

Small Area Surveillance to Estimate Prevalence of Childhood Blood and Environmental Lead Levels

A Technical Guide

J Hodge, J Nielsen, T Dignam, MJ Brown

This document contains basic information and procedures for Community Childhood Blood Lead studies. It is specifically intended to be a field guide for studies seeking to assess child blood lead prevalence and environmental exposures to lead.

The findings and conclusions in this document have not been formally disseminated by the Centers for Disease Control and Prevention/the Agency for Toxic Substances and Disease Registry and should not be construed to represent any agency determination or policy.



Preface

The Healthy Homes and Lead Poisoning Prevention Program at the Centers for Disease Control and Prevention receive multiple requests each year to assist with studies seeking to assess the prevalence of elevated child blood lead levels and evaluate environmental exposures that may increase risk. Studies of this type are valuable tools for establishing the extent and degree to which environmental risks are contributing to blood lead levels as well as establishing a baseline prevalence for a specific geographic area. The outcomes of these studies can be used to determine geographic distribution of elevated blood lead levels and inequitable exposures. That information can then be used to improve targeted screening and primary and secondary prevention efforts with the ultimate goal being elimination of lead poisoning in that area.

This is a technical guide intended to be used during the design and implementation of such studies. The purpose of this document is to provide an overview of study basics, outline the main aspects of such studies, specifically household interviews and environmental sampling, and to provide guidance to field implementers. We provide an overview of lead poisoning, its effects, and why it remains a concern for children as well as brief guidance on study objectives and other aspects of organizing and implementing a study that will be helpful for those that are designing this type of study. We also provide guidelines on how to conduct household interviews as well as instruction on how to conduct environmental sampling that will be useful for field staff. It is intended that this along with a companion paper providing detailed sampling and analysis methods [in progress], and training modules created by WHO/UNEP will provide tools for these studies to be carried out where needed by ministries of health and state or local health departments independently of CDC.

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Small Area Surveillance to Estimate Prevalence of Childhood Blood and Environmental Lead Levels

Introduction and Background

Lead is a neurotoxicant with well documented effects on behavior and intellectual functioning, particularly for young children. It continues to be a major environmental health risk in the United States where there are approximately 4 million households in which children are exposed to high levels of lead (CDC, 2015). Worldwide each year lead causes intellectual disabilities in an estimated 600,000 children, most living in low income countries (WHO, 2015; WHO, 2009). Lead in homes comes from various sources including lead paint, contaminated soil, contaminated water, occupational exposures being tracked to homes, and industrial emissions (CDC, 2011). To better understand sources of lead exposure in specific communities and how those sources contribute to elevated blood lead levels in children, field studies need to be conducted to determine prevalence of elevated blood lead levels and evaluate what environmental hazards might be influencing those levels.

This manual is designed to be a guide for field studies to assess the prevalence of elevated blood and environmental lead levels. It is meant to be used as a training tool and guide for field staff to assist with household-level interactions and to provide instructions for carrying out surveys, home inspections, and environmental sample collections. In addition, it provides suggested study goals and objectives, suggested team set-up, and example data collection instruments that may be useful for study design. It was derived from training and guidance documents from previous population based, cross-sectional studies of blood lead levels and environmental risk factors and aims to provide standardization for future studies that follow similar designs.

Why Are We Concerned About Lead Poisoning?

In children, lead decreases intelligence, growth and hearing, causes anemia, and can cause attention and behavior problems (WHO, 2010). High levels of exposure can cause severe brain damage or death (National Academies of Science, 1993). Young children are particularly susceptible to lead poisoning for a number of reasons. First, hand to mouth behavior, ingestion of non-food items, and crawling increase the amount of environmental lead that children come into contact with and ingest (Bellinger, 2004). Second, the proportion of ingested lead that is absorbed is much greater in children than in adults (Bellinger, 2004). Finally, exposure, even to low levels of lead, can lead to impaired cognitive development and deficits in IQ (Lanphear et al., 2005; Canfield et al., 2003). Sources of lead exposure include lead-based paint, industrial emissions, cottage industries (e.g. battery recycling), lead soldered cans and water pipes, lead glazed ceramics, and traditional medicines. Other sources of exposure, especially important for young children due to hand-to-mouth behavior and crawling, include household dust, contaminated soil, and contaminated drinking water (CDC, 2011).

Children who have been affected by lead may not appear different as symptoms are not always apparent. This can cause some lead-poisoning cases to go unnoticed. Some lead poisoning symptoms in children include: developmental delay, learning difficulties, irritability, loss of appetite, weight loss, sluggishness and fatigue, abdominal pain, vomiting, and constipation (CDC, 2012b). Experts now use a reference level of 5 micrograms per deciliter ($\mu\text{g}/\text{dL}$) to identify children with elevated blood lead levels. This reference level is based on the U.S. population of children ages 1-5 years who are in the highest 2.5% of children when tested for lead in their blood (CDC, 2012c). By shifting the focus to primary prevention of lead exposure, we can reduce or eliminate dangerous lead sources in children's environments before they are exposed. The key is preventing children from coming into contact with lead and identifying and treating children who have been poisoned by lead (CDC, 2012c).

What can be done to prevent exposure to lead?

Health education materials should be developed to address the known sources of lead. These are often lead paint and/or former or active industrial sites that process lead or lead contamination in drinking water. The list below can be modified to meet local conditions.

From: <http://www.cdc.gov/nceh/lead/tips.htm>

- Talk to your state or local health department or Health Ministry about testing paint and dust from your home for lead.
- Remove your child's access to peeling paint or chewable surfaces painted with lead-based paint.
- Create barriers between living/play areas and lead sources.
- Wash children's hands and toys regularly.
- Wash children's hands with soap and water before eating to avoid eating contaminated soil/dust.
- Wet-mop floors and wet-wipe window sills and window frames regularly.
- Prevent children from playing in bare soil; if possible, provide them with sandboxes or other alternative play areas.
- Prevent children and pregnant women from being present in housing built with lead paint that is undergoing renovation.
- Do not grow vegetables in or near a contaminated site..
- Do not allow children to play in sites where lead is or was being processed.
- Do not wear outdoor shoes inside your house so you don't bring contaminated soil inside.
- If you work where lead is or was processed, keep separate clothes and shoes at the worksite to prevent bringing the lead dust/soil home.

Study Goals

The goals of each study will vary based on the target population and the circumstances of the investigation. However, the primary objectives listed below should be included in all investigations:

- Obtain an unbiased, representative prevalence estimate of blood lead levels (BLLs) among children aged 9 to 72 months, or the age range of interest, living in the target community,
- Obtain an unbiased, representative geometric mean BLL (and 95th percentile) among children aged 9 to 72 months, or the age range of interest, living in the target community,
- Provide case management and/or educational services by trained staff to children identified with BLLs $\geq 10\mu\text{g}/\text{dL}$ (or lower if required by local regulations) and health education and retesting of children with BLLs $\geq 5\mu\text{g}/\text{dL}$,
- Collaborate with relevant partners (e.g. CDC/ATSDR, EPA, state and local public health authorities, Ministries of Health, non-governmental organizations and pediatric healthcare providers) as needed to develop future public health outreach efforts in the target community (e.g., a community lead poisoning elimination plan and advisory group of key stakeholders),
- Identify risk factors and sources of exposure for elevated BLLs among children aged 9 to 72 months, or the age range of interest, living in the target community, and
- Consult with the local health department to identify issues of public health concern to the community (nutrition status, immunization status, access to primary care) or unhealthy housing conditions including: presence of pests (e.g., cockroaches, mice, or rats), functional carbon monoxide / smoke alarms, presence of mold, evidence of water damage (e.g., minor plumbing leaks, water seepage via windows, or roof leaks), asthma triggers, deteriorating paint, and improperly used emergency generators.

When To Use This Guide

This guide is designed to provide assessment of child blood lead levels and environmental risk factors that may be contributing to elevated blood lead levels. Situations in which a study of the type outlined here are useful include:

- Data regarding child blood lead levels in a specific area are insufficient to provide an estimate of the prevalence of elevated blood lead levels and environmental risk factors
- A community is concerned over possible exposures to lead from industrial sites in their area, contaminated drinking water supplies, or other environmental sources

- Existing data indicate that children in a specific area are at higher risk of elevated blood lead levels and environmental risk factors need to be evaluated for possible contribution

Study Basics

Study Population and Study Area

Study area is the geographic location where the study will be done. Generally, this area is bound by some political designation such as census tracts, neighborhood, town, or city. If the study is looking at a specific point source of exposure (e.g. a battery recycling factory or lead smelting facility), the study area should be limited in geographic scope. A radius of 2.7km may be used based on previous studies that found elevated BLLs at an average radius of 2.7km from the point source (Benin, 1999; Garcia-Vargas, 2014; Baker, 1977; Stafilov, 2010; Pilgrim, 1994; Hegde, 2010; Albalak, 2003; Fritsch, 2010; Paoliello, 2002; Willmore, 2006; Meyer, 1999). However the specific radius of the study area should be determined based on the setting and the number of potentially eligible people. In situations where there is widespread environmental contamination (water, soil, dust, or air) the study area should include the entire area where exposure may have occurred.

When the study area is too large for a simple random sample, it should be divided into smaller areas called clusters. A subset of the clusters are then chosen using a sampling method, typically probability proportional to size sampling. Households within each of the selected clusters are then included in the study area (Bennett, et al. 1991; Frerichs & Shaheen, 2001). Cluster sampling requires more complicated statistical analyses and a statistician should be consulted when developing the sampling frame and conducting data analysis. For more details on implementing cluster sampling methodology see *Community Assessment for Public Health Emergency Response (CASPER) Toolkit* (CDC, 2012a) and *Designing Household Survey Samples: Practical Guidelines* (United Nations Statistics Division, 2005).

The study population consists of the people meeting the study definition who are enrolled in the study. Prior to beginning the study, inclusion criteria will need to be established to determine who will be eligible for enrollment. Some inclusion criteria include age, length of time at residence, length of time near exposure source, and parental occupation. In general, these studies will only include children 9 to 72 months old since the primary concern is elevated BLLs in children.

Sample Size and Response Rate

Sample size calculations estimate the number of participants required to find a statistically significant association between environmental exposures and BLLs (Gregg, 2008). Sample size must be calculated prior to conducting the study to determine how many participants need to be enrolled. It is important to ensure that the number of participants enrolled is at least equal to the calculated sample size to be sure that there is adequate statistical power to determine if there is

an association between the exposure and elevated BLLs. Response rate is the proportion of people that participate in the study compared to the total people that were asked to be in the study and is calculated at the end of the surveying process. If the response rate is expected to be low, it may be necessary to increase the sample size to account for non-response (UN Statistics Division, 2005). Response rates are also important to determine the representativeness of the study participants (CDC, 2012a). It is good practice to use household tracking forms to collect information about non-responders to compare to those that chose to participate and the population as a whole. This information will determine if the results are representative of and generalizable to the population of interest.

