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Lead: A Case Study in Interagency Policy-Making

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Exposures to low levels of lead in the environment are believed to have potentially significant health effects, especially in children; such exposures to the general population come from many sources. Responsibility for regulating lead exposures has been derived from a multitude of laws passed by the Congress, and thus ultimate protection of people depends on actions taken by several agencies of the federal government. For this reason, the history of efforts to reduce exposures to lead is an excellent case study in the way that federal agencies do or do not work well together. The issue of reduction of lead in gasoline is discussed in relation to the evidence generated by HUD concerning the relationship of blood lead in urban children in New York City to seasonal variations in consumption of leaded gasoline in that area. Some recommendations for developing interagency cooperation in such controversies are presented.

Lead, for the most part, is a low level environmental pollutant, with many possible sources and many pathways for exposure. Part of the problem of controlling lead is the fragmentation of responsibility for regulation, not only at the Federal level, but at the local level as well. The Department of Housing and Urban Development has had both a research and a regulatory responsibility for a part of this complex system since 1971. The major emphasis of this presentation will focus on how the results of our research were used and some of the lessons learned about interagency cooperation and policymaking, rather than the research itself.

After establishing the context in which we operated, I would like to share some observations with you on what I learned about the practical aspects of cooperation and policy making.

One of the standard operating procedures for a paper on lead is to point out the ubiquity of the metal in the environment. Often the SOP is to include a list of the lead uses, or products which contain lead, and the transport media or pathways of human exposure. To drive home the point a diagram of lines, arrows, boxes, circles and numbers is also included. The more complex and unreadable this diagram is, the better. An example of one such diagram is shown in Figure 1 (*1*). It has never been clear to me whether these diagrams are presented to clarify or confuse.

To add to the confusion, I have included my own favorite version (Fig. 2) of such a diagram (*2*), which has been modified by outlining some of the areas of Federal responsibility for the control of lead. This Balkanization of responsibility and concern in both the public and private sector has been discussed elsewhere (*3*, *4*), but dealing with it on an operational level is another matter.

From the regulatory point of view the problem of lead in the environment is one of control of risk. What is the risk to individuals, where does it come from, what is an acceptable risk, how can risk be lowered and at what cost? There are many points in the maze that describes the lead problem where one can enter, develop a strategy or an operational approach. There are, for example, two extreme approaches; either attacking the whole universe at once, on the one extreme, or selecting a single source, pathway, or issue, on the other extreme.

Unfortunately, from a policy point of view there is often little choice on the part of a particular agency where the attack can be made; it is defined by legislative mandate, agency authority or legal action. Usually, the entry point is at the latter

