Public Health Implications of Adverse Health Effects of Blood Lead Levels <10 µg/dL in Children

A Statement from the Centers for Disease Control and Prevention

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The US Department of Health and Human Services has established an ambitious goal of eliminating elevated blood lead levels in children by the year 2010, a qualitatively different goal from earlier ones focused on reducing blood lead levels by various target amounts[1]. The importance of this public health goal is underscored by recent research on lead's health effects at low blood lead levels, which suggests societal benefits from preventing even low level lead exposure in childhood. This paper describes the public health implications of research findings regarding adverse health effects at low blood lead levels summarized in the accompanying review, with a particular focus on CDC's blood lead "level of concern," and reviews necessary prevention steps to assure progress towards meeting the 2010 goal. A separate paper will offer guidance to health care providers about recommended clinical practices and patient education in response to the new research findings[2].

Comment: If the clinical paper is not in press when this document is ready for printing, we will delete the reference to the clinical paper.

PREVENTION OF CHILDHOOD LEAD POISONING IN THE UNITED STATES

The reduction of blood lead levels in the United States between 1970 and 1999, primarily as a result of federal and state regulations designed to control lead exposure, was one of the most significant public health successes of the last half of the twentieth century[3]. Nonetheless, there continue to be populations and geographic areas where the risk for lead exposure is disproportionately high[4,5,6]. Specific strategies that target screening to high risk children is essential to identify children with blood lead levels $\geq$ 10 µg/dL. Once identified, children with elevated blood lead levels should receive follow-up services as recommended in "Managing Elevated Blood Lead Levels among Young Children"[7].

However, preventing elevated blood lead levels is the preferred course of action. A compelling body of evidence points to the limited effectiveness of waiting until children's blood lead levels are elevated before intervening with available medical treatments, environmental remediation, or parental education[8,9,10,11,12]. In addition, data indicate that in many cases it takes years to reduce children's blood lead levels once they

are elevated, regardless of whether the initial blood lead elevation is very high or more moderate.[13,14,15]. The most common high dose source of lead the nation's children are exposed to is lead based paint and lead contaminated household dust and soil. Recent studies have identified methods to reduce common household lead paint hazards safely[16].(ref HUD demonstration) Thus, a multi-tiered approach that includes secondary prevention through case identification and management of elevated blood lead levels is needed to meet the goal of eliminating childhood lead poisoning. However, because no amount of lead in a child's blood is safe, primary prevention must serve as the foundation of the effort.

CDC'S BLOOD LEAD LEVEL OF CONCERN

The adverse health effects associated with elevated blood lead levels have been widely studied and documented. Previously, the Centers for Disease Control and Prevention (CDC) responded to the accumulated evidence of adverse effects associated with lead exposures by lowering the blood lead level of concern. Between 1960 and 1990 the blood lead level for individual intervention in children was lowered from 60 µg/dL to 25 µg/dL. Since 1991 the CDC has recommended that the level for individual intervention be lowered to 15 µg/dL and that community-wide primary lead poisoning prevention activities be implemented in areas where many children have blood lead levels $\geq$10 µg/dL[17]. However, this community-wide level of concern has been misinterpreted frequently as a definitive toxicological threshold and has inaccurately been used to classify individual children as "lead poisoned".

As the accompanying review of recent studies indicates, there is additional evidence that adverse health effects occur in children at blood lead levels < 10 µg/dL. However, there are valid reasons not to lower the level of concern established in 1991 at this time including:

- No effective clinical or public health interventions have been identified that reliably and consistently lower blood lead levels that are already < 10 µg/dL. Nonetheless, the sources of lead exposure and the population-based

interventions that can be expected to reduce lead exposure are similar in children with blood lead levels above or below 10 µg/dL[18], so preventive lead hazard control measures need not be deferred pending further research findings or consensus.

- No single threshold for adverse effects has been demonstrated through population-based research. Thus the process for establishing a lower level of concern would be somewhat arbitrary, undermining the reality that lead toxicity is cumulative. It may provide a false sense of safety about the well being of children whose blood lead level is below the threshold.

- The adverse health effects caused by elevated blood lead levels are subtle. Individual variation in response to exposure, as well as other influences on developmental status, make it exceedingly difficult to isolate the effect of lead or to predict the overall magnitude of potential adverse health effects associated with a given level.

- Establishing a level of concern substantially < 10 µg/dL would probably be accompanied by a sharp increase in misclassification of children. The uncertainty associated with laboratory testing is too great to ensure that a single blood lead test reliably classifies individual children at levels < 10 µg/dL. Thus this would result in confusing both parents and clinicians.

