There are six steps to developing and implementing the statewide screening plan.

1. Form an advisory committee.

2. Assess lead exposure and screening capacity.

3. Determine the boundaries of recommendation areas.

4. Decide on appropriate screening.

5. Write screening recommendations for areas with universal screening and for those with targeted screening.

6. Implement the statewide plan.

Editor’s Note: In the rest of this chapter, we outline (on the left hand pages) the step-by-step process for developing and implementing a statewide screening plan and provide a discussion of those steps on the facing right hand pages.
1. **Form an advisory committee.**

State health officials should form an advisory committee to develop the statewide plan. The committee should include child health-care providers as well as representatives from local health departments, managed-care organizations, Medicaid, private insurance organizations, and the community.
The advisory committee

The statewide plan for childhood blood lead screening developed by the health department should, at a minimum, have the input of child health-care providers, insurers, and parents.

Involvement of health-care providers, their organizations, and managed-care organizations throughout the process will improve acceptance of screening recommendations. The importance of community collaboration in public health decision-making is underscored by community health research (e.g., Green and Kreuter, 1991). Studies (e.g., Greco and Eisenberg, 1993) also indicate that health-care providers respond well to information and recommendations that come from peers and from their organizations.

Working with insurers, especially the state Medicaid agency, will help ensure that screening is included, as appropriate, in contracts and policies.
2. Assess lead exposure and screening capacity.

2.1. Examine information on children’s risk for lead exposure.

2.1.1. Examine BLL data.
Exercise caution in using BLL data to assess risk for lead exposure, because these data may not reflect the risk of the entire population. If BLL data are not thought to be reliable, other data should be used (see following sections) until improved BLL data are available.

Use the following criteria to evaluate BLL data. Data should meet all of these criteria. If they do not, they are probably not an adequate basis for screening decisions.

<table>
<thead>
<tr>
<th>Criteria for evaluating BLL data</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Laboratory data are available for children who have been screened.</td>
</tr>
<tr>
<td>2. Laboratory data are of good quality.</td>
</tr>
<tr>
<td>3. Laboratory data are available for individual children.</td>
</tr>
<tr>
<td>4. Demographic, socioeconomic, and geographic data are available for individual children.</td>
</tr>
<tr>
<td>5. Screening data are representative of the pediatric population of the jurisdiction.</td>
</tr>
<tr>
<td>6. Screening data are available for a sample that is large enough to allow for a valid estimate of prevalence to be made.</td>
</tr>
</tbody>
</table>
Evaluating BLL data, additional considerations

- Labs reporting data should be successful participants in an approved proficiency-testing program.

- BLL test results should be maintained in a way that allows identification of duplicate and sequential tests on a single child. It must be possible to distinguish between number of children tested and number of tests performed.

- The results of all tests, regardless of BLL, should be available, so that calculation of rates of elevated BLLs among screened children can take place.

- The data should be representative, i.e., the demographic, socioeconomic, and geographic distribution of children screened should be similar to that of all children in the jurisdiction.

- Screening data that are not representative of the entire population, although not ideal, may be useful. For example, data showing low prevalence among those at highest risk would tend to support a targeted-screening recommendation; data showing high prevalence among those at lowest risk would tend to support a universal-screening recommendation (see Step 5).
2.1.2. Examine data on housing.

These data are widely available from the U.S. census and can be used to estimate potential lead-exposure risk in an area. If adequate BLL data are unavailable, housing data can be used alone. Data are available for states, counties, zip codes, census tracts, and census block groups.

The focus should be on housing built before 1950 because it poses the greatest risk for lead exposure.
Age of housing

Housing built before 1950 poses the greatest risk for lead exposure because it is much more likely to contain lead-based paint than is newer housing.

- Paint manufactured before 1950 has more lead than paint manufactured after that year (Lead-Based Paint Hazard Reduction and Financing Task Force, 1995).

- 27% of U.S. housing was built before 1950. Percentages of pre-1950 housing vary widely among states and counties.

- Data from the most recent National Health and Nutrition Examination Survey (NHANES III, Phase 2) confirm the relationship between housing age and BLLs (CDC, 1997).

