The Need for a National Lead Poisoning Surveillance System and Expansion of Targeted Screening In Children

Health Effects of Lead Poisoning
Recent events in Flint, Michigan underscore a devastating issue affecting children in the United States: lead poisoning. Screening and reporting of lead exposure in children is inadequate and many cases of lead poisoning go unnoticed until it is too late. Lead exposure in children has been repeatedly linked with irreversible behavioral problems and cognitive impairment.1 23This can occur even at levels where other symptoms of lead poisoning, such as headache, abdominal pain and loss of appetite are not present.45 Thus, lead exposure screening and blood testing must be systematic, rather than awaiting clinical symptoms.

How Are Children Exposed?
The home is the most common source of lead exposure, especially houses built before 1950, when lead-based paint was used. Exposure from parental occupation and food and water supply also occur.6 For example, water supply was the cause of the many cases of lead poisoning in Flint. Children are especially vulnerable to the effects of lead exposure because their brains are still developing and they are more likely than adults to ingest things in their environment (such as chipping paint). It has also been shown that children absorb more ingested

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4 Hurwitz R, Lee D. Childhood lead poisoning: Clinical manifestations and diagnosis. In: UpToDate,
lead compared to adults. Marginalized populations and lower socioeconomic groups are also at increased risk due to use of older housing and a lack of political and social power to achieve lead removal projects.

**Current Policy: Screening, Testing & Reporting**

Current recommendations are that all children be screened for lead exposure, however these screening methods have been shown to be extremely inaccurate. For example, the most commonly used screening method, the lead exposure questionnaire, focuses on whether families live in housing built before 1950; studies have shown that 50% of families who do live in such housing think that they do not.

The use of Medicaid eligibility for screening is somewhat more reliable but can be difficult to ascertain by doctors. Most clinics use a combination of non-standardized methods. The CDC estimates that at least 4 million children in the US are at high risk for lead exposure, however far fewer of these children are tested each year.

It should be noted that while the CDC recommends that all high-risk children be sent for lead level testing, the US Preventive Services Task Force (USPSTF) claims there is insufficient evidence to recommend for or against lead level testing, even in high risk children. While the USPSTF is rigorous in their review of evidence for recommendations, current guidelines were established in 2006 and clearly more research is needed. In terms of reporting, there is currently no requirement for states to report their lead surveillance data to the CDC, though a number of states choose to supply their data voluntarily.

The lack of a nationally coordinated surveillance system leads to incongruent efforts for prevention and exposes an overall lack of data available for use in targeting testing approaches.

**Geographic Information Systems (GIS)-Cased Targeted Screening**

GIS-based targeted screening uses factors such as previous cases of lead poisoning or identification of housing developments built before 1950 to identify high-risk zip codes or census blocks. Children living in these high-risk areas can then be systematically tested for lead poisoning. A few states, such as Arizona and Illinois, have already begun to use high-risk zip codes to screen children.

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which has been shown to be both accurate and cost-effective.\textsuperscript{12\textendash}15

Other GIS-based systems, such as census block/tract risk assessment, have also been shown to be highly successful\textsuperscript{16\textendash}18.

Most of these studies implemented GIS-based screening in addition to standard questionnaire-based screening. There are currently no head-to-head effectiveness studies comparing GIS-based screening to other targeted screening methods. One retrospective observational study performed in Kentucky did find that GIS-based methods identified a significant number of additional high-risk children who were missed through normal screening method\textsuperscript{19}.

**Policy Implications**

The 2012 Advisory Committee Report on Childhood Lead Poisoning Prevention emphasized the need for primary prevention to eradicate lead exposures. Without knowledge of where these exposures occur, however, this is impossible to accomplish.\textsuperscript{20} Obviously the current approach is inadequate. In the past, some have advocated for universal testing, but this has largely been deemed costly and burdensome, since children without any risk factors are unlikely to have elevated lead levels. In fact both the CDC and USPSTF recommend against universal testing.\textsuperscript{21}

GIS-based targeted screening thus offers a unique solution that balances the need to identify cases of lead poisoning without testing those at low risk.

There are two major barriers to implementation of GIS-based screening: 1) a lack of national data about which zip codes/census blocks have experienced lead


\textsuperscript{14} Rustin C. Evaluating the Efficacy of a Childhood Lead Poisoning Risk Model as an Accurate Predictor of Lead Exposure. 2013.


poisoning and 2) the upfront cost of GIS-based mapping. The first barrier can be addressed through mandatory reporting of lead poisoning cases into a national surveillance system. National surveillance systems offer the ability to understand health problems, develop systematic prevention strategies, and allow for targeted use of resources.\textsuperscript{22} For example, CDC coordination of surveillance for Central Line Associated Bloodstream Infections (CLABSI) resulted in a significant reduction in CLABSI\textsuperscript{s} and saved over a billion dollars in health care system costs in less than 8 years.\textsuperscript{23}

The creation such a system for cases of lead poisoning through mandatory state reporting is a large-impact, cost-effective first step that will ensure that cases of lead poisoning are not ignored, and that situations such as that which occurred in Flint do not go unnoticed. This will provide the data necessary to head the advisory committee’s advice and work to eradicate lead exposures.