Field Staff and Recruitment

Recruitment of field staff is an important step in any study. If possible, it is good practice to recruit field staff from the community in which the study will be conducted. Including field staff who are local to the area will frequently result in improved participation and response from community members. Another avenue of recruitment is volunteers from local colleges or universities. In particular, nursing, public health, and medical student volunteers can be good field staff as they have some training in health sciences and/or epidemiology. Volunteer medical and nursing students that have clinical training may also be able to perform the blood sampling. Because the focus of these measurements is on a young population, a pediatric phlebotomist should also be included where possible. State and local health department staff, and state environmental or housing agency staff may also be able to volunteer as field staff. In international settings, field staff may also be recruited from local community health workers, ministries of health, and field epidemiology training programs. When conducting studies in international settings it may also be necessary to consider the cultural norms of the community including some gender restrictions. For instance, in some areas it may not be possible for women to be interviewed by men to whom they are not related. Age or religious differences may also be important to consider. Likewise, language should be considered and field staff must speak the local language or dialect of the study population.

Use and Importance of Sample IDs

Sample identification numbers need to be used to ensure that questionnaire data, environmental samples, and blood samples can be accurately matched with the study participants from whom they were obtained. Unique ID numbers need to be used for each household and unique sub-numbers need to be used for each child within a household and for each sample taken at that household. For example, the first household from which samples are obtained may be assigned a base ID number 001; the first child in the household is given the ID number 001-01, the second 001-02, etc. Each questionnaire is labeled with the household base ID number. Environmental samples should be numbered in a similar fashion. Each household environmental sample (e.g. windowsill dust) should be given a unique ID number specific to that household. For example, the

windowsill dust sample for household 001 can be numbered WS-001-01. If there is a second sample, it would be WS-001-02 and so on. Blood samples are labeled using the ID number assigned to the child from which it was taken, for example, a blood sample from the first child in the household should be labeled BS-001-01.

The minimum number of labels required for each household should be determined prior to starting the sampling. It is recommended that pre-printed sample labels are used that can be attached to survey forms, chain-of-custody forms and sample containers. Extra labels should be created to ensure that field staff have sufficient labels for all forms and samples at each household. It may be beneficial to generate all the unique participant and sample IDs prior to beginning the study to ensure that there are no issues with repeated numbers once sampling begins.

Working with Community Partners

In all cases, all relevant stakeholders should be identified and engaged with in the early phases of study preparation. In many cases it may also be beneficial to partner with these stakeholders to facilitate the study. Frequently local stakeholders will be able to provide valuable information and assistance implementing the study. The stakeholders to consider partnering with will vary by study but may include state or local public health authorities, state or local housing authorities, or non-profit organizations that engage in lead poisoning prevention work. In addition, local health care providers should be informed of the study and their role, if any, in the follow-up of children identified with high blood lead levels or other conditions.

In some countries, religious or ethnic group's political, tribal or religious leaders will need to be contacted prior to conducting the study. The support of these leaders is essential to the study's success. Getting permission from these community leaders may be necessary prior to conducting any study surveys and sampling. Local field staff may be able to advise and assist in identifying community leaders.

Reporting Results

All results must be provided to the parents of children enrolled in the study. Blood lead level results should be explained in person including any necessary follow-up. Follow-up is recommended for any child with a blood lead level of 5 µg/dl or higher. If a child has a blood lead level of 65 µg/dl or greater it is considered an emergency and the parents and a health care provider should be notified immediately. Health care providers should also be notified of all test results as soon as practical after parents have been notified. It is also important maintain confidentiality as all test results are private and should only be disclosed to the child's parents and health care provider. Environmental sample results may take longer to process but should be reported to parents as soon as they are available.

Sample Collection and Analysis

One important decision that will need to be made at the outset of the study is whether to take capillary or venous blood samples. Each have benefits and drawbacks. Capillary samples are comparatively easier to obtain and are seen as less painful for the children. They also do not necessarily require trained nurses/phlebotomists to conduct the sampling. However, they are much more likely to be contaminated by environmental lead sources. Venous samples require a trained medical professional (e.g. physician, nurse, pediatric phlebotomist) to obtain and are considered to be more invasive. In some settings, it also may be more difficult to enroll participants if using venous sampling. But, venous samples are far less likely to be contaminated.

With either type of blood sampling method there are several options for analysis. Portable analyzers are available (LeadCare and LeadCare II) as well as laboratory based methods. The advantages of the LeadCare analyzers are their portability and the relative ease and speed at which samples can be processed and the lower cost for analyzing samples. The portability also allows analysis to be conducted on site. However, they are less sensitive than laboratory based methods and have a higher lower limit of detection (LOD) and smaller overall range. In settings where low BLLs are expected or where population estimates are needed the instrument can be modified by the manufacturer to report BLLs less than the LOD of 3.3 $\mu\text{g}/\text{dL}$ (Brown, 2014). In such cases, individual results below the LOD should be reported as 'below the limit of detection'. The numeric values below the LOD should only be used for statistical analyses such as calculating the geometric mean BLL for the study population.

Laboratory based methods such as graphite furnace atomic absorption spectrometry (GFAAS) or inductively coupled plasma mass spectrometry (ICP-MS) require that samples be transported to a laboratory, are more time consuming and require highly skilled operators. However, these methods have lower limits of detection and wider ranges of blood lead that can be reliably measured (WHO, 2011). Both capillary and venous blood samples can be analyzed using the LeadCare analyzers or laboratory methods.

Additional Considerations

Participant Compensation

Determining whether to provide incentives or compensation to study participants can be a difficult decision. It involves ethical questions regarding the possibility of undue influence to coerce participation due to the receipt of financial compensation. However, it is often beneficial to provide some form of compensation (e.g. cash gift cards).

Data Collection Methods

Ensuring high quality data is a critical part of any study. Two methods for data collection should be considered: paper forms and electronic devices such as smart phones or tablets. Both paper and electronic data collection have pros and cons. Paper forms require little training and have relatively inexpensive supplies but may result in transcription errors and require data to be manually entered into a computer for analysis. Electronic devices have a higher upfront cost and require maintenance (e.g. keeping batteries charged) but can streamline interviews. Additionally, data can be automatically transferred to a computer, possibly reducing transcription errors. If electronic devices are used, it is important to have some paper forms on hand in the event that the electronic device malfunctions. The table below outlines some additional considerations for paper forms versus electronic devices.

Paper Forms	Electronic Devices
<ul style="list-style-type: none"> No technical training required Relatively inexpensive supplies 	<ul style="list-style-type: none"> Requires technical training. Hardware and software may be expensive to purchase. May be expensive to repair devices that break in the field.
<ul style="list-style-type: none"> Requires paper, pens, and clipboards in the field. 	<ul style="list-style-type: none"> Requires data collection devices, batteries, and chargers.
<ul style="list-style-type: none"> No maintenance of supplies 	<ul style="list-style-type: none"> Requires maintenance of software and devices.
<ul style="list-style-type: none"> Requires labor-intensive data entry after fieldwork. 	<ul style="list-style-type: none"> Development of electronic questionnaire can be labor-intensive.
<ul style="list-style-type: none"> May introduce errors in manual data entry process. 	<ul style="list-style-type: none"> Data can be monitored for quality as it is being collected.
<ul style="list-style-type: none"> Manual entry is a relatively slow process. 	<ul style="list-style-type: none"> No manual data entry required.
<ul style="list-style-type: none"> No limitation on the number of field teams 	<ul style="list-style-type: none"> Field teams may be limited by availability of devices
Adapted from CASPER Toolkit (CDC, 2012a)	

In the Field

The conclusions drawn from the study will only be as good as the data that are collected. As a data collector and part of a study team, you are the main link between the study investigators and the study population. Data collectors should be easily identifiable, trained in collection procedures and familiar with participants' rights as study subjects. For a complete list of supplies, see Appendix A. A protocol for household visits and revisits can be found in Appendix B.

Below is information on team member roles and suggestions on how to conduct household visits.

Study Team Members:

Study teams are responsible for collecting and safeguarding the study data. The number of study teams will vary depending on the number of households to be enrolled, household participation and refusal rates, geographic area to be covered among other factors. Each study team will be composed of three or four members with the responsibilities described below.

- Spokesperson* (1 person)** – introducing team and study to community members, consent form administration, questionnaire administration, and incentive dispenser
- Logistics* (1 person)** – visitation tracking, navigation, blood storage, and chain-of-custody issues
- Environmental Sampler (1 person)** – responsible for conducting the water, soil and indoor dust sampling
- Pediatric Phlebotomist (1 person)** – responsible for obtaining the blood sample from the child

* Sometimes, the responsibilities of the spokesperson and logistics are conducted by the same team member.

DRESS

Make sure to dress appropriately for the weather in business casual clothing. Please avoid wearing clothing with slogans or logos. Consider also using sunscreen and bringing a hat and sunglasses along for sun protection. Each fieldworker will be given a badge with identifying information.

Administering The Questionnaire

Supplies:

- Pens
- Consent form (2 per household) (Appendix C1)
- Resident appointment notecards (Appendix C2)
- Verbal script for consent for eligibility and non-response rate form (Appendix C3)
- Household questionnaire (Appendix C4)
- Child questionnaire (Appendix C5)
- Healthy homes questionnaire (Appendix C6)
- Daily household tracking form (Appendix C7)
- Frequently Asked Questions and Answers (Appendix D)
- Educational Materials (Appendix E)
- Signature form for compensation if compensation will be provided
- Study labels

Examples of all forms and a sample questionnaire as well as frequently asked questions and suggested educational materials can be found in Appendices C, D, and E. When working in areas where multiple languages are spoken, all of the documents listed above and in the appendices should be translated into the local languages.

Addressing the Homeowner and Obtaining Permission

Upon arrival, introduce yourself and explain what you are doing and why. Be friendly, positive, self-assured, and matter-of-fact.

- Introduce yourself
 - Hello, my name is _____. I am working on a Child Health Study with the [Name of organization].
 - Ask to speak with the head of the household.
 - We are here today working on a research study to better understand child blood lead levels in your community. Would it be OK to ask you a few questions to see if you qualify for the study?



Be sure to give them informational documents on lead and healthy housing and answer any questions they have. **Verbal permission must be granted before moving on to questions about eligibility.**

We anticipate the administration of the Child, Household, and Healthy Homes questionnaire; venous blood sampling; provision of the compensation, if any; and environmental sampling to take approximately 45 minutes to one hour.

Determining Eligibility

Before administering the questionnaire, the team must determine eligibility by asking the following questions:

1. Is there a child between the ages of 9 to 72 months (under 6 years) [or the age range of interest] who lives in this household?
2. Has this child lived at this residence at least 3 days per week for the past 6 months?
3. Are you the parent or legal guardian?
4. Will you allow your child (or children) to join in a study on the blood lead levels among children living in [Target Community]? This project will include taking a sample of your child's blood from a finger or vein and testing it for lead and a questionnaire about your household. In addition the study team will collect dust, soil, and water samples from your house.

The respondent must answer 'yes' to all four questions in order to continue with the interview. If the parent, legal guardian, or consenting adult who gives permission answers 'yes' to all four screening questions, an assigned team member will explain the purpose of the study to the head of household including the risks and benefits of the study.

If the parent, legal guardian, or consenting adult agrees to be a part of the study, he/she will be given a Childhood Blood Lead Prevalence Research Study Consent Form (Appendix C1) to sign. This form will be read out loud and/or given in the local language understood by the community if requested.

If the parent or legal guardian is eligible and does not want to join the study, please ask why and write down the reason on the daily household tracking form.