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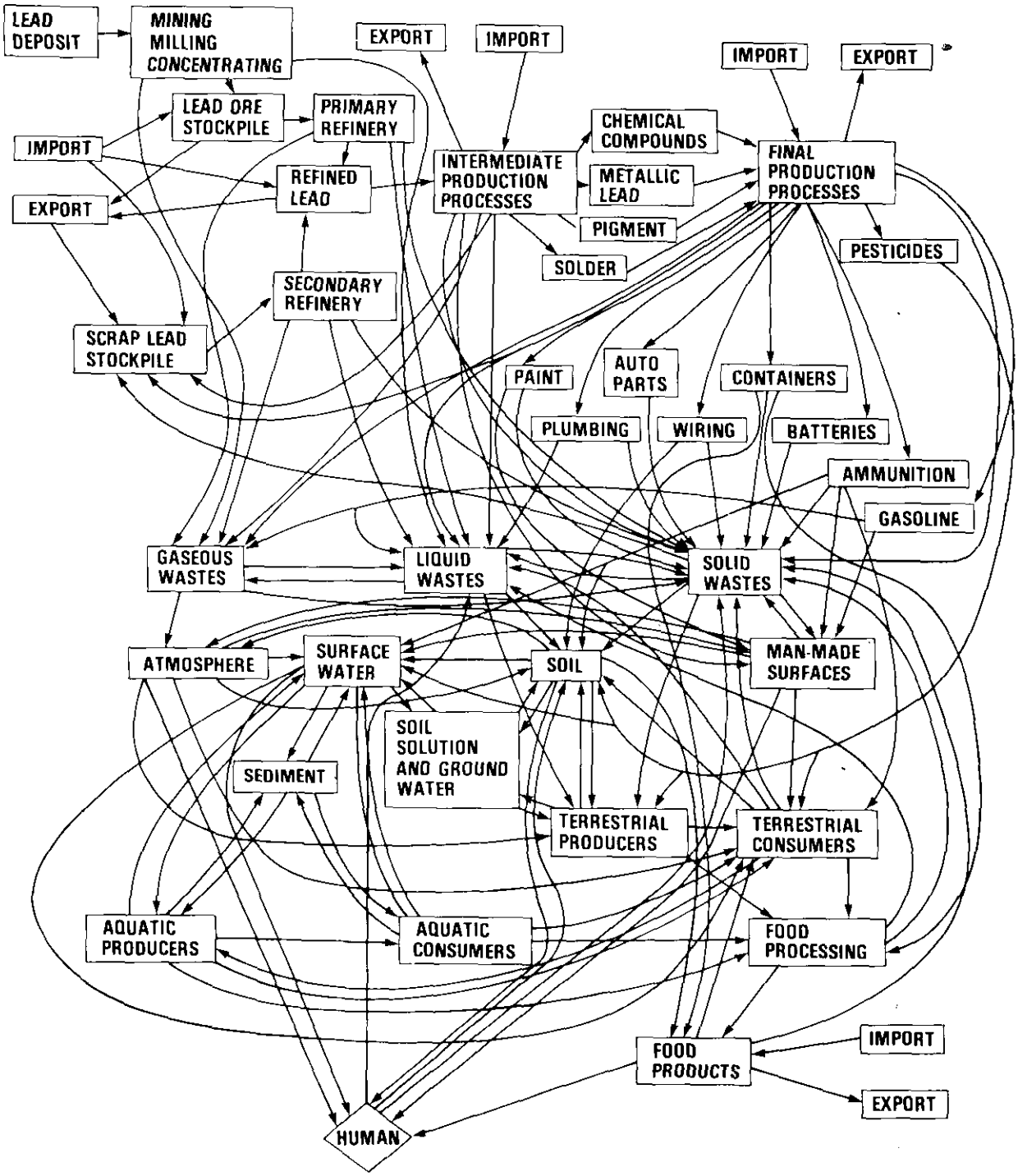

FIGURE 1. Sources and pathways for environmental lead (*1*).

extreme. All one can do is take great pains to point out the complexity of the system, put blinders on and then, like a old race horse pulling a wagon, plod forward on our appointed rounds.

A further complication arises because frequently little is known, either before or after standards are set, as to the relative contribution of each particular source or pathway to the risk or what effect an action has. This lack of knowledge may arise from a lack of measure of risks or the inability to