Table 3.1. Percentage of children ages 1-5 years with BLLs $\geq 10 \ \mu g/dL$, by year house built, and geometric mean BLL, by year house built, U.S., 1991-1994

<table>
<thead>
<tr>
<th>Year house built</th>
<th>% with BLLs $\geq 10 \ \mu g/dL$</th>
<th>Geometric mean BLL ($\mu g/dL$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before 1946</td>
<td>8.6</td>
<td>3.8</td>
</tr>
<tr>
<td>1946-1973</td>
<td>4.6</td>
<td>2.8</td>
</tr>
<tr>
<td>1973 onward</td>
<td>1.6</td>
<td>2.0</td>
</tr>
</tbody>
</table>
2.1.3. Examine data on demographic characteristics of children.

The focus should be on poor children and children of racial/ethnic minority groups because generally they are at higher risk than other children.

Demographic data on children are widely available from the U.S. census and can be used to identify places with high proportions of children who may be at higher than average risk for lead exposure.
Data on demographic characteristics of children: race/ethnicity and income

Data from NHANES III, Phase 2, show strong relationships between BLL and race/ethnicity and between BLL and income.

Table 3.2. Percentage of children with BLLs $\geq 10 \mu g/dL$ by race/ethnicity and income, U.S., 1991-1994

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>% children, ages 1-5 with BLLs $\geq 10 \mu g/dL$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Race/Ethnicity</td>
<td></td>
</tr>
<tr>
<td>Black, non-Hispanic</td>
<td>11.2%</td>
</tr>
<tr>
<td>Mexican-American</td>
<td>4.0%</td>
</tr>
<tr>
<td>White, non-Hispanic</td>
<td>2.3%</td>
</tr>
<tr>
<td>Income</td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>8.0%</td>
</tr>
<tr>
<td>Middle</td>
<td>1.9%</td>
</tr>
<tr>
<td>High</td>
<td>1.0%</td>
</tr>
<tr>
<td>All children</td>
<td>4.4%</td>
</tr>
</tbody>
</table>
2.1.3. Examine data on demographic characteristics of children (continued).

The focus should be on children between the ages of 12 and 36 months (1- and 2-year-old children) because BLLs tend to be highest in this age group, and more children in this age group have BLLs $\geq 10$ µg/dL.

Examine census and local information to determine whether there are places with high percentages of young children. Estimates generated since the last U.S. census (conducted in 1990) are available to help identify these areas.
Data on demographic characteristics of children: age

Focus on children at ages 1 and 2.

One- and 2-year-old children are at greatest risk for elevated BLLs because of:
- Increasing mobility during the second year of life, resulting in more access to lead hazards.
- Normal hand-to-mouth activity.

In addition, the developing nervous systems of young children are more susceptible to the adverse effects of lead.

Data from NHANES III, Phase 2, reinforce the association between children’s age and their risk for elevated BLLs.

Table 3.3. Percentage of children ages 1-11 years with BLLs ≥10 µg/dL by age group, U.S., 1991-1994

<table>
<thead>
<tr>
<th>Age group (years)</th>
<th>% with BLLs ≥10 µg/dL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-2</td>
<td>5.9%</td>
</tr>
<tr>
<td>3-5</td>
<td>3.5%</td>
</tr>
<tr>
<td>6-11</td>
<td>2.0%</td>
</tr>
</tbody>
</table>
2.1.4. Examine data on the presence of other sources of lead.

Examine data from within the state on other sources of lead exposure, such as pottery, traditional remedies and cosmetics, operating or abandoned industrial sources, waste-disposal sites, occupational and take-home exposure, and drinking water. (See National Research Council, 1993, for a comprehensive discussion of sources and pathways of lead exposure.)

Data from local surveys may supply additional information about local sources of lead exposure. BLL surveillance data may also reveal the presence of unusual sources.
Other sources and pathways of lead exposure

Industries, work sites, occupations, and associated materials
Secondary smelting and refining of nonferrous metals
Brass/copper foundries
Firing ranges
Automotive repair shops
Bridge, tunnel, and elevated highway construction
Motor vehicle parts and accessories
Storage batteries (lead batteries)
Valve and pipe fittings
Plumbing fixture fittings and trim
Pottery
Chemical and chemical preparations
Industrial machinery and equipment
Inorganic pigments
Primary batteries, dry and wet

Hobbies and home activities
Recreational use of firing ranges
Home repairs, repainting, or remodeling
Furniture refinishing
Stained glass making
Casting ammunition
Making fishing weights or sinkers, or toy soldiers
Using lead solder (e.g., for electronics)
Using lead-containing artists’ paints or ceramic glazes
Burning lead-painted wood
Car or boat repair
2.2. Assess the capacity of local public health systems within the state to oversee and provide lead screening.

