental conditions confronting the poor were also a major concern of the Progressive Movement (115), the City Beautiful Movement, the Urban Housekeeping Movement (77, pp. 121–32), and the Smoke Prevention Movement (111). In addition, in a history that is only recently being written, there have been several significant efforts to achieve environmental justice

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throughout the first half of the twentieth century by people of color in urban centers across the United States (125).

Beginning in the late 1970s and early 1980s, a national movement for environmental justice took shape (39). A number of groups organized around environmental justice concerns emerged from within communities of color and poor and working-class white communities throughout the United States (14, 19, 56). The neighborhoods where these populations live, work, and play had been disproportionately burdened with a range of toxic and hazardous pollution and other environmental harms (49). Responding to these local health hazards, community-based organizations emerged to build a potent force for grassroots organizing (27, 32, 41, 49). As Bullard notes, "In many instances, grassroots leaders emerged from groups of concerned citizens (many of them women) who see their families, homes, and communities threatened by some type of polluting industry or government policy" (20, p. 8).

Thus the Environmental Justice Movement was born and articulated a framework for social change that included the following terms:

1. incorporates the principle of the right of all individuals to be protected from environmental degradation,
2. adopts a public health model of prevention (elimination of the threat before harm occurs) as the preferred strategy,
3. shifts the burden of proof to polluters and dischargers who do harm or discriminate or who do not give equal protection to racial and ethnic minorities and other "protected" classes,
4. allows disparate impact and statistical weight, as opposed to "intent" to infer discrimination, and
5. redresses disproportionate risk burdens through targeted action and resources (19, pp. 10–11).

The movements that arose to fight environmental inequality took different forms depending on the community in which they developed. In the white working-class community, the movement took the form of the Anti-Toxics or Citizen-Worker Movements (26, 58, 72). In communities of color, it took the form of the Environmental Justice Movement or The People of Color Environmental Movement. In general, groups pursuing environmental justice take the form of a decentralized movement based in multiple local community groups (20, 108). In addition, these local groups have formed into networks, such as the Citizen's Clearinghouse for Hazardous Waste or the Southwest Network for Environmental and Economic Justice, which enable them to engage in coordinated joint actions at the state, regional, and national scales (105, pp. 107–44). These movements grew throughout the 1980s as new struggles were built on lessons learned from previous conflicts (99) and as activists convened at regional and national gatherings to exchange ideas, tactics, and strategies.



## Anti-Toxics Movement

The Anti-Toxics Movement is based primarily in white working-class and middle-class communities (58, 112). A key example of this type of organizing activity involved the community that lived on the abandoned toxic-waste dumpsite in Love Canal, New York (26, 52, pp. 75–84). This community struggle, led by homemaker Lois Gibbs, was emblematic of the development of a number of similar groups. That movement quickly expanded beyond its original focus on toxic wastes to include a concern with a broad agenda centered around social justice. One of the first national organizations rooted in this perspective was the Citizen's Clearinghouse for Hazardous Waste, now called the Center for Health, Environment, and Justice. Building on the Love Canal Homeowners Association, Gibbs founded the Citizens Clearinghouse for Hazardous Waste in 1981 (109, pp. 231–50). Following the organizational strategies of the Association of Community Organizations for Reform Now (ACORN) and Fair Share, this group serves as a center for a variety of local organizations seeking to confront threats to public health and environmental quality nationwide. The Anti-Toxics Movement has now grown to encompass several thousand local and regional environmental groups. Beginning in the 1990s, this component of the environmental justice movement expanded its focus from local issues to encompass a national concern with toxic exposures and environmental health. This expansion has resulted in new relationships between community groups and traditional public health advocacy organizations (10, 11, 53, 75).

## The People of Color Environmental Movement

At around the same time, within communities of color, a similar movement focused on environmental inequality arose, the People of Color Environmental Movement (20). This movement encompasses a number of communities, including African Americans, Native Americans (65), Latinos, Asian Pacific Americans, and a range of immigrant groups. Although the movement shares a great deal of commonality with the Anti-Toxics Movement, it has developed its own unique identity and organizations (117). The People of Color Environmental Movement has not only expanded in size but also placed a strong emphasis on reformulating the goals of existing civil rights and community organizations to include environmental concerns (24, 116, p. 47).

Thus, communities across the ethnic spectrum are battling a host of environmental threats, from toxic contamination and locally unwanted land uses (LULUs) to unsafe and substandard housing and natural-resource extraction. Activists from these diverse ethnic and racial communities have challenged the sources of pollution and public health threats separately and often in collaboration.