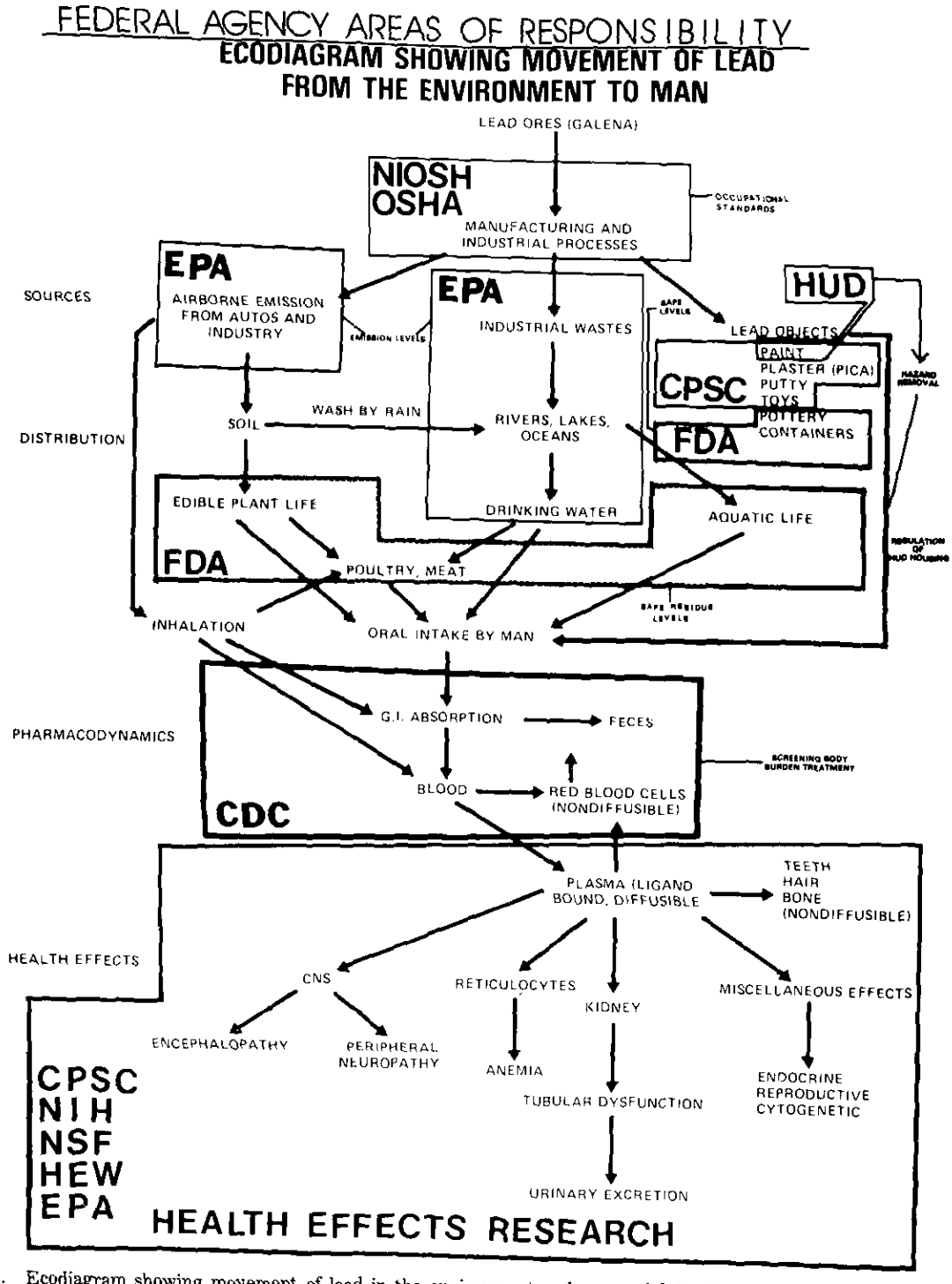

FIGURE 2. Ecodiagram showing movement of lead in the environment and areas of federal agency responsibility for control of exposure. Modification of illustration by Goyer and Rhyne (2).

separate out a specific contribution from a global measurement.

In the case of lead, there is at least a measure of risk, the blood lead level. Arguments can be made about the scientific meaning of this measure, how adequate it is, etc., but, at least it exists. On the other hand, even if we accept that blood lead is a measure of risk, at the present time both the

relative contribution of different lead exposure sources and the pathways to the blood are unknown.

However, all is not lost. If we can associate the results of a specific action, for example a standard leading to a change in lead levels in air, or program action, such as lead paint removal, with a change in overall blood lead, we can begin to have confidence in our actions or possibly develop an overall policy strategy which will be effective.

This can be illustrated by using Figure 3 (*5*). For the case of lead, our measure of risk R is mean blood lead level, and R_i would be the change in mean blood lead level for a specific action S_i, which has a cost C_i associated with it. Some examples of S_i included reduction of lead in gasoline; setting air, water, or food lead standards and removal of lead paint from housing. The overall policy strategy would be one where $\Delta R_i/\Delta C_i$, for one or several different S_i, is maximized and where the selection of a S_i produces a significant $\Delta R_i/\Delta C_i$. An effort should be made to address the problem at its weakest point, or series of weak points, where the greatest benefit will be derived for the least cost, in both the societal or economic sense. Such a policy is needed now more than ever when the demands on available resources are increasing and one detects an increasing antiregulatory climate.