Obtain Consent

Review the consent form section by section with the parent or legal guardian. Obtain completion of check boxes and signatures at the end of the form. Provide a copy of the consent form for their records. Affix a study label on the signed consent form for the study team.

Conducting the Interview

IMPORTANT: Practice obtaining consent and asking interview questions with other data collectors ahead of time. Speak in a clear, slow, and direct manner. Maintain eye contact and have a firm understanding of the questionnaire contents.

Start by letting the respondent know that all responses and samples gathered are confidential and their information will be protected. The responses from the interview will not be discussed with anyone not associated with the project. Confidentiality is your personal responsibility as interviewer.

If possible, find a private place to conduct the interview. This could be a room separate from other people in the house or outside. If it is not possible to conduct the interview without other people present, do the following to make the interview as private as possible:

- Speak in a voice that is loud enough for the respondent to hear, but soft enough so that others cannot.
- Try to seat the respondent so that his/her back is to the others present.

Start the interview by arranging the seats in a comfortable fashion so that the respondent is facing the interviewer.

Administer the Child, Household, and Healthy Homes questionnaires.

- Ask all questions, exactly as they are written; do not improvise on the way the sentences are worded.
- Be sure the respondent hears the entire question before answering. If he/she answers before you read the whole question, just explain that you must ask the whole question because it may change the answer.
- Probe to avoid “Don’t Know” responses, but keep a neutral attitude; do not express surprise, pleasure, or disapproval at any answer or comment.

Try to keep the respondent on the subject. People like to talk, but chatter tends to lead away from the subject in the questionnaire. Use gentle but firm persuasion to keep the respondent on track.

Complete Environmental Observations checklist (at end of Household questionnaire). This portion is not read to the study participant.

Examples of items included on the checklist are:

- House material (e.g. brick, wood, stucco, etc.)
- Condition of paint on exterior of home
- Condition of paint on interior of home
- Condition of exterior windows
- Distance of home from a major street or highway

What if No One is Home?

If nobody is home when you arrive onsite:

- Leave a resident notecard (Appendix C2)
- Record that follow up is needed and list the location of the home
- Follow up in the evening (4 hours later) or the next day.

Environmental sampling

Samples of water, soil and dust wipe samples are collected concurrently with children's blood from enrolled households. The purpose of collecting environmental samples is to determine the amount of lead in the environment (home and yard) among children in enrolled households, and to provide feedback to families regarding control or elimination of identified exposures to lead as appropriate. Field staff will be trained to properly collect environmental samples and will be responsible for collecting environmental samples at each enrolled household.

Study planners and participants should be aware that environmental sample collection, handling and preparation can influence the sample results. For example with respect to soil samples, sieving of soils can be conducted to different size fractions, and/or soil samples can be collected as a single "grab" or with a five-point composite approach. Dust samples can be collected and analyzed for lead loading levels, or lead concentration levels. Study planners should carefully consider their study's specific objectives and adapt their environmental sampling strategy appropriately, and communicate directly with the laboratory that will process their samples what is desired ahead of time.

At the time of the study, agencies may wish to collect additional environmental samples to help further evaluate the extent and potential impact of the source(s) of environmental lead contamination. For example, study planners may wish to incorporate x-ray fluorescence analysis (XRF) of paint at the home. Dust, soil, water, and XRF sampling should be done in accordance with the U.S. Department of Housing and Urban Development protocol (HUD, 2012), the EPA "Residential Sampling for Lead: Protocols for Dust and Soil Sampling" (EPA, 1995) or an equivalent method. The procedures below provide an outline of those protocols.

Initial Procedures

- Take a geographic positioning system (GPS) reading at the front door (if not at the front door, note location)
- Identify areas to be sampled by discussing children's play area and sleeping area with parent or guardian: wipe areas (near front door, child's play area, child's bedroom window sill) – water sample (kitchen or bathroom tap) – soil sample (bare soil where child plays)
- Draw schematic of home on Sampling Form (Appendix F) –indicate sampling locations inside and outside the home – write the GPS coordinates for the front door and the soil sampling location on the schematic
- **Put sample identification (ID) labels on all sampling containers as well as the Sampling Form**
- Write sample ID numbers on the Sample Collection form

- Utilize secure, verified documentation of showing transport of samples from one party to another (i.e. chain of custody form supplied by the laboratory).

Tap Water Sampling

The water sample should be collected first.

Supplies:

- Gloves
- Environmental sampling form (Appendix F) and ID labels
- 250 mL collection container(s)
- Trash bags

Procedure:

- The sample should be taken at the kitchen sink if possible. If that cannot be done, the sample should be taken at a bathroom sink. Indicate on the schematic on the sampling form where the sample was taken.
- Put on gloves.
- Put the sample container under the faucet, fill and cap. **Do not run the water prior to sampling.**
- Fill in the sampling form with any additional information (e.g., sample location if not kitchen sink).
- Make sure that the sample ID is on the Sampling Form.
- Do not dispose of gloves – use them for the wipe sampling.
- If quality assurance / quality control (QA/QC) samples are needed for this location, the appropriate supplies will be provided
- Samples must be analyzed by a qualified laboratory that meets local jurisdictional requirements for certification for analysis of environmental samples using [EPA Method 200.8](#). or an equivalent analytic method.

Wipe Sampling

A dust wipe measures the total amount of lead dust on a specific surface area. This measurement is called lead “loading,” which is a good indicator of the amount of lead to which a child is exposed. Laboratories will report the amount of lead found in the dust wipe in micrograms (μg) per wipe. This amount is then divided by the area sampled to produce a dust lead loading result in $\mu\text{g}/\text{ft}^2$ or m^2 . It is very important that the sampled area is measured and recorded accurately since this will affect the dust wipe results.

Supplies:

- Gloves (use gloves from the water sampling effort)
- Environmental sampling form (Appendix F) and ID labels
- Sample Wipes (three)
- Templates – (two - 100 cm^2)
- Painter’s tape or masking tape (for window sills)
- Ruler – reusable
- Baby wipes to clean ruler between sampling locations
- Sample containers (three)
- Trash bags

Floor Wipe Procedures:

- Keep gloves on from the water sampling effort.
- Identify locations where samples will be taken: one sample near the front door (within 3 feet of the closed door) and one from area where child plays as identified by the parent or guardian.
- Clear large debris from the sampling areas before beginning the sampling. DO NOT clean the area prior to sampling.
- If the front door or play area locations are covered with carpet, choose an alternative area with a hard surface (e.g. wood floor, linoleum, cement) and note location on the sampling form.
- Fill in the sampling form.
- Place a disposable template (100 cm^2) on the floor at each sample location.
- Remove wipe from packet and obtain the sample as indicated in ‘Wipe Schematic’. – use one wipe for the sample near the door and one wipe for the sample in the area where the child plays, using a new template for each location.
- Put each wipe into a separate sample container.
- Make sure that the sample ID is on Sampling Form.
- If QA/QC samples are needed for this location, the appropriate supplies will be provided and the samples should be listed on the Sample Collection Form.

- Samples must be analyzed by a qualified laboratory that meets local jurisdictional requirements for certification for analysis of environmental samples using [EPA Method SW-6020](#) or an equivalent analytic method.

Windowsill Wipe Procedures:

- Keep gloves on from the floor wipe sampling effort.
- Identify the child's bedroom for sampling (if >1 child enrolled in household choose any child bedroom) and clear large debris from the sampling area before beginning the sampling – DO NOT clean the area prior to sampling.
- Fill in sampling form.
- Use painter's tape to tape off area to be sampled and measure the area with the ruler – **note the area on the Sampling Form (attempt to obtain a 2 ft x 2 in sample). Be certain to note the units you are using – inches or cm.**
 - If a template for a sill is not available, or does not fit, do the following:
 - 1) Use tape to outline the sample area on a floor when a template is not available or does not fit the area.
 - 2) Place tape perpendicular to the edge of the sill or trough.
 - a. The sample area will be calculated **after** taking the sample to avoid contaminating the area.
 - 3) Make sure the area you are sampling is at least 16 square inches. Try to sample at least 8" of sill width.

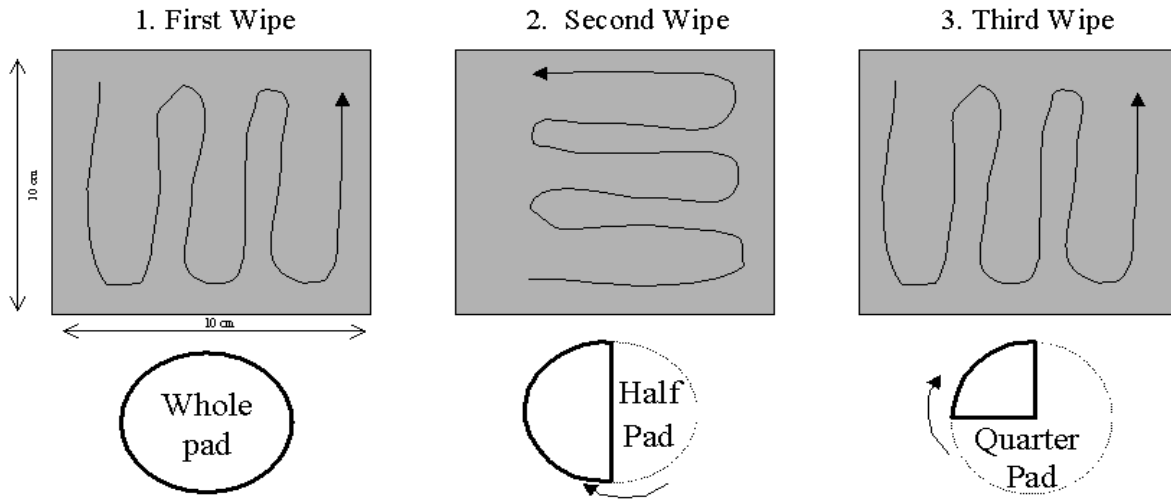


Source: EPA/HUD Model Lead Dust Sampling Technician Training Course found on line at:http://www2.epa.gov/sites/production/files/documents/ldst-instructor_manual-2011-10-12.pdf

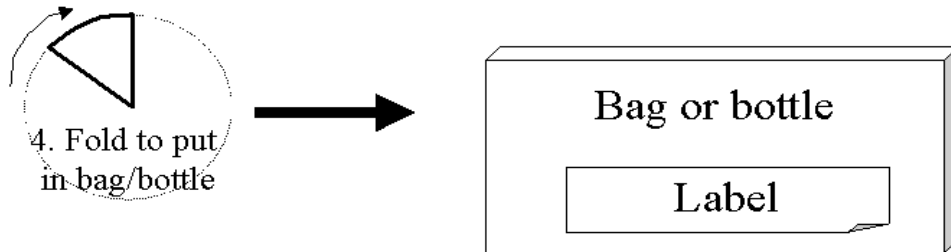
- 4) Remove wipe from packet and obtain the sample as indicated on 'Wipe Schematic'.
- 5) Put the wipe into a sampling container.
- 6) Make sure that the sample ID is on the Sampling Form.

- 7) Remove the tape from the window sill and dispose of the tape and the gloves in the trash bag.
- 8) If QA/QC samples are needed for this location, the appropriate supplies will be provided.
- 9) Samples must be analyzed by a qualified laboratory that meets local jurisdictional requirements for certification for analysis of environmental samples using [EPA Method SW-6020](#) or an equivalent method.