Although the precise extent to which exposure to industrial pollutants contributes to health problems is unclear, it is well known that African Americans suffer higher-than-average rates of asthma and related respiratory ailments, cancer, lead poisoning, infant mortality, and death and have a lower life expectancy

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(24, 126). Latino children are much more likely to suffer from asthma, lead poisoning, and exposure to contaminated water, pesticides, and mercury than are their white counterparts (85). Higher levels of stomach, cervical, and uterine cancer as well as some forms of leukemia have also been documented among Latinos. According to data from the U.S. Centers for Disease Control and Prevention, African Americans suffer from greater exposure to dioxins and polychlorinated biphenyls (PCBs), whereas Latinos face greater exposure to herbicides and pesticides (Environ. Justice Health Union 2003). Native Americans are exposed to a greater number of psychological and physical stressors associated with military weapons testing, as well as to threats to the safety of fish and other food sources, than is any other group (65). Native Hawaiians have the highest cancer rates of any Asian American/Pacific Islander population in the United States (126). The mainly female and disproportionately immigrant workforce in the electronics industry's production sector faces an occupational illness rate nearly three times that of any other basic manufacturing workforce (94). It may be that, because many environmental illnesses lay dormant and take years to incubate, we have yet to observe the full effect of the massive increases in chemical production and use that has only recently emerged in the post-World War II period. This is particularly likely because the intense colocation of toxic facilities near communities of color in the United States is believed to have begun only in the past 30 years or so (103, 114).

#### Environmental Justice and the Government

The actions of movements seeking to remedy environmental inequality have resulted in some legal gains and the institutionalization of these concerns in the federal government. With the passage of the 1980 Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA, also known as Superfund) and the 1986 Emergency Planning and Community Right-to-Know Act (EPCRA), the Anti-Toxics movement created a great deal of momentum for providing public funds to clean up hazardous waste and giving citizens greater legal authority to monitor polluting facilities. Building on this success, environmental justice activists continued to raise concerns over the links between pollution and disproportionate burdens in communities of color. In 1990, U.S. EPA administrator William Reilly created an internal agency workgroup to review the evidence pertaining to disproportionate environmental burdens and to draft policy proposals intended to deal with this issue. As a result of its work, the Agency published its 1992 report, *Environmental Equity: Reducing Risk for All Communities* (120). This report was significant because it was the first official acknowledgment of the problem by a federal agency in a position to do something about it. The EPA's report lent considerable legitimacy to environmental justice activists' claims. The report also contained the first set of policy proposals to address these issues by any branch of the federal government. It led to the creation of an Office of Environmental Justice in the EPA in 1992, as well as the National Environmental Justice Advisory Council

(NEJAC) to the EPA. This was followed, in 1994, by President Clinton's signing of Executive Order 12,898, titled "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations." The Order required all federal agencies to take environmental justice consequences into account in their decision making and to identify and address "disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low income populations." At the same time, a number of states have pursued their own efforts to articulate policies addressing environmental injustices (96). Thus the Environmental Justice Movement has succeeded at getting the issue of environmental justice into the discourse of environmental protection and embedding it in some significant policies as well.

### The Realization of Environmental Justice

The rise of movements seeking environmental justice has had significant impacts in three areas: local politics, litigation, and state/national politics. Without a doubt, it is at the level of local community struggles that the Environmental Justice Movement has had its clearest victories. Although there may be questions about the indirect effects of a particular victory (i.e., displacing a locally unwanted land use onto another community), the movement has had significant influence at the local scale. Some examples include shutting down major incinerators and landfills in Los Angeles and Chicago; preventing polluting operations (such as the chemical plant proposed by Shintech Corporation in Louisiana) from being built or expanded; making improvements and abatements at existing sites (such as the North River Sewage Treatment plant in Harlem, or as a result of good neighbor agreements between community members and polluting facilities, such as that between residents of Crockett, California, and Unocal); and securing relocations and/or buyouts for residents in polluted areas (which occurred at Love Canal, New York; Times Beach, Missouri; and Norco, Louisiana). If all politics is local, then the Environmental Justice Movement has certainly been successful at engaging environmental justice politics where it matters most. People in the communities mentioned above and across the United States have directly benefited from the power of the movement to focus its strength and energy in a local context, a definable space. These social movements have made it extremely difficult for firms to locate incinerators, landfills, and related LULUs anywhere in the nation without a political struggle. Efforts to expand existing polluting facilities now face considerable controversy (93).

The litigated cases emerging from environmental injustice conflicts in communities have produced a much-less-promising record than activists had hoped for (55, 73). As early as 1979, lawyers began pursuing cases based on claims of racial discrimination in environmental decision making. Beginning in 1994, lawyers representing environmental justice advocates attempted to prevent the siting of polluting facilities, or to close existing polluting facilities, in minority communities based on an application of Title VI of the Civil Rights Act [which makes it

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illegal for institutions receiving federal funds to discriminate on the basis of race (among other factors) and allows plaintiffs to bring discrimination claims based on statistical weight and trends, rather than on the basis of intent or animus]. However, the courts have systematically refused to prohibit government actions based on Title VI without direct evidence of a discriminatory intent. Administrative relief via the EPA has also been limited (119). Since 1994, when the EPA began accepting Title VI complaints, more than 110 have been filed and none has been resolved. Only one federal agency has thus far invoked environmental justice to protect a community in a major decision. In May 2001, the Nuclear Regulatory Commission denied a permit for a uranium enrichment plant in Louisiana (Louisiana Energy Services case), citing its findings that environmental justice issues had been ignored.

