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Environmental Equity: Statistical Issues - Report of a Forum

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Technical Report Number 11
April, 1994

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ENVIRONMENTAL EQUITY: STATISTICAL ISSUES

REPORT OF A FORUM

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March, 1994

1 Preface

On December 6, 1993, the National Institute of Statistical Sciences held a forum on “Environmental Equity: Statistical Issues” at Duke University in Durham, North Carolina. Environmental equity, or environmental justice, is concerned with questions raised by evidence that environmental hazards are faced disproportionately by low-income and racial minority communities. The Forum featured presentations by four prominent participants in the current national discourse on environmental justice. The talks covered the background and evidence for the concerns, the scientific issues involved, the legal questions posed and the role of statistical reasoning and information.

The program:

“Statistics and Community Participation in Environmental Decision Making,” by Charles Lee, Director of Research, United Church of Christ Commission for Racial Justice;

“Research to Better Define and Understand Environmental Equity,” by Ken Sexton, Director, Office of Health Research, US Environmental Protection Agency;

“Health Effects and Environmental Inequities,” by Dan VanderMeer, Director, Office of Program Planning and Evaluation, National Institute of Environmental Health Sciences;

“Environmental Justice: The Need for Statistical Information,” by Catherine Sheafor, Trial Attorney, Environment Division, US Department of Justice.

This report is an edited synthesis and interpretation of the the four speakers’ presentations at the Forum. The first section covers the background of the issues; the second is devoted to

the scientific issues raised by efforts to explain the background evidence, the third section discusses the legal implications and the last section treats the statistical issues that are centrally involved.

2 Background

In 1982, angry demonstrators from civil rights organizations converged on a poor, rural county of North Carolina not to protest a directly political, social or economic issue but, rather, an environmental one - the placing of a PCB (polychlorinated biphenyl) landfill in a predominantly black community. Over 500 people were arrested including Walter Fauntroy, the District of Columbia delegate to Congress, and Benjamin Chavis, now the director of the National Association for the Advancement of Colored People (NAACP). Though the demonstrations failed to stop the landfill, a series of events was sparked that has led to a new movement, environmental justice (or equity), addressing civil rights concerns over environmental policies and conditions.

After release from jail, Fauntroy asked the General Accounting Office for a report on the socio-demographic characteristics of the communities where hazardous waste sites are located. The 1983 GAO report and other evidence gathered over the last decade suggest that minority groups may be disproportionately exposed to environmental hazards:

- Of the four largest active (1983) hazardous waste sites in the Southeast, three were located in predominantly black populated areas.
- One of the largest concentration of hazardous waste sites in the nation is located in a heavily Black and Hispanic area on the south side of Chicago.
- Farm workers and their families, over 80% of whom are Hispanic, are commonly exposed to a wide variety of pesticides.
- During the 1940's and 50's uranium miners came mostly from Navajo Indian communities.
- High blood lead levels are far greater for black than for white children (Table 1) - this is one of the more startling items.
- Native Americans living near the Columbia River in the Pacific Northwest consume about 20 times more fish than do whites, and are thereby more heavily exposed to chemicals discharged into the river by paper mills.

Much of this information was assembled and appeared in 1987 in the report, "Toxic Wastes and Race in the United States: A National Report on the Racial and Socio-Economic

RACE	< \$6000	\$6000-\$15000	> \$15000
Black	68%	54%	38%
White	36%	23%	12%

Table 1: Estimated Percentage of Children (Living in Cities with Population over Million) 0.5–5 Years Old with Blood Levels Greater Than 15 $\mu\text{g}/\text{ld}$ by Race and Income (from Table 6 of EPA report 230-R-92-008A, *Environmental Equity, Reducing the Risk for All Communities*, Volume 2, June 1992).

Characteristics of Communities with Hazardous Waste Sites” by the United Church of Christ Commission for Racial Justice (UCC). During the press conference at the National Press Club where the report was released, Benjamin Chavis raised the issue of “environmental racism”, and was met with a skeptical response.

