Neighborhood Screening In Communities Throughout the Nation for Children with Elevated Blood Lead Levels

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From the spring of 1971 to September 1973, neighborhood surveys were conducted in 58 communities throughout the nation to determine whether children with confirmed elevated blood lead levels could be identified. Another purpose of these screenings was to assist communities in identifying children with elevated blood lead levels and thereby demonstrate to community officials that such children do exist in communities screened. The children screened were not a random sample.

In those communities where the initial elevated blood levels were confirmed all but seven had one or more children requiring followup and/or treatment. Of those children screened, black children had an elevated rate about three times as great as nonblack children.

With few exceptions, the homes in the neighborhoods had at least one interior surface with sufficient quantities of lead paint to be dangerous if the paint were ingested.

Lead poisoning, while known to man for many centuries, has only recently become a topic of major concern to environmentalists, physicians, and others charged with the health and safety of children. Young children (less than 3 years) are particularly susceptible to adverse effects of increased lead absorption and many may suffer permanent damage. It is estimated that annually 600,000 children in the United States have increased lead absorption, 6000 of whom may suffer permanent neurologic damage. Approximately 200 deaths will result from lead intoxication (*1*).

It has been estimated by King (*2*) that the maximum daily intake of lead without excessive body lead burden in children is 300 μg. Lead, being ubiquitous in our present environment, is accumulated both through ingestion and inhalation. It has also been estimated by King that an urban child's daily intake of lead from food, water, and air ranges between 106 and 146 μg, thus leaving a daily intake of 194–154 μg before accumulation in the body begins.

In addition to the "normal unavoidable" sources of lead intake, there are two potentially hazardous sources of lead in the living environment. These are lead-based paint and lead-contaminated street dust and soils along major urban thoroughfares. Lead-based paint may contain as much as 300,000 μg/g (30% lead paint). Existing evidence indicates that lead concentrations of street dust may be in excess of 2000 μg/g (*3*). The ingestion of lead from either of these sources may cause

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the total intake to exceed the maximum permissible daily intake of 300 μg and result in blood lead elevations, i.e., those children whose blood lead level is greater than or equal to 40 μg/00 ml of whole blood (4). To date, the experience of the national childhood lead poisoning prevention program indicates that virtually all cases of children with evidence of undue lead absorption are found to be associated with hazardous lead-based paint on the surfaces of their dwelling units.

The Bureau of Community Environmental Management (presently the Environmental Health Services Division, Center for Disease Control) has been engaged several years in a national effort to coordinate community childhood lead poisoning control programs. During this period the Bureau was charged with the responsibility of determining the extent of the childhood lead poisoning problem and to determine the most expeditious methods for identifying children at risk.

Since the spring of 1971, the Bureau has been pursuing solutions to the problems of medical screening methodologies. Following a review of all available methods, these efforts have been concentrated on sampling and analyzing techniques for blood specimens that could be used to screen large numbers of children. Funds made available through PL 91-695 (enacted in January 1971) made possible the rapid development of satisfactory analytical methods for determining blood lead levels by using micro samples obtained by fingerstick.

With this development and the availability of funds, 43 communities have established childhood lead poisoning control projects. In addition to these screening programs, the BCEM has been engaged in conducting rapid exploratory screening programs in cooperation with local health departments. These programs screened 50–150 children in each of 58 communities throughout the nation.

The rapid exploratory screening program has been conducted in two phases. The first phase includes the screening of children in 27 of the 58 communities from the spring of 1971 through early 1972. The purpose was to determine the existence of elevated blood lead levels among children aged 1 to 6 living in older housing where it was likely that lead paint was on interior walls. These surveys were reported by Simpson et al. (5).

Of the 27 cities surveyed, children with elevated blood lead levels were found in 25 cities. The children's homes were screened with the use of the portable x-ray fluorescence analyzer. Although this analyzer is effective for rapid screening of painted surfaces, its value is limited by the instrument's sensitivity. The lowest practical quantitative measurement of lead on dwelling surfaces is 2 mg/cm², an amount in excess of that which is considered safe. It was found that hazardous lead paint was accessible to children throughout the neighborhoods from which the children were screened.

The Bureau has continued the neighborhood screening surveys since the publication of the 27-city data.

