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# Validation of a Screening Kit for Detecting Lead Hazards in the Environment

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## Introduction

Many states only evaluate environmental lead hazards after a lead-poisoned child has been identified. This passive approach is problematic because only a small percentage of children are tested for lead, and children who have elevated blood lead levels may suffer irreversible developmental damage. To change this paradigm, a new lead screening kit was created. In this study, we validated the kit's accuracy in comparison to conventional methods. The kit was used by 45 participants to collect three dust, three soil, and two paint samples from their homes [1].

Childhood lead exposure is largely associated with the United States' ageing housing stock, which is exacerbated by antiquated standards and regulations. For example, the National Guard and the New York City Housing Authority have both recently come under fire for their inaction and disregard for lead testing standards and public housing regulations. According to the Centers for Disease Control and Prevention, 83% (24 million) of all homes built before 1978 contain lead-based paint, and at least 4 million children under the age of five are at risk of exposure. Leaded gasoline residues contribute to the soil burden of lead and dust and may be the primary source of lead exposure in large cities.

A commercial DIY lead test kit can be purchased as an alternative to hiring a professional. The EPA established new kit requirements on September 1, 2010, requiring test kits to meet both a positive and negative response criterion sensitivity of 95% and a specificity of 90% for paint. The EPA currently states that no commercially available test kit meets these criteria; however, the EPA recognises three test kits that meet the requirements established prior to September 1, 2010, which require a negative response criterion [2].

Given the magnitude of the legacy lead problem in our community and across the country, new methods for assisting families in primary lead poisoning prevention are required. As previously stated, current methods for testing homes are labour intensive, costly, and limited. This kit is a screening tool, which is the first step in identifying a lead hazard in the home. It was intended to be quick, inexpensive and scalable. Furthermore, the development of this kit was not motivated by a commercial interest or the desire to replicate HUD and EPA testing, but rather by the desire to create a screening tool to supplement ongoing state and federal lead risk reduction efforts.

Participants for this double-blind study were recruited in Saint Joseph County, Indiana, USA. Community organisations, medical practises, and word of mouth were the primary sources of recruitment. Community organisations distributed a variety of recruitment materials such as postcards and flyers. Investigators contacted medical practises directly, and practises that believed this project would benefit their patients aided in recruitment. Seminars about the study were also given on campus and posted on the university website. Participants contacted the study team as the study progressed after hearing about the screening testing process from previous participants [3].

## Description

Homes in St. Joseph County, IN, USA were visited in June, July, and August to screen participants' homes for lead exposure risks and to observe the use of a "citizen science" lead screening kit. Residents were given the sample kit, which contained written instructions, and no oral instructions were given other than to follow the instructions while the research team observed and performed in-situ testing at the sample site after the participant collected each sample. The kit includes three soil samples, two paint samples, and three composite dust samples. Prior to kit use, all kit components (tape, bags, paper, or plastic) were analysed by XRF to ensure their lead levels were below the XRF's detection limit [4].

The majority of penetrometers are made up of a metal probe with a conical tip attached to a cylindrical shaft. The probe diameter ranges from about 0.1 mm for a small needle penetrometer to more than 10 mm for a large field penetrometer, but it is usually around 1 mm, which is comparable to the diameter of many crop roots such as maize or peas. A relieved shaft with a diameter smaller than the cone basis is frequently used to reduce friction and adhesion between the soil and the shaft.

Third, the kit has the potential to significantly improve child lead poisoning prevention and reach. Saint Joseph County has nearly 68,000 homes built before 1978. Given the labor-intensive nature of the SJCHD's risk assessment (approximately 6 person hours are required per home to collect samples and write reports), testing all homes for environmental lead hazards would require 408,000 h, or more than 200 person-years. Given these constraints and shrinking health-care budgets, we arrive at the current situation, in which the vast majority of homes remain untested. Another option would be to distribute these screening kits directly to residents, which would involve families in the process of testing their homes. Trained analysts would still conduct the analysis [5].

## Conclusion

The Lead Screening Kit has the potential to significantly alter how we identify environmental lead and thus prevent exposure. The kit enables parents to initiate and participate in the primary prevention of lead poisoning. After decades of relying on a child's elevated blood result to detect environmental lead, the kit offers a more humane, proactive, and effective method of identifying lead hazards before children are exposed.

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## Conflict of Interest

There is no conflict of interest by author.

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