Since then perceptions have changed. The accumulation of further evidence, the assemblage of health and mortality data showing wide differences between majority and minority health status, the growing attention to environmental issues and calls for action from the minority communities have led Federal agencies to attend to the question of equity. In his October 1993 Earth Day message, President Clinton stated the current administration’s concerns about the impact of regulations and administrative decisions on environmental equity:

...[I have] asked the Environmental Protection Agency and the Department of Justice to begin an inter-agency review of federal, state and local regulations and enforcement that affect communities of color and low income communities with the goal of formulating an aggressive investigation of the inequalities in exposure to environmental hazards. ¹

3 Scientific Issues

Of clear concern is the link between exposure to environmental pollution and health especially in poor, minority communities. At a conference in 1991, two law professors from the University of Pennsylvania stated:

Poor black and brown people throughout this nation are bearing more than their fair share of the poisonous fruits of industrial pollution. They live cheek to jowl with waste dumps, landfills, incinerators, smelters, factories, and oil refineries,

¹On February 11, 1994 President Clinton issued an executive order giving federal agencies a year to develop a plan “that identifies and addresses disproportionately high and adverse human health or environmental effects of its programs, policies and activities.”

whose operations make them sick. They are poisoned by the air they breathe, the water they drink, the fish they catch, the vegetables they eat and, in the case of children, the ground they play on.

Are the lawyers correct? Do the environmental conditions cause health and mortality problems for the minority communities?

There is, indeed, substantial evidence that minority communities have worse mortality and health profiles. For example,

- Life expectancy data recently released by the Centers for Disease Control and Prevention (CDC), show that whites on the whole live 10 years longer than blacks. Moreover, the trend for blacks, over the past few years, is getting worse compared to that for whites.
- Black children are more likely than white children to have asthma and seven times more likely to die from it.
- Diseases, mortality, low birth weight, and various cancers are typically found to be in higher proportion among blacks and Hispanics than among the white majority.²

But these facts do not by themselves establish that the reason for the differences lies in the environment. What are the explanations for the differences? Are the causes of the differences environmental? Is race implicated?

These questions are difficult to answer. Economic status, life-style issues, health-care access and genetics may all be involved and are intertwined with race and environment, making it difficult to separate causes and effects. Poverty and race are connected, impeding assignment of effect to one in place of the other factor. It is rare to find data on environmental exposure and risk that sorts out distinctions between race and income. A notable exception is shown in Table 1 where poor, black children are twice as likely as poor, white children to have high blood lead levels. In this instance it is likely that poverty, race and “where you live” are what counts.

The questions posed above could be answered if the EPA paradigm of exposure assessment, effects assessment and combining these into a risk characterization could be done within population subgroups. Defining groups at highest risk, those who are more susceptible or more exposed and how to compare them are problems that need to be addressed in order to separate and evaluate effects due to life-style factors, genetics or environmental conditions.

²For example, the cancer mortality rate for black males is 1/3 higher than for white males and 1/6 higher for black females than white females (Tables 1 and 2 of EPA report 230-R-92-008A, *Environmental Equity, Reducing the Risk for All Communities*, Volume 2, June 1992).

There is added complexity if a small, hard-to-detect risk of an environmental condition may be involved. If a large population is exposed to the condition, even a small risk can affect a substantial number of people (thus, the continuing concern over potential effects of electromagnetic radiation (EMR) even though no study has revealed substantial individual risk).

The deeper the pursuit of a risk characterization the more varied and complex are the issues. It is unclear how to extract health effects of environmental factors; it is difficult to measure exposure; it is unclear which environmental factors and which exposures may be involved. Is "outdoors" benzene, a carcinogen, a good surrogate for benzene exposure? Is residential proximity to a hazardous waste site a good indicator of exposure? Is the exposure in the workplace, at home or outdoors? Is it acute or chronic exposure that counts? What is the risk from exposure to multiple hazards; is it "additive"?

Stating these issues generates many hypotheses. Unfortunately, few of them have been tested to date. Whereas the scientific issues can often be stated clearly, even while evading resolution, the policy issues (management decisions) are not easily specified - how should disproportionate effect be measured and utilized in an allocation of clean-up funds? In siting of waste facilities? Political issues arising from the public's perceptions of risk induce still further questions, even less easily formulated.