Wipe Schematic:



With each step, fold the exposed surface inward



NOTE:

- Press the wipe down firmly at an upper corner of the sample area.
- Make as many “S”-like motions as needed to wipe the entire sample area, moving from side to side. Do not cross the outer border of the tape or template.
- *Fold the wipe in half, keeping the dirty side in*, and repeat the wiping procedure in the original direction in a forward and back motion (see Appendix G).
<http://www2.epa.gov/sites/production/files/documents/ldstguide.pdf>
- Fold the wipe again and repeat the wiping procedure, concentrating on collecting dust from the edges and corners of the sample area
- Fold the wipe again with the sample side folded in, and place the folded wipe into the sample tube.

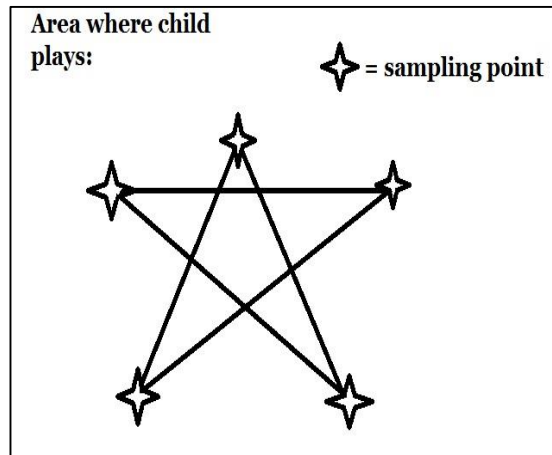
Composite Soil Sampling

Supplies:

- Gloves (use new pair for the soil sampling)
- 1-gallon zip-top bag
- Environmental sampling form (Appendix F) and ID labels
- Sampling Spoon
- Trash bag

Procedure:

- Ask the parent or guardian to identify an area of the yard where children play. Try to use only areas that are not covered by grass – the area should be bare dirt if possible.
- Fill in the sample collection form with the location of the sample collected indicated on the schematic diagram.
- Ensure that the GPS location of the soil sample is noted on the Sampling Form.
- Put on gloves.
- Take a sample from five different locations as shown in the diagram below - take the sample from the top 1/2 inch of soil using the disposable sampling spoon.



- Put all five samples in the provided zip-top bag, filling the bag at least a third and manipulate it to mix the samples. Transfer mixed sample to sample container with the sampling spoon, ensuring that there is sufficient sample taken to fill the sample container.
- Put the gloves in the trash bag.
- If QA/QC samples are needed for this location, the appropriate supplies will be provided.
- Samples must be analyzed by a qualified laboratory that meets local jurisdictional requirements for certification for analysis of environmental samples by [EPA Method SW-6020](#) or an equivalent analytic method.

Air Sampling

In situations where there is an active industrial process emitting lead or in areas where leaded gasoline remains in use, air sampling is recommended to quantify lead exposure from inhalation. Due to the complexity of the sampling instruments and requirement that they sample for a longer period of time, air samples are not taken at each household but are taken at designated locations in the study area. There are different types of air sampling instruments available and the procedures and supplies will vary depending on which type is used in the study. Manufacturers instructions should be followed. However, the following general list of supplies and procedures should be applied.

Supplies:

- Air sampling monitors approved for use to measure lead content in air
- Battery or continuous power source
- Prepared filters – the type is dependent on the air sampling device

Procedures:

- Follow manufacturer's guide for assembling the instrument. Most manufacturers will provide hands on training in the use of the equipment
- Identify an environmental laboratory that can prepare the filters. Filters will need to be equilibrated (conditioned) to a specified temperature and pressure and then weighed before being sent to the field for sampling
- Follow manufacturers' guide for placement of monitors ensuring that the area is secure
- Record the ID number of the air sampler and filter
- Take GPS coordinates for each sampling location and record them on air sampling form
- Remove filters at the prescribed time interval and place in zip lock bag for transport to the laboratory
- Record total air flow
- Filters must be analyzed by a qualified laboratory using the Federal Reference Method described in [Appendix G to 40 CFR Part 50](#) which is based on EPA method 6020A (SW-846)

Additional Considerations:

- Returning battery operated air monitors may be problematic if they will be transported across international boundaries. Be sure to check local procedures and regulations.

Sample Analysis

When all samples have been collected (tap water, soil, wipe samples), put them into a 1-gallon Ziploc bag with the chain of custody forms (one for each laboratory/company that will be conducting analysis, i.e. if one laboratory will analyze the soil and dust and a separate laboratory will analyze the water you will need two chain of custody forms).

- Chain Of Custody (COC) forms: complete the COCs forms as instructed (fill in the information regarding what samples were collected and sign the form (on the “Collected by” line)).
- Give the bag of samples to the team leader.

Blood Sample Management

A capillary or venous blood lead sample will be drawn from the eligible child or children. If the child is not at home, ask the parent or legal guardian when the child will be home and at what time it would be most convenient for the study team to return. Phlebotomists will be handling blood draws, but it is the responsibility of the study team to ensure all blood samples are handled properly.

Handling Blood Specimens:

- Make a record of the whole blood collections using the Blood Sample Shipping form. A copy of this log should be sent with the specimen.
- Place a study label on the sample tube and on the space provided in the log.
- Place the tube(s) in the venous tube holder inside of the cooler.
- Deliver samples to the [analysis laboratory/company] at the end of each day.
- If blood samples are to be shipped to a laboratory, they must be packaged and shipped in accordance with US federal regulations, 42 CFR part 72 or the regulations that apply where the study is being conducted.
- Blood samples should be analyzed inductively coupled plasma mass spectrometry (ICP-MS) following the method established in Caldwell et al. (2009).
- In some cases, if the equipment necessary for ICP-MS is not available or quicker results are required, portable LeadCare II units (Magellan Diagnostics) which utilize anodic stripping voltmetry (ASV) can be used (WHO, 2011).

Data Analysis Strategies

A statistician should be consulted before undertaking data analysis. Below are listed some standard analytic techniques.

Study participants can be selected in two ways: simple random sampling or cluster sampling. Simple random samples can be used when the population of potential study participants is relatively small; generally less than 800 (CDC, 2012a). When the population is larger it is better to use a cluster sampling strategy. In cluster sampling, the overall study area is divided into smaller geographic areas called clusters. For the first stage of a two stage cluster, the clusters are the primary sampling unit and are selected by simple random sampling or probability-proportional-to-size-sampling. In the second stage, households are sampled from within the clusters selected in the first stage. Each selected household is visited and if a child < 6 resides at the household, they may be enrolled in the study. In some cases it may be necessary to sample different strata based on the age of housing, distance from a point source of lead, or other environmental factors. Areas of interest with known risks for lead poisoning can be oversampled to capture more children with elevated BLLs (Bennett et al., 1991; Frerichs & Shaheen, 2001; UN Statistics Division, 2005; CDC, 2012a).

When using a cluster sampling strategy, data analysis is more complex than when using simple random samples. To calculate prevalence estimates and make inferences about the entire population of children <6 years of age, sampling weights for both households and children are needed. Sampling weights can be calibrated to the census population and adjusted to account for any unequal probabilities of selection that occurred due to non-response by potential participants. Such data should be analyzed using complex survey procedures in SAS/SUDAAN software or EpiInfo software to account for unequal weighting, clustering and stratification.

Descriptive statistics should be used to describe household and child demographics and other characteristics of the study population. Linear regression techniques can be used to examine risk factors for elevated BLLs that were obtained from the household and child questionnaires. Risk factors that may be assessed include child age and gender, child activities and health conditions, whether the child had ever traveled outside of residential area > 2 weeks in his/her entire life, previous renovation activity in the household, frequency of painting the residence, presence of household pets, all resident smoking status, mother's education level, lead-related occupation or activities, use of household remedies, herbal remedies or folk medicines, receipt of public housing or housing vouchers (if applicable), receipt of public assistance, and house ownership status. Because BLLs are frequently right skewed, they should be log-transformed prior to analysis.

Bivariate analyses should be conducted to assess each risk factor's association with elevated BLLs. Risk factors significantly associated with elevated BLLs are then evaluated separately in

multivariable analyses that include confounding variables and any interaction terms. To build a multi-variate model including all significant variables, use a selection strategy that adds 1 risk factor variable at a time to the most predictive model, including the *a priori* confounder variables, until all risk factors in the model are statistically significant.* Only statistically significant risk factors (at the $p < 0.10$ level) identified in the initial multivariable analysis should be included in the second multivariable analysis. The final model should only include age and risk factors significant at the $p < 0.05$ level. Variance inflation factors can be used to assess collinearity between variables in the predictive models.

Limitations

The prevalence studies outlined here are subject to a few limitations while working in the field. First, in many cases it may be difficult to enroll the necessary number of participants to meet the sample size. Furthermore, there may be selection bias among those who choose to enroll. If there is a particularly low response rate, it is possible that those that did choose to enroll had some external reason for doing so that may not be representative of the wider population. It is also possible that people will consent to completing the survey and environmental samples but not to blood draws from their children. This outcome will require more enrollees overall to ensure that enough blood samples can be obtained to meet the pre-determined sample size requirements.

Conclusion

Exposure to lead in the environment can negatively impact child development. This document outlines how to conduct a study to determine the extent to which children in a specific area are exposed and what are the most common sources of exposure. Using the information gained from these studies, public health authorities can then focus their efforts on eliminating the environmental exposures that pose the biggest risk and providing medical services for those children with elevated blood lead levels.

* This analysis can be done in SAS using the forward select option in PROC REG or PROC GLMSELECT.

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APPENDIX A: SUGGESTED LIST OF SUPPLIES

All supplies:

- 250 mL collection container
- Chain of custody form for gift cards
- Child questionnaire
- Consent form
- Daily household tracking form
- Dust Wipe Template – (100 cm²)
- Educational materials / Study flier
- Eligibility and non-response rate form
- Environmental sampling form and ID labels
- Gloves
- GPS Unit
- Healthy homes questionnaire
- Household questionnaire (including Environmental Observations list)
- Masking tape (for window sills)
- Measuring tape
- Pens
- Resident appointment notecards
- Dust Wipe Sample container
- Sample Wipes
- Soil Sample Container
- Spoon or sample shovel
- Stickers for children
- Study labels
- Trash bag
- Verbal script for consent for eligibility
- Photo release form
- Venous kit
- Cooler
- Biohazard sharps container

Questionnaire:

- Pens
- GPS Unit
- Verbal script for consent for eligibility

- Consent form
- Household questionnaire (including Environmental Observations list)
- Child questionnaire
- Healthy homes questionnaire
- Daily household tracking form
- Eligibility and non-response rate form
- Educational materials / Study flier
- Chain of custody form for gift cards
- Resident appointment notecards
- Study labels
- Stickers for children

Tap Water Sampling:

- Gloves
- Environmental sampling form and ID laboratoryels
- 250 mL collection container
- Trash bag

Wipe Sampling:

- Gloves
- Environmental sampling form and ID labels
- Sample Wipes (supplied by lab)
- Dust Wipe Template – (100 cm²)
- Masking tape (for window sills)
- Measuring tape
- Dust Wipe Sample container
- Trash bag

Composite Soil Sampling:

- Gloves
- Environmental sampling form and ID labels
- Spoon or sample shovel
- Soil Sample Container
- Trash bag

APPENDIX B: HOUSEHOLD VISIT PROTOCOL

I. Initial visit

1. Notate the cluster ID number, date and study team information on the Daily Household Tracking Form.
2. Visit the randomly chosen address in your cluster from the Address List (roster) provided to you in the morning.
3. Notate an outcome for the visit on the Daily Household Tracking Form. Remember to leave an appointment card at addresses where no one is home and the home appears to be occupied OR the occupied status is unknown (i.e. where we cannot ascertain eligibility).
4. Continue visiting addresses down the Address List and notate the outcome of each visit on the Daily Household Tracking Form.