At the national level, the environmental justice movements have succeeded in capturing the attention of high-level elected officials. Most prominent among these successes was President Clinton's signing of Executive Order 12,898, which, as noted earlier, mandated all federal agencies to ensure environmental justice in their operations. Less visible are more modest and perhaps more meaningful victories. These include the support of the Congressional Black Caucus, which has one of the strongest environmental voting records of all groups in the U.S. congress (81), and the passage (or expected passage) of environmental justice laws and rules in states including Massachusetts (29), Florida (86), and California (63). More problematic are the participatory schemes that the EPA hatched during the 1990s to address environmental justice demands. The EPA chartered the National Environmental Justice Advisory Council (NEJAC) to provide advice and oversight of its environmental justice activities. As much as activists and scholars would like to celebrate the development of the council and other high-level advisory committees and task forces as an acknowledgment of the issue by decision makers, these entities are so rife with problems (lack of political power, inequalities among participants, a drain of energy away from grassroots issues) that they have born little fruit. Even the much-celebrated Executive Order on environmental justice has had a very limited impact (71). As noted in March 2004 by the Inspector General of the EPA (121), the agency is not doing an effective job enforcing environmental justice. Among other problems, the Inspector General noted that the EPA has no strategic plans, goals, or performance measurements designed to advance the intent of this Executive Order.

## ADDRESSING ENVIRONMENTAL INEQUALITY

As discussed earlier, environmental inequality is an outcome of social processes. It then follows that social change is required to realize environmental justice. Specifically, to deal effectively with health disparities it will be necessary to address the underlying social determinants of environmental inequality (48). Thus, to realize an ecologically just and sustainable society, the environmental justice movement has focused on three distinct social innovations.

## Implementation of Democratic Science

Through numerous participatory research ventures and the emergence of lay experts on a host of environmental issues, environmental justice groups, in cooperation with a number of scholars, have adopted a community-based research strategy known as popular epidemiology (8, 12, 31). Popular epidemiology is a way of democratizing scientific practices associated with documentation, analysis, and reporting of public health outcomes. That is, activists work with scientific professionals to coproduce new knowledge and therefore challenge the institutional barriers to their cooperation and to the idea of broadening the definition of the term expert. Many environmental justice activists view traditional “objective” science as a systematically disempowering discipline and practice rooted in Western Enlightenment concepts that tend to separate human beings and cultures from nature in a way that ignores the importance of non-European peoples’ contributions to knowledge and environmental sustainability. By creating a technocratic value-neutral discourse, Western science removes moral considerations from public policy formulations and serves to silence the community. This “scientization of politics” (59, p. 68) serves to delegitimize the voices of those who do not speak the specialized languages of science. Citizens are reduced to the status of a population to be managed. Rather than accepting scientific research as an independent and objective activity, the environmental justice movement has adopted a model of science as embedded in particular social structures, and thus reflective of existing power structures and interests (8). Therefore, members of the community are recognized as possessing expert knowledge about local conditions and as being capable of performing scientific research. In addition, in this type of scientific practice, the local community in the form of citizens’ groups provides the civil will and intelligence that animates scientific inquiry. The individual expert’s role as omnipotent seer is replaced by that of many contributors to a larger body of community-based knowledge used for self-determination. Thus popular epidemiology can be seen as the development of a form of “democratic science,” i.e., a science “that is cognitively accessible and politically accountable to nonprofessional publics” (13, p. ix).

## Precautionary Principle

The environmental justice movement has been at the forefront of advocacy for the adoption of the Precautionary Principle as the governing framework for how society addresses environmental risks. Communities living in areas that are inundated with toxic pollution are often unwilling to wait years until all of the scientific studies are completed for proof that their health has been adversely impacted. Rather than presuming that specific chemicals or production processes are safe until data and research prove they are hazardous to human health (a public health version of “innocent until proven guilty”), and thus allowing scientific uncertainty to delay action, the Precautionary Principle shifts the burden of proof to the producers to show an absence of harm (83). Under this paradigm, there is no requirement for

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absolute proof that one or more chemicals cause certain diseases. If there is reason to believe that harm is associated with a particular substance or group of substances, communities can argue for its temporary elimination from production and use. Increasingly, this approach is being advocated by scientists and has resulted in some recent legislation, such as the Massachusetts Toxic Use Reduction Act, and the adoption of the Precautionary Principle by the San Francisco Board of Supervisors, the European Commission, and institutions in Germany, Sweden, Australia, Scotland, and Norway.