What follows is a brief description on how we at HUD went from an narrowly focused program on lead-based paint poisoning prevention research to the more general program on lead hazards prevention research, what effect our research has had on government-wide action, and finally some observations on what, I feel, are some lessons learned about the policy research process.

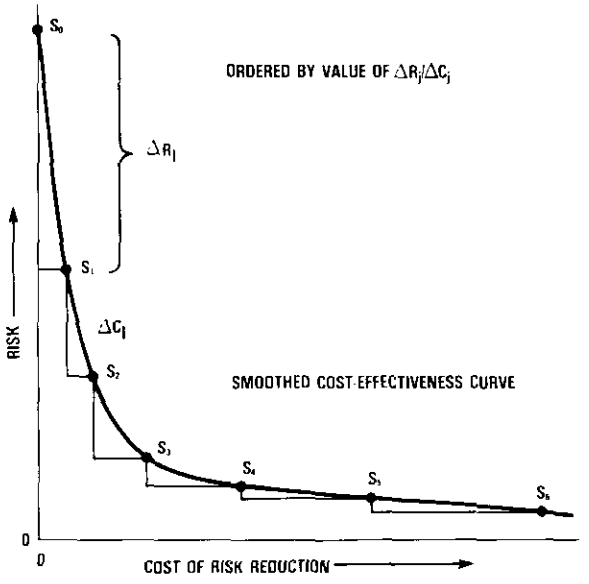

FIGURE 3. Cost effectiveness of risk reduction for action S_i. Risk reduction action ΔR_i = change in risk for S_i; ΔC_i = change in cost for S_i.

The Department of Housing and Urban Development was hitched to its lead-based paint wagon in 1971 with the passage of the Lead-Based Paint Poisoning Prevention Act, which defined HUD's path, by mandating research into the nature and extent of lead based paint poisoning in children. Our research program was never more than a two or three person in-house operation, with most of our work being carried out by grants and contracts and most of our funds spent on the other part of the program, hazard abatement. A review and evaluation of the program and how we spent eight million dollars since 1971 is available (*6*). Other agencies were given, or had due to other legislation, responsibility for control and standard setting. For example, HEW has the responsibility for a screening program to identify and treat children with lead poisoning and the Consumer Protection and Safety Commission was to set a safe level of lead in paint. The Act not only mandated what we were to do, it told us both the problem, lead-based paint, and its solution, remove the lead-based paint hazard.

Because of our limited manpower resources, and what was perceived as a limited turf, we tried to establish formal liaison and joint projects with those other agencies we felt had greater technical expertise. For the most part we met with limited success. Our closest ties were with CDC/HEW which carried out the screening grant program. Their program funded local programs to conduct blood lead level screening programs for children perceived to be at greatest risk.

About 1976, five years after the Act was passed, we began to wonder what progress, if any, had been made in controlling lead burden in children and if so, which programs were the most successful and why. Our initial interest was to determine what impact programs for screening and control for lead-based paint poisoning had on changing the risk as measured by changes in blood lead levels. We began by looking at HEW published data and found they were unsuitable for analysis. The data published in the Morbidity and Mortality Reports were too highly aggregated (e.g., no breakdown by demographic parameters) and only reported case finding, based on the number of children who were lead poisoned, a definition which changed periodically. More specifically, we wished to know how the distribution of blood lead levels varied with various factors such as race, age, sampling data and if there were changes which could be

associated with program actions, environmental parameters or other factors.

Inquiries as to the availability of such data yielded an almost universal response; data were not collected at the Federal level and if such data existed at the local level they were no good. Fortunately, this latter observation proved to be incorrect. Ample data exist at the local level, but the major problem, and one which is soluble, is to obtain the data in an analyzable form. Obtaining such data in a clean, computer-useable format, and with suitable documentation, has become a major portion of our research since 1976.

Our first attempt to get useable data was successful, and we obtained over 400,000 records of individual blood lead records, on computer tape, from New York City covering the period from 1970-76, along with some demographic information. Analysis of this data base yielded results which were both unexpected and inconsistent with our legislative mandate.