- Efforts to identify and provide services to children with blood lead levels < 10 µg/dL may deflect needed resources away from those children with higher blood lead levels who are likely to benefit most from individualized interventions.

Efforts to eliminate lead exposures through primary prevention have the greatest potential for success. Reducing exposures will benefit all children regardless of their current blood lead level or the blood lead level at which the level of concern is set.

RESPONDING TO DATA ON ADVERSE HEALTH EFFECTS AT BLOOD LEAD LEVELS BELOW 10 µg/dL FROM A PUBLIC HEALTH PERSPECTIVE

Since 1991, CDC has emphasized the need to make primary prevention of lead poisoning, through interventions that control or eliminate lead hazards before children are exposed**,** a high priority for health, housing and environmental agencies at the state, local and federal levels [19,]. Federal and state policies and programs, largely the result of Title X of the 1992 Housing and Community Development Act (Public Law 102-550), have increasingly focused on primary prevention using strategies known to effectively reduce residential lead paint hazards[20]. Research findings also indicate that primary prevention would be expected to benefit all children at high risk because communities with the largest percentage of children with blood lead levels ≥ 20 µg/dL also have the largest percentage of children with blood lead levels that are lower but still above the national average of approximately 2 µg/dL[17]. These data underscore the importance of targeting efforts to those communities where the risk for exposure is highest and provide a strong rationale for primary prevention efforts. The strategies described below will effectively direct efforts to achieve the *Healthy People 2010* objective to eliminate lead poisoning in young children and can be expected to reduce lead exposure for all children including those with blood lead levels < 10 µg/dL [21].

Primary Prevention

CDC's Advisory Committee on Childhood Lead Poisoning Prevention has recently issued updated recommendations calling for the nation to focus on primary prevention of childhood lead poisoning. Because the nation's 2010 health objective of eliminating childhood lead poisoning can only be achieved through primary prevention[22], this document provides important guidance to state and local agencies regarding the implementation of primary prevention activities. Given that the single most important measure of a successful primary prevention strategy is elimination of lead exposure sources for young children, here we focus on the two main exposure sources for children in the United States.

Lead in Housing-The first essential element of primary prevention is implementation of strategies to control lead paint contaminated house dust and peeling lead paint in housing, the most important source of lead exposure for young children[23, 24 25]. After 10 or more years of widespread blood lead testing and data collection by CDC-supported state and local agencies, the specific addresses of housing units at which children have been repeatedly identified with elevated blood lead levels are known to local officials. Two examples are:

- In Detroit, 657 addresses accounted for nearly 1,500 children with blood lead levels of 20 µg/dL or higher over the last ten years because the sources of lead were never completely controlled when the initial case occurred. It is likely that these housing units also were the source of lead exposure for several thousand Detroit children with levels of 10 µg/dL or higher. (ref.)

- In Louisville, Kentucky, 35% of children identified with elevated blood lead levels during the last 5 years resided in 79 housing units; these units represent <0.3% of all housing units in the community. (ref)

These experiences are repeated in high-risk communities across the country. The infrastructure needed to identify high risk housing and to prevent and control lead hazards in these units is largely in place. Most communities now have in place both established firms that are certified in lead hazard evaluation and control as well as other skilled trades-people trained in lead safe work practices during routine maintenance and painting. Systematic identification and reduction of residential lead sources, particularly in old, poorly maintained housing where children with elevated blood lead levels are known to have lived in the past, combined with periodic monitoring of housing conditions to detect new deterioration and resultant lead hazards will prevent children from being exposed to lead in these units in the future and break the cycle of repeated cases of elevated blood lead levels.

Other steps critical to success in controlling lead hazards in housing and preventing lead exposure in the future are 1) enforcement of lead safety and housing code requirements to ensure good property maintenance;, 2) widespread adoption of lead-safe work practices to control, contain, and clean up lead dust during painting and remodeling projects; and 3) periodic monitoring of housing conditions to detect new deterioration and resultant lead hazard.

Non-essential Uses of Lead-The second crucial element of a primary prevention strategy is to restrict or eliminate non-essential uses of lead, particularly in both imported and domestically-manufactured toys, eating and drinking utensils, cosmetics and traditional medicines. This effort requires identifying communities where cultural practices and traditional medicines may put children at risk, and incorporating lead poisoning prevention activities into health and community services that reach families at high risk for lead exposure from non-paint sources[7]. Some areas of the United States report that as many as 35% of children identified with elevated blood lead levels have been exposed to items decorated or made with lead, in some cases resulting in life-threatening blood lead levels[26]. The 2010 health objective cannot be achieved without a more systematic approach that, at a minimum, allows identification of lead contaminated items and prohibits their sale before children are exposed. Ultimately, all non-essential uses of lead should be eliminated.