II. First re-visit

5. Begin your first re-visit to the first address where your team left an appointment card following two successes (i.e., enrollment in study of two addresses) AND the passing of three hours after the first visit. Continue first re-visits down the Address List.
6. Two other circumstances that indicate the need for first re-visit are: 1) when we have visited a total of 10 addresses where we cannot ascertain eligibility; or 2) the passing of four hours from the beginning of the day with less than two successes (i.e., enrollment in study of less than two addresses).

III. Second re-visit

7. After completing all first re-visits, perform second re-visits of unsuccessful addresses one last time.

IV. Finishing the cluster

8. Your cluster is finished after you achieve your household sample size (i.e., 7 households) and you have revisited all addresses in need of re-visitation twice. You may enroll more than 7 households in your cluster if re-visitation causes this to happen.

APPENDIX C1: SAMPLE CONSENT FORM

This sample consent form is provided as an example only and should be adapted to local requirements and to fit the study protocol. For all studies, consent forms must be submitted and approved by an Institutional Review Board and/or regional Ethics Committee.

Community Childhood Blood Lead Prevalence Research Study

SAMPLE CONSENT FORM

Introduction

[Name of partners] are conducting a research study [dates of study period]. The purpose of this research is to develop better ways of determining possible lead exposure in young children in your community. It is possible to take steps to decrease the amount of lead to which a child is exposed including regularly mopping floors and cleaning windowsills, washing toys, washing your child's hands prior to eating and minimizing your child's access to peeling, flaking or chipping paint. Children with high lead levels can get medical care. The study will involve children ages 9 to 72 months [or the age range of interest] and their families. Participation takes approximately 1 hour.

Why we are conducting this research?

Elevated blood lead levels can be harmful to young children. Lead can affect a child's intelligence, growth, hearing, and can contribute to anemia (low blood). However early detection and medical treatment can prevent or lessen these negative effects. This research will help public health workers find the most efficient and accurate way to judge a community's risk for lead exposure. We will also look at home and yard environmental hazards that can potentially harm children and see if they can be used to predict the risk of elevated blood lead levels. Finally, we will also give/send you information on how to prevent future lead exposure.

What is involved in participation?

To reach the research goals, households will be asked to participate in four research activities:

1. Household questionnaire – this set of questions will ask about the home in which you live, basic information about yourself and your child(ren), and possible risk factors for lead poisoning.
2. Child questionnaire – this set of questions will ask basic information about each eligible child who joins the study.
3. Household lead sampling – samples of dust, soil and water will be taken from inside and outside your house. These samples will be analyzed for lead content. You will receive a

letter in the mail with the results of the environmental sampling for lead. You will not be charged any money for the testing.

4. Child blood lead level sample – we will take a small sample of blood from each eligible child’s arm (about 1-2 teaspoons). We will use new, sterile instruments that are clean and completely safe. The blood sample will be taken by a pediatric phlebotomist, nurse, or physician. Blood lead samples will be analyzed by the [local health department] laboratory. Following analysis, blood results will be reported back to you and blood samples will be destroyed. You will not be charged any money for the testing.

How was your household selected?

[Provide details on why this community was chosen for this study, e.g. there is a historical source of lead contamination] Your household was selected randomly from a list of households in your community.

What are the risks to participation?

The risks for participation in this research are minimal. During the blood test, your child may feel anxious and will feel a slight pinch, slight pain, or dizziness when the blood is drawn. Children may develop a slight bruise following the venous blood test and there is a very slight, and rare, risk of infection at the needle site. Also, answering some of the household questions may be uncomfortable for you.

What are the benefits to participation?

There is no direct benefit of this research for you or your child(ren). However, you will learn your child(ren)’s blood lead level and whether it is elevated so that you can seek medical treatment. You will receive the results of your child’s lead test within 2 weeks as well as additional educational handouts on lead poisoning prevention and healthy housing [If compensation will be provided: You will receive compensation to reimburse you for your time and effort in this project.]

What will happen if my child(ren) has/have been exposed to lead?

If your child has high lead levels, you should take your child to your pediatrician or a health clinic for a follow-up test. If your child’s test results show that your child needs medical care (a blood lead level equal to or above 10 µg/dL), he or she can receive medical care, through your regular health care provider. ***[Depending on local conditions, change BLL at which medical care will be provided and explain how follow up medical care will be provided and who will cover the costs, e.g.: You may also choose to use your own private pediatrician. If you choose to use your regular health care provider, you or your medical insurer will be responsible for the cost. Additionally, if your child has very high blood lead (equal to or above 25 µg/dL), the [local public health department] will help coordinate a home inspection for sources of lead, at no cost to you. Treatment costs for your child will not be covered by the study.]***

How is your privacy going to be protected?

The results of your child's test will be kept confidential to the extent permitted by law. The answers to our questions and your child's blood sample will be identified by using numbers. No names will be used on the blood samples or the questionnaires. ***[Depending on local conditions explain who will keep a list of children's names and addresses and for what purpose (follow-up, referral etc.), e.g.:*** However, if your child has a blood lead level equal to or above 10µg/dL, the local public health department will keep a master list of names to make sure all children receive case management services that need them. After the study, this master list will be destroyed. Any information that field team members view or hear about child abuse or intent to harm yourself or others will be reported to authorities, as required by law.]

What is the Lead Disclosure Rule? *[Note: this question is only relevant in the United States]*

According to the Federal Lead Disclosure Rule, if your house was built before 1978 and you own the home, you are required to disclose any lead dust and soil testing results and reports to buyers and renters before selling or leasing the property (including renewing or extending a lease). The lead dust and soil testing as part of this research study is covered by the disclosure rule. You should save the dust and soil testing reports from this research study. The reports may also be maintained by the [local public health department]. For more information visit: <http://www2.epa.gov/lead/real-estate-disclosure> or <http://www.hud.gov/lead>.

Do I have to participate?

You are free to have your family join this research project or not. If you choose not to join, you will not lose any of the health care services that you normally receive. You are free to stop participating in this study at any time. You may participate or not participate in any part of the research. You may elect not to answer any questions asked. If you don't want to participate in this study but would still like to have your child's blood lead tested you should contact your child's pediatrician.

What if I have questions?

If you have any questions about the study or about how you've been treated during the study, please call [contact information for study administrators] If you have questions about your rights as a participant in this research study, please call [contact information for local Human Subjects Review Board] if necessary leave a message, including your name and phone number, and someone will call you back as soon as possible.

You will be given a copy of this consent for your records.

Your Signatures:

I voluntarily agree to participate in the following components of the Community Childhood Blood Lead Prevalence Research Study (check all that apply).

- Household questionnaire
- Child questionnaire
- Household and yard lead sampling
- Soil samples from my yard can be stored for future analysis

Participant Signature/Mark _____
Date

Witness Signature/Mark _____
Date

I voluntarily agree to allow my child(ren) to participate in the following components of the Childhood Blood Lead Prevalence Research Study (check the box below).

- Child blood sample Please print: _____
Child Name (first, last)
- Child blood sample Please print: _____
Child Name (first, last)
- Child blood sample Please print: _____
Child Name (first, last)
- Child blood sample Please print: _____
Child Name (first, last)

Participant Signature/Mark

Date

Witness Signature/Mark

Date

Your address:

Street _____

City _____

ZIP code _____

GPS coordinates at front door of household: Latitude _____ Longitude _____

Directions to home:

Your phone number: _____

Your child's doctor's name: _____

Study ID assigned: _____

APPENDIX C3: EXAMPLE VERBAL SCRIPT FOR ELIGIBILITY AND NON-RESPONSE FORM

Hello, I am _____. I am working on a Child Health Study with the [public health department / organization]. We are working on this research study to better understand child blood levels in your community.

Before we can ask people to join the study we need to know some things. We need to know if you have children living here who are aged 9 to 72 months [or the age range of interest]. We also need to know if those young children have been living here for some time. These screening questions will take about 1 minute to answer.

You are free to answer or not answer these questions. If you qualify, I will tell you about the study and you can ask me some questions.

Is it okay if I ask you a few questions to see if you qualify to take part in this research study?

Yes No

ELIGIBILITY AND NON-RESPONSE RATE FORM

Screening statements/questions:

1. Is there a child between 9 and 72 months of age [or age range or interest] who lives in this household? Yes No

2. Has the child lived here for the previous 6 months [children who live in multiple households (i.e., are in shared custody arrangements) are eligible for study participation if they live in the household on average, 2 days per week]? Yes No

3. Are you the parent or legal guardian of the child or children? Yes No

4. Will you consider allowing your child (or children) to join in a study on the blood lead levels in children in this community? This will include taking a sample of your child's blood and testing it for lead and asking questions from a questionnaire. In addition, you will have dust, soil, and water samples gathered from your house and tested for lead. Yes No

Explain study:

Text: The [public health department / organization] want to find out how common childhood lead exposure is and where the lead exposure is coming from in this community. This will help us learn how severe the problem is and what steps need to be taken to address the problem. We also want to know about home environmental hazards that can potentially harm children and see how common they are in this community. To reach these goals, we will visit about [X] households with children in this community.

APPENDIX C4: EXAMPLE HOUSEHOLD QUESTIONNAIRE FOR BLOOD LEAD STUDY

(place label here)

TEAM ID: _____
 COMMUNITY AREA: _____

COMMUNITY CHILD LEAD PREVALANCE PROJECT HOUSEHOLD QUESTIONNAIRE

[Ask the participant if he/she has any questions or concerns before beginning.]

B. INTERVIEWER VISIT	
Questions	Coding categories
Date of interview	DAY MONTH YEAR <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
Name of interviewer	_____ (First and last name)

	Name	Date
		DAY MONTH YEAR
Field editor:	_____ (First and last name)	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
Data entry person:	_____ (First and last name)	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>

Was consent obtained?

- Yes
 No
 Don't know

(IF NO OR DON'T KNOW STOP QUESTIONNAIRE AND OBTAIN CONSENT)

First, I would like to ask for the first and last name(s) of your child(ren) who is/are providing us with blood samples.