Analysis of the geometric mean blood lead disaggregated by ethnic group, age and sampling quarter yielded results typical of that shown in Figure 4 for 25-36 month old black and Hispanic children. The time dependence of all of the age-ethnic subgroups showed qualitatively the same behavior: a long-term downward trend with a distinct cyclical pattern. These observations seem to indicate a more general environmental exposure to lead than one would expect from episodic lead-based paint ingestion or pica behavior.

The next logical step was to compare the observations on blood lead with environmental lead

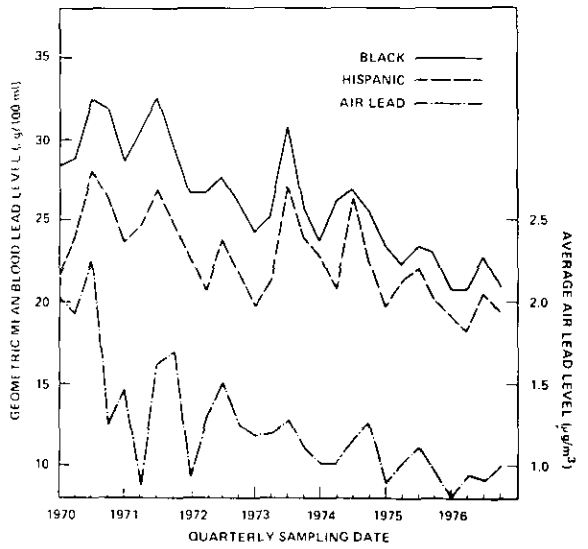

FIGURE 4. Variation of blood lead levels of New York City children aged 25-36 months and air lead levels.

measurements, the most obvious one being air lead levels. Again the problem was to get data. That took about six months of telephoning and then the only air lead observations we could find for New York City, covering the continuous seven-year period, was from a single station 56 m above downtown Manhattan. Preliminary analysis showed a significant correlation between the air and blood lead levels.

About this time, we accidently learned that EPA was in the process of developing a criteria document for air lead and that its Scientific Review Board was meeting to review the first draft. A letter was sent to EPA describing our findings (7), and a presentation was given at the Board meeting. While the technical information itself was considered in the development of the final version of the criteria document, what to us was more important was that it was the start of our subsequent involvement with EPA, and other Agencies, responsible for regulating of lead in the environment.

For our own part, we became aware of the much broader universe in which we were working. We found that others working in lead research were completely unaware of our involvement, of our data base and of our analysis. That formless giant, EPA, began to take on shape, and it soon became apparent that even within a single Agency there was a great deal of fragmentation, and lack of knowledge about who was doing what and why, on what was not perceived by us as a single environmental problem. In order to cope with this fragmentation we made a decision aggressively to coordinate our efforts with these of others having responsibilities for the control of lead.

Aggressive coordination can loosely be defined a making a pest of oneself: find out what are the major issues, what data are available, who is working on what and who needs what. At the same time, you share this information with others and also let them know what you are doing and what relevance it has to their mission. In the long run, it pays off.

Thus, while our immediate contact with EPA concerned lead in air, about a year later we were able to assist EPA on a related problem. Our associates at EPA who had the responsibility for setting regulations for controlling the level of lead in gasoline, were faced with the problem of re-justifying, in a very short time period, their regulation for lead levels in gasoline.

The policy issue at that time (April 1979) was that the President was seeking ways to increase crude oil supplies and one way to do this was to remove constraints on the use of lead in gasoline.

An environmental regulation that was on the books since 1973 required oil refineries to phase down the lead content of gasoline to a pool value of 0.5 g/gal by October 1979 (*8*).

The oil industry was fighting the requirement for phasedown because unleaded gasoline is more expensive to produce. The Energy Department opposed the regulation on energy conservation grounds because a barrel of oil will yield more gallons of leaded gasoline than unleaded. A range of options for relaxing the standard, including total repeal, were proposed and EPA was being requested to justify its regulation.