This assessment will be one basis for deciding whether to divide the state into areas with different recommended screening.

Examine local information about:
- Health department organization and capacity to oversee screening.
- Current screening activity.
- Capacity to collect and analyze screening data.
- Child health-care delivery systems and patterns.
- Enrollment of children in Medicaid managed care.
- Health department capacity to support private providers of screening.
- Health department capacity to provide screening for children without other access to care.
Information on local health systems

Some locales have long-standing, comprehensive childhood lead poisoning prevention programs with ties to managed-care organizations and support from providers. Other places have less experience, fewer allocated resources, and less provider involvement.

Information about local activities should be used to develop a plan that is responsive to local needs and respectful of local capacities.
3. **Determine the boundaries of recommendation areas.**

If necessary, subdivide the state into recommendation areas. A recommendation area is a geographic area for which a screening recommendation can be reasonably made.

Efforts should be made to draw boundaries so that recommendation areas are reasonably homogeneous both in magnitude of risk and in health-system capacity to provide screening.
Boundaries of recommendation areas

Some states have relatively widespread and homogeneous risk, while others have less risk or scattered pockets of risk. States also differ with regard to the capacity of local health systems to oversee and provide screening.

Universal screening is appropriate in areas with widespread risk. A state with widespread risk may comprise a single recommendation area with universal screening. Other states with less risk or scattered pockets of risk may be divided into different areas, some with universal screening and others with targeted screening.

Example: A state is divided into two recommendation areas: 1) a large city, designated as a universal-screening area because of its high percentage of older housing, and 2) the rest of the state, throughout which older housing is scattered, which is designated as a targeted-screening area. The large city’s health department, with its experienced lead program, will oversee screening in the city; the state health department will oversee screening in the rest of the state.
4. **Decide on appropriate screening.**

Choose universal or targeted screening for each recommendation area. Use the following table to guide decision making.

**Table 3.4.** Guidelines for choosing an appropriate screening recommendation

<table>
<thead>
<tr>
<th>% children, ages 12-36 months, with BLLs $\geq 10$ µg/dL</th>
<th>% housing built before 1950</th>
<th>Recommended screening</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\geq 12%$</td>
<td>----</td>
<td>universal</td>
</tr>
<tr>
<td>$&lt;12%$</td>
<td>$\geq 27%$</td>
<td>universal (or targeted--see discussion)</td>
</tr>
<tr>
<td>3-12%</td>
<td>$&lt;27%$</td>
<td>targeted</td>
</tr>
<tr>
<td>$&lt;3%$</td>
<td>$&lt;27%$</td>
<td>see discussion</td>
</tr>
<tr>
<td>unknown</td>
<td>$\geq 27%$</td>
<td>universal</td>
</tr>
<tr>
<td>unknown</td>
<td>$&lt;27%$</td>
<td>targeted</td>
</tr>
</tbody>
</table>
Cut-off points
These should be used as guides to decision making and should not inhibit, for example, universal screening at prevalences of elevated BLLs or older housing that are slightly lower.

12% prevalence: The vast majority of children in recommendation areas where less than 12% of children have BLLs ≥10 µg/dL will have BLLs below 20 µg/dL, the level requiring medical and environmental intervention. The members of CDC’s advisory committee reached substantial, although not unanimous, agreement on the 12% cut-off, which is also supported by a cost-benefit analysis.

27% pre-1950 housing: Housing data can be used as a proxy for BLL data; 27% of U.S. housing was built before 1950. (Bureau of the Census, 1992)

≥27% of housing pre-1950, but prevalence <12%:
• Universal screening should be recommended unless prevalence data are reliable and representative.
• If targeted screening is recommended, the condition of older housing stock should be monitored. Decline in housing conditions should trigger universal screening.

<3% prevalence: Where reliable BLL prevalence estimates are extremely low and exposure sources are demonstrably lacking, methods other than routine screening should be used. Examples of alternatives are periodic focused surveys, routine review of BLL lab data, and public health alerts about newly identified sources of lead exposure.

Note: Whenever a parent or a health-care provider suspects that a child is at risk for lead exposure, a BLL test should be performed regardless of health-department recommendation.
5. **Write screening recommendations** for areas with universal screening, and for those with targeted screening.

5.1. **Write a universal-screening recommendation.**

A sample:

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Using a blood lead test, screen all children at ages 1 and 2, and screen all children from 36-72 months of age who have not been screened previously.
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Implementation of universal screening is discussed in Step 6.