4 Legal Questions

Issues of environmental equity have emerged in legal challenges to regulatory decisions, for example, claims that standards set by the EPA failed to take into account impact on minority groups (*Dioxin/Organochlorine Center and Columbia Rivers United v. Rasmussen*, where the disproportionate consumption of fish by Native Americans exposes them disproportionately to hazards from pollutants discharged by paper mills into the Columbia River in the Pacific Northwest). The U. S. Department of Justice (DOJ), unlike the EPA and NIEHS, does not have a substantive environmental or health mandate. Nevertheless, DOJ has become involved in environmental justice; the department has been working with the EPA to coordinate environmental equity strategies and also to look at related enforcement issues. This comes, in part, as a response to prior criticism³ of enforcement of laws requiring cleanups by hazardous waste polluters, including allegations that, when minority communities are involved, lower fines are levied and the government is more likely to settle than to push to litigation.

Legislation pending before Congress may introduce environmental equity requirements on departments and agencies. Even without final legislative requirements of environmental equity, regulatory bodies in agencies and departments such as Housing and Urban De-

³For example, the National Law Journal, September 21, 1992.

velopment, Energy, Agriculture, Defense and Interior, will need relevant, equity-related information about pollutants in making decisions affecting health and the environment.

One especially critical need is to have useful characterizations of “high environmentally-impacted areas”. The focus thus far has been on using data from the Toxic Release Inventory (TRI), a list of releases of over 600 toxic chemicals into the air, land, or water which is maintained by the EPA. The locations of these releases have been visually related to demographic characteristics of nearby communities. This approach evokes a number of questions:

- Is this an appropriate base for determining a high impact area?
- Is it enough to rely only on the listed chemicals?
- Does this limit attention to the siting of hazardous waste facilities?
- How should occupational exposures, lead in urban areas, pesticides on farms and exposure to toxics in fish be introduced?
- How should locations with long-term cumulative environmental impacts be identified?
- How should locations where impacts are likely to result from interactions between multiple toxic chemicals be identified?
- Are there more appropriate ways to quantify the relationship between demographic data and the TRI data?

Redress of environmental inequities is also being sought through litigation of environmental justice claims. Suits have been pursued through the use of civil rights statutes as well as through environmental laws. However, suits brought under the equal protection clause of the 14th Amendment require showing of intent, usually a difficult if not impossible task. The barrier may be overcome by use of Title VI of the Civil Rights Act of 1964, which forbids discrimination in the use of federal financial assistance. If an agency distributing Federal funds has regulations that prohibit discriminatory effects, then the statute allows the bringing of a civil rights claim if there are discriminatory effects - establishment of intent is not required. A key matter would then be determining discriminatory effects perhaps by defining impact areas and quantitatively relating them to demography.

Title VI has not been widely used and there is no resulting body of law establishing definitions of discriminatory effect and allowing its general use in environmental justice suits. This stands in contrast to Title VII of the same act, which prohibits discriminatory employment practices and has been used extensively in litigating employment discrimination, leading to a large body of law around questions of intent and measures of disparate impact

(discriminatory effect). Whether similar developments will ensue in connection with Title VI and environmental practices remains to be seen.

Of those cases which *have* been litigated under Title VI, those classifiable as environmental justice cases were brought in the 1970's and challenged disparate municipal services (collection of garbage, maintenance of roads, police protection). In these cases the distribution of benefit was easy to measure and compare. But to generalize to a "distribution of environmental benefit" is difficult. In environmental justice cases, it may be the distribution of burdens (such as created by waste sites), not benefits, that is at issue. Analyses may then require different approaches. Compounding the matter, there may be a whole series of environmental burdens affecting a community, some borne disproportionately by the minority groups, some by the majority, and the other burdens shared. How to define disparate impact in such instances is unclear.