Name of child 1: _____

Name of child 2: _____

Name of child 3: _____

Name of child 4: _____

B. RESIDENTIAL			
No.	Questions and filters	Coding categories	Skip to
001	What is the main language spoken in the house?	Spanish.....1 English.....2 Other.....3	
002	How many people live in the household (including all children and all adults)?	<input type="text"/> <input type="text"/> persons	
003	How many of these people are --less than 1 year old --1- 5 years old --6-14 years old --15 years old or greater	<input type="checkbox"/> <input type="checkbox"/> people less than 1 <input type="checkbox"/> <input type="checkbox"/> people 1-5 <input type="checkbox"/> <input type="checkbox"/> people 6-14 <input type="checkbox"/> <input type="checkbox"/> people 15 or greater	
004	What is the highest level of education the child's mother completed?	None 1 Eighth grade or less 2 Some high school 3 High school graduate or GED4 Some college or trade school 5 College or higher 6 Don't know.....7	

005	What is the highest level of education the child's father completed?	None 1 Eighth grade or less 2 Some high school 3 High school graduate or GED 4 Some college or trade school 5 College or higher 6 Don't know.....7	
006	What is the current ownership type of your home? <i>(Please read responses).</i>	Owner occupied 1 Rental 2 Public housing 3 Publicly subsidized (Section 8) 4 Other 5	
007	What type of dwelling is the home? <i>(Please read responses)</i>	Single family home 1 Multiple family home 2 2-Unit apartment (duplex) 3 > 2 unit apartment 4 Row home.....5 Other 6	
008	What year was the dwelling built?	Parent/guardian knows the exact year.....1 Year _____ Parent/guardian has a guess.....2 Year _____ Parent/guardian does not know.....3	
009	Has this home been remodeled inside or outside during the last 6 months?	Yes 1 No 2 Don't know 3	
010	Are any of your plates, bowls, cook pots or food storage containers made of ceramic or earthenware?	Yes 1 No 2 Don't know 3	

011	Do any of the adults in the household have a job that involves working with lead such as?	Smelting.....1 Auto repair.....2 Work on firing ranges.....3 Painting.....4 Manufacturing of ceramics.....5 Manufacturing of electrical components or electrical equipment.....6 Manufacturing of batteries.....7 Wire and cable production.....8 Pottery making.....9 Stained glass.....10	
012	Please specify who and what type of work (from question 011):	_____ _____ _____	
013	Does anyone in the home have one of the following hobbies?	Automobile repair.....1 Metal recycling.....2 Making fishing sinkers.....3 Stained glass.....4 Ceramics/pottery.....5 Shooting guns.....6 Jewelry making.....7 None of above.....8 If No go to \longrightarrow	015
014	Please write in which person in the family does which hobby from question 013.	Person: _____ Hobby: _____ Person: _____ Hobby: _____	
015	How is the drinking and cooking water collected for your household?	Public water system/piped municipal source.....1 From a well.....2 Rain water collection.....3 Other.....4 Please list: _____ Don't know.....5	

016	Do you wash or does your child wash his/her hands before he/she eats?	Yes, often.....	1
		Yes, sometimes.....	2
		Rarely.....	3
		No, never.....	4
		Don't know	5
017	How often is your home cleaned or swept?	Daily.....	1
		At least weekly.....	2
		At least monthly.....	3
		Less than once a month.....	4
		Never.....	5
		Don't know	6
018	How often do you paint the inside of your house?	More than once a year.....	1
		Once a year.....	2
		Every two years.....	3
		Every five years.....	4
		Don't remember.....	5
019	How often do you paint the outside of your house?	More than once a year.....	1
		Once a year.....	2
		Every two years.....	3
		Every five years.....	4
		Don't remember.....	5
020	How much time (in hours) does your child play outside on an average day?	My child plays outside ____ hours.....	1
		My child does not play outside.....	2
		Don't know.....	3

C. ENVIRONMENTAL OBSERVATIONS (For interviewer use ONLY)		
<i>This sheet is for the interviewer's environmental assessment of the home environment. Please complete after the interview. Please print.</i>		
No.	Environmental Assessment	Coding categories
001	Approximate the number of blocks the dwelling is located from a busy street or interstate.	No. of blocks: _____ Street or interstate name: _____
002	Describe the exterior of the dwelling.	Brick.....1 Cement or cement blocks.....2 Wood.....3 Siding.....4 Stucco.....5 Other.....6 Please describe: _____
003	Describe the exterior condition of the dwelling. (Paint peeling, etc.)	Intact.....1 Peeling.....2 Chipping.....3 Cracking.....4 Chalking.....5 Other.....6 Please describe: _____
004	Is there a porch?	Yes*.....1 No.....2 Don't know.....3 *If there is no porch go to question 006
005	Describe the condition of the paint on the porch	Intact.....1 Peeling.....2 Chipping.....3 Cracking.....4 Other.....5
006	Describe the conditions of the exterior windows of the dwelling.	Intact.....1 Peeling.....2 Chipping.....3 Cracking.....4

007	Describe the interior paint surfaces in the dwelling.	Intact.....1 Peeling.....2 Chipping.....3 Cracking.....4 Other.....5
008	Do you see any evidence of car repair or work on machinery in the yard (such as dismantled cars, old machinery or dismantled household appliances)?	Yes.....1 No.....2 Don't know.....3

APPENDIX C5: EXAMPLE CHILD QUESTIONNAIRE

CHILD QUESTIONNAIRE FOR BLOOD LEAD STUDY (place label here)

TEAM ID: _____
 COMMUNITY AREA: _____

COMMUNITY CHILD LEAD PREVALANCE PROJECT CHILD QUESTIONNAIRE

A. INTERVIEWER VISIT	
Questions	Coding categories
Date of interview	DAY MONTH YEAR <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
Name of interviewer	_____ (First and last name)

	Name	Date
		DAY MONTH YEAR
Field editor:	_____ (First and last name)	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
Data entry person:	_____ (First and last name)	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>

Was consent obtained?

Yes

No

Don't know

(IF NO OR DON'T KNOW STOP QUESTIONNAIRE AND OBTAIN CONSENT)

First, I would like to ask you a couple of questions about <INSERT NAME OF CHILD> who is providing us with a blood sample.

Name of child: _____

Age: _____ Birthday: (mo/day/yr): ___/___/___ Gender (circle one) M F

Name and contact information of <INSERT NAME OF CHILD>'s pediatrician:

B. GENERAL INFORMATION			
No.	Questions and filters	Coding categories	Skip to
001	Please describe your relationship to <INSERT NAME OF CHILD>	Grandfather 1 Father 2 Uncle 3 Brother 4 Grandmother 5 Mother 6 Aunt 7 Sister 8 Other relation 9 Unrelated 10 Legal Guardian 11	
002	What is the race of <INSERT NAME OF CHILD>? (Read from the list. More than one may be selected.)	Asian 1 Black or African American 2 White 3 Multi racial4 Other.....5 (specify) _____ Refused.....9	
003	Is <INSERT NAME OF CHILD> of Hispanic/Latino ethnicity?	Yes 1 No 2 Don't know 3 Refused.....9 If No, Don't know, refused →	005

004	What best describes your Hispanic/Latino ethnicity? <i>(Read from the list. More than one may be selected.)</i>	Dominican 1 Puerto Rican 2 Cuban American 3 Mexican 4 Other 5 (specify) _____	
005	Where was <INSERT NAME OF CHILD> born?	[Target Community].....1 Other2 Specify Location: _____ Don't know.....3	
006	Have you seen <INSERT NAME OF CHILD> eating/mouthing something that is not food? (Check only one)	Yes, often1 Yes, sometimes.....2 Yes, rarely.....3 No, never.....4 Don't know.....5 If No _____ →	008
007	If you answered “yes”, what was <INSERT NAME OF CHILD> eating or mouthing? (Check all that apply)	Dirt/soil1 Paints/paint chips.....2 Toys.....3 Jewelry.....4 Cosmetics.....5 Stones.....6 Other7 (please write in): _____	
008	Does <INSERT NAME OF CHILD> regularly consume any of the following: (Circle all that apply)	Formula.....1 Fresh milk (any animal).....2 Calcium supplements.....3 Iron supplements.....4 Other nutritional supplements/Vitamins.....5 None of the above.....6	

009	Has <INSERT NAME OF CHILD> been given home remedies, herbal remedies or folk medicines (such as azarcon and greta)?	Yes 1 No 2 Don't know.....3 <i>If No or Don't know</i> →	011												
010	What are these folk medicines, what do they treat, and where are they from?	<table border="1"> <thead> <tr> <th data-bbox="656 436 870 506">Medicine</th> <th data-bbox="875 436 1065 506">Treatment</th> <th data-bbox="1070 436 1313 506">Country of Origin</th> </tr> </thead> <tbody> <tr> <td>_____</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>_____</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>_____</td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>	Medicine	Treatment	Country of Origin	_____	_____	_____	_____	_____	_____	_____	_____	_____	
Medicine	Treatment	Country of Origin													
_____	_____	_____													
_____	_____	_____													
_____	_____	_____													
011	Does <INSERT NAME OF CHILD> have any symptoms related to asthma (such as shortness of breath, coughing, or wheezing)?	Yes 1 No 2 Don't know 3 Refused.....4													
012	Has a doctor or other health professional ever told you that <INSERT NAME OF CHILD> has asthma?	Yes 1 No 2 Don't know 3													
013	Is <INSERT NAME OF CHILD> currently receiving or has ever been received any of the following services? <i>(Circle all that apply).</i>	Government Medical Insurance (Medicaid) 1 Public Housing 2 Section 8 Voucher 3 Food Stamps 4 WIC 5 Other forms of public assistance 6 Other _____ (Please specify)													
014	Has <INSERT NAME OF CHILD> had a blood lead test in the past?	Yes 1 No 2 Don't know 3 <i>If No or Don't know go to question</i> →	016												

015a	Where did <INSERT NAME OF CHILD> receive a lead test?	Doctor's office.....1 Head Start Program.....2 Phil. Department of Public Health.....3 WIC.....4 Other5 Specify _____	
015b	Who recommended that <INSERT NAME OF CHILD> have his/her blood tested for lead?	A physician.....1 Head Stat Program.....2 School.....3 Other.....4 Specify _____	
016	Is <INSERT NAME OF CHILD> up to date on their vaccinations? (Please ask the mother/father to show the child's vaccine card, if available)	Yes, the child is up to date.....1 No the child is not up to date.....2 Don't know3 Refused.....4	
017	Does <INSERT NAME OF CHILD> currently spend more than 20 hours a week anywhere other than this home?	Yes,1 No2 Don't know3 Refused.....4 <i>If No or Don't know or Refused then END OF QUESTIONNAIRE</i>	
018	Where does <INSERT NAME OF CHILD> spend more than 20 hours a week?	Day care center.....1 Babysitter.....2 Home of relative3 Home of friend..4 School.....5 Other6	

APPENDIX C6: EXAMPLE HEALTHY HOMES QUESTIONNAIRE

HEALTHY HOMES QUESTIONNAIRE FOR BLOOD LEAD STUDY

(place label here)

TEAM ID: _____

COMMUNITY AREA: _____

COMMUNITY CHILD LEAD PREVALENCE PROJECT HEALTHY HOMES QUESTIONNAIRE

Healthy Homes Tool – <i>This sheet is for Health Homes inspection</i>			
Number	Questions and filters	Coding categories	Skip to
001	Pests Evidence of pests such as cockroaches, mice, or rats (For example: living pests, dead pests, droppings, or resident reports)	Yes.....1 No.....2 If NO skip to	005
002	Are there COCKROACHES in the home?	Seen on inspection.....1 Reported by participant.....2	
003	Are there MICE in the home?	Seen on inspection.....1 Reported by participant.....2	
004	Are there RATS in the home?	Seen on inspection.....1 Reported by participant.....2	
005	Are there SPIDERS, TERMITES, ANTS or BEDBUGS in the home?	Seen on inspection.....1 Reported by participant.....2	