Those at EPA responsible for a reply were able to make statements that they knew where the data to support their position existed and within a very short time period, we jointly responded with an analysis in a form suitable for policy decision-making. A significant part of EPA's argument to the Domestic Policy Staff, was the results of our analysis: basically the two graphs shown in Figure 5 and 6. EPA, the Energy Department and the White House Domestic Policy Staff were able to work out a compromise to postpone the effective date of the requirement of 0.5 g/gal for one year with an interim level of 0.8 g/gal, on the condition that refineries immediately increase their yield of unleaded gasoline. According to one write-up of this whole process, White House officials were quoted (*8*) as saying "We were able to say to the President that lead has very serious effects on poor kids in the inner cities. Without the analysis the decision would never have been made."

This saga does not imply that the policy issue was decided on the basis of our findings alone, other issues are involved, but it was one of the rare instances where we have documentation of how the process worked from the collection of data through the policy decision. Also it does not mean the decision is final. Since there is still some debate about going from 0.8 g/gal to 0.5 g/gal by fall of 1980, the whole process is starting over again.

For one who has been in and out of the so called science policy game, an ability to follow actual scientific research and see its direct influence on policy is a very heady experience. I feel that a number of lessons were learned that can contribute to the successful practice of policy research and interagency cooperation and coordination. These are summarized as follows.

(1) Understand and appreciate the complexity of the system you are operating in. Then look for places where the most can be accomplished for the least cost.

(2) Be concerned about the problem, not about turf. This is particularly true in a pervasive environmental problem such as lead.

(3) Above all, get the data. The state of the art of determining impact or policy is restrained only by the data. The projections are only as good as the data base (*9*).

(4) More data exist than you think. They are buried, a little difficult to get, but they are there. For the most part people are delighted to share them with you and want their work to be appreciated and used.

(5) Establish informal networks. Find out who is doing what, what their needs are, what the issues are, who's putting on the pressure and offer to

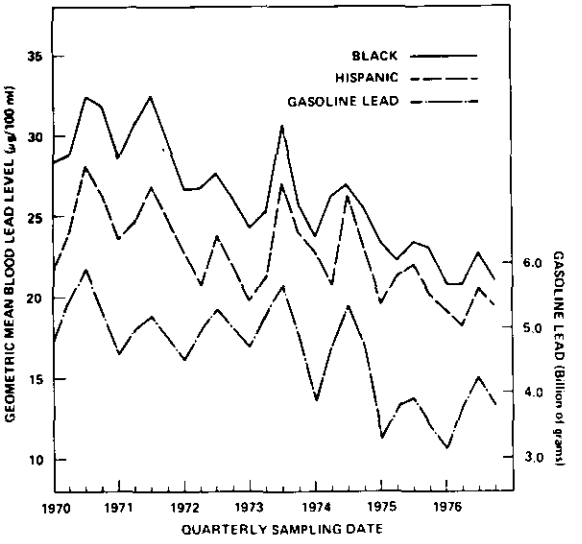

FIGURE 5. Variation of blood lead levels of New York City children aged 25-36 months and gasoline lead consumption.

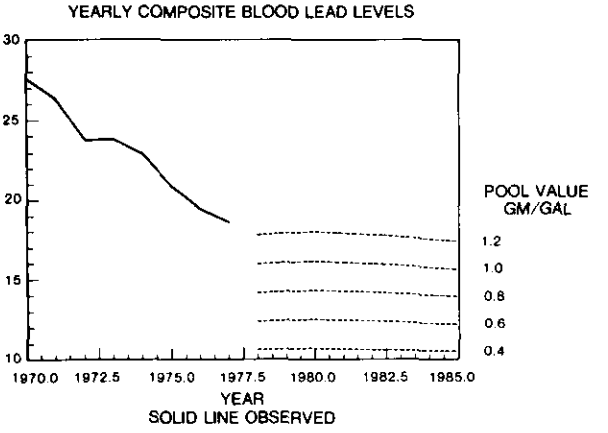

FIGURE 6. Yearly blood lead level variation of New York City children and expected levels for various gasoline lead pool values.

help. Let them know what you have and how it may help them. Formal coordinating groups are fine to find out who's who, but not for doing work.

(6) The higher up the policy ladder you go, the shorter should be your presentation of results. Sophisticated analysis is needed for backup, but a simple graph has more meaning to a policymaker than a regression analysis.

The observations and opinions expressed in this paper are those of the author and in no way reflect the position of the Department of Housing and Urban Development or other Agencies or elements of Federal government.

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