Identifying the problems and determining the causes are primarily scientific and data-driven problems that will necessarily be important in subsequent law-making and drafting of regulations. If the siting of hazardous waste facilities is found to occur disproportionately in minority communities established prior to the siting, then laws concerning the siting process may need change. On the other hand, if minority communities develop after the siting is done, then attention will have to be paid to housing patterns and why minority communities are pushed into more industrialized areas. At the same time economic considerations, changing over time, introduce added dimensions and complications.

Because administrative decisions must be made "now", they have to be based on information that may be seriously incomplete. Temporary, even inadequate, definitions of disparate impact and high impact areas may be necessary to accommodate environmental justice considerations, pending acquisition of better information and outcomes of more intensive research.

5 Statistical Issues

Implicit in the description above of scientific and legal problems of environmental equity is a vast variety of statistical issues. Those that involve the risk characterization at the heart of the scientific issues are well-charted and need no additional comment here; the central roles of statistical method, analysis and interpretation are well-known. Requiring more elucidation, however, is the role of statistical evaluation in linking law and policy to scientific information. Although there is an extensive literature covering many aspects of the connection between law, policy, and statistics, environmental justice brings novel issues to the fore.

Statistical analysis will play an intrinsic role in the definition, evaluation and implications of "disparate impact" in environmental justice settings, just as it has in other situa-

tions such as employment discrimination. Ideally, a definition would connect exposure and health effects of suspect substances on different groups within a community. But there is scant data available about specific exposures and possibly related health effects. Until more such information becomes available, the only quantifiable definitions will rely on proximity measures of a group to environmental hazards.

How to measure proximity in a meaningful way must vary depending on geography and potentially subtle features of meteorology and hydrology: individuals living “downwind” or “downstream” from toxic materials are “closer” to hazards than those living equidistance but “upwind” or “upstream”. The particular mix of toxic substances in a waste dump brings added relevant concerns - a radioactive waste site is likely to be of greater concern than a municipal garbage dump. How to merge such considerations into a workable definition of “disparate impact” is by no means clear.

Some recent approaches have relied on simple, though evocative measures such as numbers of waste sites in geographical units with identified proportions of minority residents. But such data are usually incapable of comparison of exposure to particular hazards of different groups within a community. Reference populations must be defined for making such comparisons - is the relevant geographical unit the city, the county, the state or...?

Experience acquired in the litigation of employment discrimination cases may be instructive and perhaps transferable to environmental justice claims. It took several years before standards were developed for the use and relevance of statistical evidence in employment situations. The issues were recognized as complex and no simple measure was found to be suitable for all situations. The even greater complexity inherent in environmental claims will undoubtedly lead to the need for more demanding statistical insight. One challenge is to develop ways of analyzing and combining information so that localized outbreaks of environmentally-linked disease can be identified.

Complementing these concerns, already vast, are questions about data. Establishing an adequate data base connecting environmental information with socio-demographic information will be necessary, but not easily achieved. One of the most important consequences of the 1987 UCC study was the arousal, in many communities, of concern about issues of environmental justice and the development of local organizations to deal with the questions raised. The feasibility of using computer software to bring environmental and geographical data to the attention of individual communities can lead to a wider public involvement in the issues. This has the potential of stimulating useful dialogue and improved public understanding of environmental risks.⁴

It is important, therefore, that the information provided the public be accurate and relevant. How best to present such information to achieve understanding without sacrificing

⁴There is considerable public suspicion to overcome, as evidenced by a series of comments at the Symposium on Health Research Needs to Ensure Environmental Justice, Arlington VA, February 10-12, 1994.

complexity is an issue that should be addressed along with the more direct emphases on data collection and analysis.

6 Conclusion

When the United Church of Christ Commission for Racial Justice, a civil rights organization, first became involved with environmental problems the question was raised: what does the environment have to do with civil rights? The reply that everything (housing, jobs,...) is connected to civil rights so, therefore, the same must be true of the environment, was, in turn, met with: where's the evidence? Data and studies currently available only partly illuminate the issues. Beyond the need to develop and adapt existing methods, the challenges for statisticians are to quantify key environmental justice concepts and to ensure the accuracy, relevancy, and comprehensiveness of information given to the public.