006	During the past 6 monts, have you or an exterminator used any pest control measures (pesticides, traps, etc.) to control COCKROACHES, MICE, RATS, SPIDERS, TERMITES, ANTS or BEDBUGS in the household?	Yes.....1 No.....2 If NO skip to	008
007	If pest control measures have been used inside the home to control COCKROACHES, MICE, RATS, SPIDERS, TERMITES, ANTS or BEDBUGS in the household, which were they?	Sticky traps.....1 Snap traps.....2 Bait traps (Combat).....3 Boric Acid.....4 Gel.....5 Spray.....6 Chinese/Miraculous Chalk or Tempo.....7 Chemical poison.....8 Exclusion (by sealing cracks, holes, etc.)....9 Tres Pasitos.....10 Other.....11 (Write in): _____	
008	Does the household have a smoke alarm?	Yes, there is at least one working smoke alarm.....1 Yes, there is a smoke alarm BUT the smoke alarm does not work.....2 No smoke alarm.....3	
009	Does the home have a generator or other fuel burning device that uses natural gas, propane, wood, diesel, or coal?	Yes.....1 No.....2	
010	Does the household have a carbon monoxide alarm?	Yes, there is at least one working carbon monoxide alarm1 Yes, there is a carbon monoxide alarm BUT the carbon monoxide alarm does not work.....2 No carbon monoxide alarm.....3	

011	Has there been any flooding in the household during the past year?	Yes.....1 No.....2	
012	Did the household have water damage (other than flooding) such as minor plumbing leaks, water seeping through windows, or leaks from the roof during the past year?	Yes.....1 No.....2	
013	Does your household have a dirt, concrete, or finished basement?	Yes.....1 No.....2 If NO skip to	015
014	Does your basement get wet?	Yes.....1 No.....2	
015	Is there any mold within the household? This can be either reported by participant or seen on inspection by study team member.	No mold observed.....1 4 square feet or more of visible mold present.....2 (This can be mold on a ceiling, floor, or wall) If answer YES please write in the location of the mold _____	
016	Do you (the study team member) smell a musty odor anywhere in the home?	Yes.....1 No.....2 N/A.....3 (cannot smell due to cold or other respiratory problem)	
017	Does anyone smoke tobacco inside the home? (This includes hanging tobacco products out the window)	Yes.....1 No.....2	

018	Are there any pets living in the household?	Yes.....1 No.....2 If NO skip to	020
019	What type of pet(s) live(s) in the household?	Dog.....1 Cat.....2 Parrots.....3 Reptiles & Amphibians.....4 Pocket pets (guinea pigs, hamsters, rats).....5 Fish.....6 Other.....7 Specify _____	
020	Describe the conditions of the yard?	Bare Soil.....1 Grass Cover.....2 Cement/concrete.....3 Mix of bare soil and cover (eg grass/rubble/cement).....4 Does not have yard.....5 Other, please describe _____	
021	Do you have a garden in your yard?	Yes.....1 No.....2 N/A.....3 If NO skip to	END
022	How often do you garden in your yard?	Once a week or more.....1 Once every two weeks.....2 Other, please describe _____	
023	Have you added clean soil/mulch or other amendments to your soil?	Yes.....1 No.....2 N/A.....3	

APPENDIX C7: EXAMPLE DAILY HOUSEHOLD TRACKING FORM

Cluster: _____ Date: _____ Study Team: _____

				Outcome: (mark an 'x' and complete other appropriate information)							
	Address/House Number	Need to return Y/N	Time of visit (am/pm)	Vacant	Occupied but not at home (leave card)	Occupied with children 1-5 but refused	Occupied but no children 1-5	Occupied but no children 1-5 per neighbor	Occupied with children 1-5 enrolled in study	Occupied with children 1-5, told to come back later (note date/time)	Other (please specify)
House 1											
	1										
	1										
House 2											
	2										
	2										
House 3											
	3										
	3										
House 4											
	4										
	4										
House 5											
	5										
	5										
House 6											
	6										
	6										
House 7											
	7										
	7										

APPENDIX D: FREQUENTLY ASKED QUESTIONS

It may be beneficial to create an educational tool with frequently asked questions and answers that can be provided to parents during the field visits. The following list provides some frequently asked questions and answers. However, this list is not comprehensive and should be adapted for each study based on local conditions.

1. What is lead poisoning?
 - Lead poisoning occurs when lead builds up in the body. CDC recommends that that all sources of lead in children's environment be controlled or eliminated particularly for those with a blood lead level of 5 µg/dL or higher.
2. How are children exposed to lead?
 - Children may be exposed to lead from multiple environmental sources including lead paint, lead dust in the home, contaminated soil and contaminated water. Lead exposure may also occur through imported pottery, metal jewelry, toys, traditional medicines and some food items.
3. What are the symptoms of lead poisoning?
 - Lead poisoning does not have clear symptoms except for very high lead levels when lead can cause seizures, coma and death. However, even lower levels without symptoms are associated with decreased intelligence and delays in behavioral development.
4. Where does lead in my home come from?
 - Lead in homes may come from a number of sources including lead paint, contaminated soil, or contaminated water. In some areas, current or former industrial activities may contribute to lead in the environment.
5. Why are you only testing children?
 - Children are especially vulnerable to lead poisoning for several reasons:
 - i. Hand-to-mouth behavior and mouthing or eating non-food items increases the likelihood of young children ingesting lead.
 - ii. Children absorb ingested lead more readily than adults.
 - Lead in children is particularly harmful to their growth and development.
6. What can I do to prevent exposure to lead?
 - Make sure your child does not have access to peeling paint or chewable surfaces painted with lead-based paint.
 - Create barriers between living/play areas and lead sources.
 - Regularly wash children's hands and toys.
 - Regularly wet-mop floors and wet-wipe window sills and window frames.

- Make sure children wash their hands with soap and water before eating.
- Prevent children from playing in bare soil; if possible, provide them with sandboxes or other alternative play areas.
- Talk to your state or local health department or Health Ministry about testing paint and dust from your home for lead.
- Keep children out of a home with lead paint that is undergoing renovation.
- Prevent children from playing in or around former or active battery smelters, metal and e-waste recycling sites, and mining sites.
- Do not grow vegetables in or near sites that are or were formerly processing lead.

From: <http://www.cdc.gov/nceh/lead/tips.htm>

http://www.cdc.gov/nceh/lead/acclpp/lead_levels_in_children_fact_sheet.pdf

<http://www.cdc.gov/nceh/lead/publications/refugeetoolkit/pdfs/medicaltechnicalbrief.pdf>

APPENDIX E: LEAD AND HEALTHY HOMES EDUCATIONAL MATERIAL

1. CDC lead fact sheets (English and Spanish):

Know the Facts: A fact sheet with general lead poisoning prevention information.

[English](#) [PDF - 276 KB]

[en Español](#) [PDF - 220 KB]

5 Things You Can Do: A fact sheet with information on how to help lower elevated blood lead levels.

[English](#) [PDF - 186 KB]

[en Español](#) [PDF - 186 KB]

Are You Pregnant?: A fact sheet with lead poisoning prevention information for pregnant women.

[English](#) [PDF - 128 KB]

[en Español](#) [PDF - 86 KB]

2. Occupational Safety and Health Administration “If You Work Around Lead, Don’t Take It Home!” Fact Sheet:

[English](#) [PDF – 315 KB]

en [Español](#) [PDF – 282 KB]

3. ATSDR Lead FAQ Fact Sheet:

[English](#) [PDF – 185 KB]

[en Español](#) [PDF – 274 KB]

4. U.S. Department of Housing and Urban Development’s (HUD) Working Towards Healthy Housing (English):

http://portal.hud.gov/hudportal/documents/huddoc?id=DOC_11881.pdf

5. HUD’s 7 Steps Toward a Healthy Home (English):

http://portal.hud.gov/hudportal/documents/huddoc?id=DOC_11882.pdf

6. HUD Lead Fact Sheet Brochure

http://portal.hud.gov/hudportal/documents/huddoc?id=DOC_11875.pdf

7. EPA Renovation, Repair and Painting Program website:

<http://www2.epa.gov/lead/renovation-repair-and-painting-program>

8. EPA Renovate Right: Important Lead Hazard Information for Families, Child Care Providers, and Schools:

[English](#) [PDF – 7MB]

[en Español](#) [PDF – 2MB]

9. EPA Protect Your Family From Lead in Your Home:

[English](#) [PDF – 2MB]

[en Español](#) [PDF – 1.5MB]

10. EPA Steps to Lead Safe Renovation, Repair and Painting:

[English](#) [PDF – 5MB]

[en Español](#) [PDF – 2.3MB]

11. EPA Fight Lead Poisoning with a Healthy Diet (PDF) (English and Spanish):

[English](#) [PDF – 382KB]

[en Español](#) [PDF – 290KB]

12. HUD Lead and Healthy Housing Website (several useful documents) (English and Spanish):

http://portal.hud.gov/hudportal/HUD?src=/program_offices/healthy_homes/healthyhomes/lead

13. CDC Healthy Homes Publications:

[Coloring Book on Lead Poisoning Prevention \[PDF - 2.83 MB\]](#)

[Safety and Health in Manufactured Structures \[PDF - 2.92 MB\]](#) (2011).

[Healthy Homes Manual: Smoke-Free Policies in Multiunit Housing \[PDF - 7.35 MB\]](#) (2011).

[A Healthy Home for Everyone: The Guide for Families and Individuals \[PDF - 2.56 MB\]](#) (2010).

[The Surgeon General's Call to Action to Promote Healthy Homes](#) (2009).