CONCLUSIONS AND RECOMMENDATIONS

Changes in the Focus of CDC Funded Programs

To best achieve these goals, CDC is focusing its efforts to eliminate childhood lead poisoning by preferentially funding programs to provide lead-related services for communities and populations with large numbers of children at high risk for lead exposure. The cooperative agreements with 42 state and local health departments funded in 2003 stress the importance of primary prevention and require funded state and local programs to work aggressively to develop and implement the necessary strategic partnerships, programs and activities. CDC has required its state and local

partners to undertake a strategic planning process, which includes gathering input from housing professionals, pediatric health care providers, advocacy groups, parents of children with elevated blood lead levels, and others with an interest in preventing lead poisoning in children. These strategic plans, developed by local partners to respond to local conditions, provide road maps to drive primary prevention activities during the next 3 year grant cycle.

Progress toward the goal of eliminating childhood lead poisoning can only be measured by ongoing surveillance of blood lead levels in childhood populations where the risk for exposure is high, as well as continued monitoring of population-based blood lead levels through the National Health and Nutrition Examination Survey[27] . CDC's role in supporting state and local efforts and providing technical assistance to improve data management and reporting is essential to these activities.

Recommendations to Federal, State and Local Government Agencies

Achieving the *Healthy People 2010* objective to eliminate childhood lead poisoning requires the coordinated efforts of many different federal, state and local agencies. The roles and responsibilities for federal partners in the elimination effort are detailed in the report of the President's Task Force on Environmental Health Risks and Safety Risks in Children.[28] However, all levels of government share responsibility for primary prevention of childhood lead poisoning. Governments should:

1. Articulate public health goals and clear strategic priorities at the federal, state and local government levels.

2. Support and disseminate information about, and adequately fund programs and interventions that will lead to full implementation of primary prevention.

3. Update or establish and enforce regulatory requirements for lead safe housing that link lead safety to the housing and/or sanitary code.

4. Require dust clearance testing prior to re-occupancy in housing that has undergone lead paint abatement or substantial renovation to lead painted surfaces. Dust testing should also be required in all cases where public health agencies have ordered paint repair, particularly in the homes of children already identified with elevated blood lead levels.

5. Expand financial resources for permanent measures to control or eliminate residential lead hazards.

6. Promote broad use of lead-safe work practices (LSWP) for routine painting and maintenance projects in older homes, and make LSWP training widely available at low or no cost to painters, remodelers, landlords, and maintenance workers.

7. Identify populations where the risk of exposure to non-paint sources of lead is high and develop strategies to minimize the risk.

8. Develop and implement regulatory and voluntary strategies to control non-essential uses of lead, particularly in items that are easily accessible to young children such as toys, jewelry, eating and drinking utensils, traditional remedies and cosmetics.

9. Evaluate the effectiveness of primary prevention activities in reducing lead exposure and eliminating childhood lead poisoning particularly in areas where the risk of exposure is disproportionately high.

10. Establish formal agreements among health, social services, housing and legal agencies to increase the sharing of data, educational information, violations and success stories.

11. Monitor and enforce existing regulations controlling the lead content of various environmental media including air, water and soil.

Recommendations to Health Care Providers and Community-based Health and Social Service Agencies

Health care providers are encouraged to continue their traditional role of providing anticipatory guidance as part of routine well child care, assessing risk for exposure to lead, conducting blood lead screening in children and treating children identified with elevated blood lead levels. In addition, health care and social service providers are urged to go beyond their traditional roles. They should keep abreast of research data that clarify the relationship between lead exposure and neurocognitive development in children. They also can function as strong advocates for children and foster lead exposure prevention by helping facilitate implementation of the specific strategic plans to eliminate childhood lead poisoning in their local and state communities. Health care and social service providers are highly effective child advocates and their active participation in the process provides needed expertise and leadership to accomplish this goal. Health care and social service providers should:

1. Provide culturally appropriate education to all pregnant women and families with young children on the principal sources of lead and how to reduce exposure.

2. Target outreach, education, and screening to those populations where the risk of lead exposure is greatest.

3. Become aware of, and actively support, lead poisoning elimination efforts in the community.

4. Express the importance of ensuring that children live in a lead safe environment to federal, state and local policy and decision makers and actively support legislation and regulatory initiatives. Advocate for lead safe, affordable housing by supporting appropriate legislation.

5. Health care providers should become aware of and comply with lead screening policies issued by Medicaid or state and local health departments.

6. Agencies that engage in housing renovation or rehabilitation should ensure that staff members are trained in lead safe work practices.

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