The purpose of this paper is to report the results of the continuation phase of this survey effort.

Method

Through September 15, 1973, an additional 31 neighborhood surveys have been conducted. These surveys were not a random sample of any population since participation was voluntary. Their purpose was to assist local communities in identifying children with elevated blood lead levels and thereby show that such children do exist in the neighborhoods screened. Guidelines were used as an aid to each community in selecting only those neighborhoods where housing was dilapidated or in a state of progressive deterioration. These guidelines proposed that only children under 6 years were to be screened and that these were to be preferentially black children. While the guidelines were the same for all communities, not all communities followed them. For example, one city conducted a city-wide random sampling of houses which were then tested for leaded paint on four designated surfaces. Children under age 6 were identified and only those living in houses containing

lead paint as detected by an XRF analyzer were screened. In another community, primarily white children living in deteriorated housing were screened, and in several communities children from day care centers and Head Start programs were screened.

Most cities that were requested to participate were selected from standard metropolitan statistical areas on the basis of number of children under age six living in deteriorated housing. In addition, communities in rural areas were selected in an effort to determine whether or not children in these communities were evidencing undue lead exposure. Rural areas such as the Boot Heel section of Missouri, the agricultural community of Vineland, New Jersey, and several small communities in New Mexico were surveyed.

The Bureau of Community Environmental Management trained local health agency personnel in proper sample collection and housing inspection techniques. All blood samples were analyzed by a BCEM contract laboratory by using the anodic stripping voltammetry (ASV) method. Those children found to have elevated blood lead levels on the initial screening were to be retested and a confirmatory blood lead analysis made. Housing inspections by use of x-ray fluorescence analyzer were made in those homes associated with children whose blood lead level was confirmed as greater than or equal to 40 μg/100 ml. It was also suggested to the communities that any child less than three years old whose blood lead level exceeded 35 μg/100 ml on the initial screening should be retested for confirmation.

Each community was responsible to assure medical follow-up and housing corrections for those children whose confirmed blood lead levels indicated such action.

Results

A total of 2580 children have been screened in the 31 communities. However, results from six communities in which 311 children were screened cannot be included in this report, since information on confirmatory blood analysis or demographic data is not available.

In the remaining 25 communities 2269 children were screened. Children with confirmed blood lead elevations were found in 19 of these 25 communities.

Results of the 25 community survey are summarized in Table 1 Since previous screening results indicated a significant difference in the proportion of elevated blood lead among black and nonblack and between children under 3 years of age and those between 3 and 6 years, the data from this survey are presented by age and black–nonblack groupings.

Approximately equal numbers of black and nonblack children were screened, and about 38% of the children screened were under 3 years of age.

The rates for the younger children are somewhat higher in both the black and nonblack groups. The rates for the black children are markedly higher in both age groups, the overall black rate being 2.5 times the nonblack rate.

Housing surveys for leaded paint were conducted in the dwelling of those children whose blood lead levels were elevated. Not all houses were surveyed, since in many cases the family had moved before the inspector arrived. In all houses surveyed, lead paint exceeding 2 mg/cm^2 was found on at least one interior surface accessible to the child.

Table 1. Elevated blood lead rates by age and black and nonblack groupings.

	<3 Yrs. Old		≥3 Yrs. Old		Total	
	No./Total	%	No./Total	%	No./Total	%
Black	34/373	9.1	50/732	6.8	84/1105	7.6
Nonblack	19/508	3.7	16/656	2.4	35/1164	3.0
Total	53/881	6.0	66/1388	4.8	109/2269	4.8

Discussion

In general, the findings for the 25 communities confirm what was found in the first 27 cities surveyed as well as data from previous community control programs. Children with elevated blood lead levels can be identified in many communities throughout the United States. Lead paint on interior surfaces of dwellings and which is accessible to children, can be associated, in virtually all instances, with children who have elevated blood lead levels.

The rate of elevations for black children screened continues to be higher than the rate for nonblack children, 2.5 times as great in the 25 communities, as compared to over 3 times as great in the original 27 cities.

In the 27 cities the rate of elevations was higher for children age three and over while in the 25 communities children under 3 years old exhibited the higher rate. This would suggest that the presence of elevated blood lead levels in children is not a function of age, even though the physiological impact may be more severe among those under 3 years.

REFERENCES

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