14. HUD Help Yourself to a Healthy Home

[English](#) [PDF – 1.8MB]

[en Español](#) [PDF – 8.5MB]

APPENDIX F: EXAMPLE ENVIRONMENTAL SAMPLING FORM

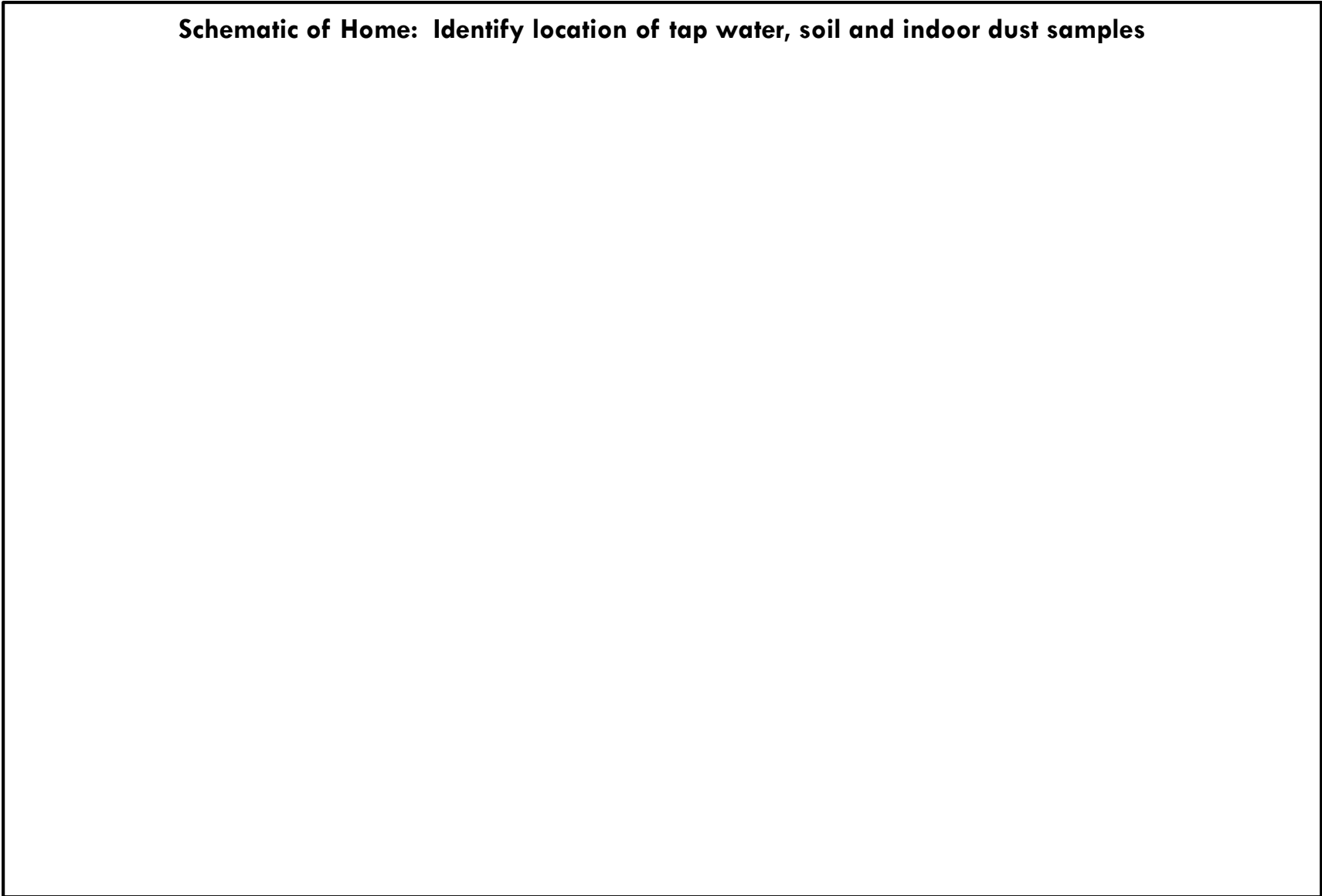
Lead Prevalence Site – Sampling Form

Location ID: _____ Date and Time _____ Sample Team: _____

GPS Coordinates at Front Door (note location if not at front door): _____

	Wipe Samples			Water Sample	Soil Sample
	Window Sill in Child's Room	Floor Near Front Door	Floor Where Child Plays	Tap Water	Composite Soil Sample
Sample ID					
Location (indicate on map on back of sheet)					GPS Coordinates:
Wipe Sample Surface (wood, linoleum, etc.)					
Wipe Sample Surface Area (cm ²)					
Notes					

Schematic of Home: Identify location of tap water, soil and indoor dust samples



APPENDIX G: DUST LEAD SAMPLE COLLECTION PROTOCOL

(<http://www2.epa.gov/sites/production/files/documents/ldstguide.pdf>)

Step One: Put on disposable shoe covers and lay out the sample area

- Clean template with a new wipe.
- Tape template to surface.
- If no template, outline with tape.
- Using tape to lay out the sample area, make sure that on floors the tape is laid in a square. On sills and troughs, the tape should be laid perpendicular to the sill.

Note: Use disposable shoe covers when walking between buildings and remove shoe covers before entering your vehicle to help minimize the spreading of settled lead dust from one location to another.

Step Two: Prepare the sample tubes

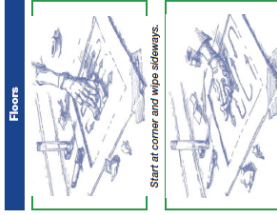
- Use clean tubes.
- Label tube with ID number.
- Record ID number on sample collection form and chain-of-custody form.
- Partially unscrew tube cap.
- Place tube near sample area.

Step Three: Put on clean gloves

- Use disposable gloves.
- Use new gloves for each sample.
- DO NOT touch anything except the wipe after putting on the gloves.

Step Four: Wipe sample area and place wipe in sample tube

- Do not touch other objects.
- Press the wipe down firmly at an upper corner of the sample area.
- Make as many "S"-like motions as needed to wipe the entire sample area. Do not cross the outer border of the tape or template.
- Fold the wipe in half, keeping the dirty side in, and repeat the wiping procedure in the original direction in a forward and back motion.



Note: Wipe in a forward and back motion, the wiping procedure, concentrating on collecting dust from the edges and corners of the sample area.

If the work area is a single room, hallway, or stairwell, or a smaller area, take:

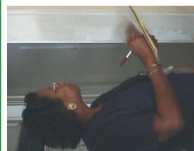
- One window sill sample and one floor sample.
- If the windows were not closed and covered with plastic during the renovation, also take one window trough sample.
- One floor sample adjacent to the work area, but not in an area that has been cleaned.

Equipment List

- Disposable lead dust wipes (individually wrapped)
- Disposable gloves
- Sample tubes with caps
- Re-usable templates
- Masking or painter's tape
- Ruler
- Sample collection forms
- Chain-of-custody forms
- Markers, trash bags, labels, pens, / re-sealable storage bags
- Calculator
- Sanitary wipes

Check with your laboratory for their sampling requirements

Visual Inspections



Lead dust clearance testing for both EPA's RRP Rule and HUD's LSHR requires a visual inspection as a first step in the clearance process:

- Under both HUD and EPA rules, the visual inspection is designed to determine if the area is free of visible dust and debris before lead dust clearance testing can begin.

In addition, under HUD's rule the visual inspection determines whether the unit/work area (interior and exterior) is clear of visible conditions that can result in exposure to lead-based paint hazards:

- Deteriorated paint
- Chips or debris
- Visible dust

Lead Dust Wipe Sampling

Single or composite samples can be taken; however, single-surface sampling is recommended to get results for specific surfaces. Use durable, re-usable 12" x 12" sampling templates, a disposable template, or use tape to lay out the sampling area.

What Is the Field Guide?

This guide will help determine that a recently-renovated area has been cleaned sufficiently. The Lead Dust Sampling Technician Field Guide should be used by lead dust sampling technicians. The guide provides protocols for conducting post-renovation clearance under EPA's Renovation, Repair, and Painting Rule (RRP) covering housing and child-occupied facilities built before 1978, and clearance examinations under HUD's Lead Safe Housing Rule (LSHR) in federally-assisted housing built before 1978. This guide also provides federal standards for maximum allowable contamination levels of residual lead dust.

How To Use This Guide

Take this guide with you on site when you perform clearance, including visual inspections. It serves as a quick reminder of:

- When and where to take lead dust clearance samples;
- The step-by-step instructions for taking a dust wipe sample; and
- EPA/HUD clearance standards for lead dust.

When To Perform Lead Dust Clearance Tests

Renovation activities that disturb lead-based paint can create lead dust so proper cleanup after these jobs is critical. The purpose of lead dust clearance is to determine if the area is safe for re-occupancy.

Lead dust clearance is performed:

- After renovation, repair, painting, and cleaning activities are finished in property built before 1978 and where children are assumed to spend time.
- After hazard reduction or maintenance activities in most federally-assisted properties built before 1978 that are covered by HUD's LSHR.

Lead dust sampling technicians should NEVER perform post-abatement clearance. (Abatement—as opposed to renovation, repair and painting—is a term used for the complete removal of lead.) When performing clearance, the lead dust sampling technician is required to bring a copy of his or her certificate of initial training to the worksite.

Where To Collect Samples for Lead Dust Clearances Tests

- If there is more than one room, hallway, or stairwell within the work area, take:
- One window sill sample and one floor sample within each room, hall way, or stairwell (no more than four rooms, hallways, or stairwells need be sampled).
 - If the windows were not closed and covered with plastic during the renovation, also take one window trough sample in each room, hall way, stairwell (no more than four need be sampled).
 - One floor sample adjacent to the work area, but not in an area that has been cleaned housing, take these samples if the work area is federally-assisted housing, otherwise, clear the whole unit.

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 Office of Pollution Prevention and Toxics
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Lead Dust Sampling Technician Field Guide

Useful Resources

National Lead Information Center
 1-800-424-LEAD (1-800-424-5323)
<http://www.epa.gov/lead/pubs/nlic.htm>
 For a wide range of lead information—from outreach brochures to technical reports—on lead-based paint in the home.

National Lead Laboratory Accreditation Program
<http://www.epa.gov/lead/pubs/nllaplist.pdf>
 For information on locating EPA-accredited labs.

Office of Pollution Prevention and Toxics
 U.S. Environmental Protection Agency
 1200 Pennsylvania Avenue, NW (7404T)
 Washington, DC 20460
 202-566-0500
<http://www.epa.gov/lead>

For information on EPA lead-based paint regulations.

Office of Healthy Homes and Lead Hazard Control
 U.S. Department of Housing and Urban Development (HUD)
 451 Seventh Street, SW
 Washington, DC 20410
 202-765-1785
<http://www.hud.gov/offices/lead>

For information on the HUD lead-based paint regulations and technical assistance in complying with the HUD regulations for HUD-funded work.

Step Four: (Continued)

- Fold the wipe again with the sample side folded in, and place the folded wipe into the sample tube.
- Cap the container. Discard the gloves into a trash bag.
- Label the centrifuge tube and record the dimensions of the sampling area.

Step Five: Measure the sample area

- Measure width and length (unless template was used).
 - Length of sill or trough between edges of tape
 - Width of sill or trough, measure at tape
- Measure to 1/8 inch.
- Do not remove tape until after measurements are taken.

Step Six: Record sample area dimensions on forms

- Calculate the sample area and record on sample collection form and laboratory chain-of-custody form.

Step Seven: Clean up

- Clean template with a clean wipe; place in a plastic bag for storage.
- Remove materials from site:
 - Gloves, tape from floors and windows, and used shoe covers
 - Put items in trash bag, NOT in client's trash containers
- Clean face and hands with warm, soapy water.
- Use sanitary wipes if you do not have access to warm, soapy water
- Send the samples to a laboratory recognized by the National Lead Laboratory Accreditation Program (NLLAP) as being proficient in lead in dust analysis. For information on locating EPA-accredited labs, visit <http://www.epa.gov/lead/pubs/nllaplist.pdf>.

Evaluate the Results

- Compare the laboratory results to the EPA clearance standards for maximum allowable residual lead dust provided below:
 - Floors: 40 micrograms per square foot ($\mu\text{g}/\text{ft}^2$)
 - Interior windowsills: 250 $\mu\text{g}/\text{ft}^2$
 - Window troughs: 400 $\mu\text{g}/\text{ft}^2$

These standards are for single-surface samples. The clearance standards for composite samples will be different depending on how many sub-samples are collected. Before collecting composite samples, check with your laboratory. Note that HUD discourages composite sampling when clearing federally-assisted housing.

Write the Report

- Use the standard report format.
- Sign the report.