#### National and International Policy Changes

The environmental justice movement seeks to create a number of governmental policy changes to address a broad range of practices, such as housing segregation, transportation policies, and energy policy, that systematically create and maintain environmental inequality. Environmental justice movement leaders consider these policy changes critical to reducing environmental inequality and health disparities. As noted by House & Williams (62) “the reduction of socioeconomic and racial/ethnic disparities in health depends most on social changes and public policies that reduce disparities in socioeconomic and racial/ethnic status or, more exactly, ensure that all citizens live under conditions that protect against disease and promote health” (p. 117). To realize this social arrangement, the environmental movement has created a number of innovative practices in the areas of food supply, local environmental restoration activities, public health programs, and pollution reduction. These efforts converge in urban areas where activists have made significant gains at achieving local control over community resources and instituting innovative governance practices that allow for greater community autonomy and meaningful political participation (56, 57, 76, 110).

#### RESEARCH IS NEEDED TO DEVELOP A FURTHER UNDERSTANDING OF HEALTH AND ENVIRONMENTAL INEQUALITY

As this review has shown, scholars have amassed a considerable volume of studies regarding (a) the nature of health disparities in the United States and (b) the nature of environmental inequality and the movements that seek environmental justice. However, these literatures are limited in their scope for a number of reasons. First, the literature on the role of SES, race, and health has identified community characteristics as a significant factor in the creation and maintenance of health disparities. However, the role of exposures to toxic pollution on community health is nearly absent from this literature, except for an occasional acknowledgment that research on the topic is sorely lacking (126). This lack is significant because it is well established that residential segregation is a major mechanism contributing to environmental inequality (19, 21), poverty (74), and health disparities (127)

in the United States. Thus it is highly likely that the stark spatial distribution of environmental disamenities in society would also produce health disparities. We therefore maintain that to prevent environmentally related health problems and to address environmental inequality, an understanding of how both social and environmental factors influence health is necessary. Thus there is a critical need to integrate research on the impacts of environmental inequality and exposure to environmental pollution into existing studies of community health and health disparities (87). This next stage of research on health disparities must address the fragmented nature of existing knowledge by testing a conceptual-empirical model that includes social and environmental factors and investigates their effects, individual and joint, on general and specific health outcomes. This oversight is compounded by the general lack of research on the environmental health gap, the impact of environmental pollution and related factors on public health (37, 38, 64, 126). Given the rising concerns that exposure to industrial pollutants is correlated with increasing cancer and asthma rates and myriad neurological and developmental disorders (including mental retardation and autism), this should be a major focus in the public health research agenda.

Second, regarding the literature on environmental inequality, although the race versus class debate has produced exceptional methodological advances in the study of environmental racism/inequality (1, 2, 6, 8, 36, 80), it has missed the larger picture. The distribution of environmental harm does involve, and has always involved, both race and class (42). The social production of environmental inequality cannot be understood through a singularly focused framework that emphasizes one form of inequality to the exclusion of others. Environmental injustices impact human beings unequally along lines of race, gender, class, and nation, so an overemphasis on any one of these factors will dilute the explanatory power of any analytical approach and weaken any effort at serious theory building.

Third, much of the environmental inequality literature fails to employ the theoretical perspectives and research methods developed in the literatures of sociology, history, and ethnic studies. Recently, critical and scholarly analyses of environmental justice have been undertaken in a number of areas, including the impacts of various strategies employed by environmental justice organizations (89, 99); the nature of this social movement's discourse and its impacts on the efficacy of the environmental movement (7, 43, 51, 84); the governance structure of the environmental justice movement (15); the role of globalization and the distribution of environmental inequality on a global scale (44, 50, 91); and the relationship and impact of foundation funding on the environmental justice movements (16, 43). It is important to build more significant links between research on environmental justice and the theoretical and empirical sociological literatures on social movements and environmental sociology to advance our understanding of the origins of and responses to environmental inequality.

Fourth and finally, although the literature on environmental inequality recognizes that health and environmental protection will be improved through a combination of better science and politics (64), unfortunately much of the analysis of

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environmental justice tends to lack a critical component. For the most part, the literature is not only uncritical of the environmental justice movement, but often quite celebratory. As a result, only a few scholars have asked how effective the movement has been at achieving its basic goals. Although further documentation of environmental injustices continues to teach us a great deal about how environmental inequalities develop and what impact they exert on communities, the literature suffers from a lack of attention to the larger question of whether this movement has the efficacy or capacity to achieve its stated goals. Fortunately, this trend is beginning to change. Whether as researchers or as advocates, ultimately we all hope for the reduction of environmental inequality and the improvement of public and environmental health for the general population.

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