Inaccuracy in Parental Reporting of the Age of Their Home for Lead-Screening Purposes

Lea T. Schwab, MD, MS; James R. Roberts, MD, MPH; J. Routt Reigart, MD

Objective: To determine the proportion of children living in pre-1950 housing who are correctly identified by parental report as being at risk for lead poisoning.

Design: Cross-sectional survey of parents. Parents’ answers about the age of their home were compared with the age of the home found in tax assessor records.

Setting: The resident continuity clinic at an urban medical center and 4 private pediatric practices.

Participants: A convenience sample of 199 parents accompanying children to their 9-month to 2-year well-child care visits. All parents agreed to participate. Twenty-six were excluded because they lived outside the predetermined geographic area or because the age of their home could not be confirmed, leaving 173 in the sample.

Main Outcome Measure: We calculated the sensitivity of asking parents the age of their home in determining which children were at risk for lead poisoning because of residence in pre-1950 housing.

Results: According to tax assessor records, 42 children lived in or spent time in homes built before 1950. Of these 42 children, 22 of their parents reported this exposure when asked, for a sensitivity of 52% (95% confidence interval, 37%-67%). If a questionnaire was used to determine whether the child should be tested for lead poisoning, 20 of the 42 children who lived in older homes would not have been tested.

Conclusion: Asking parents about the age of their home is no better than chance at determining which children are at risk for lead poisoning because of residence in older housing.


LEAD IS a significant environmental toxicant that affects children. Health care providers can screen for lead poisoning by obtaining a blood lead level (BLL). The decision whether to obtain a BLL is often based on the parents’ response to questions about risk of lead exposure. Most lead risk assessment questionnaires require parental knowledge of the age of their home.1,2

Multiple studies3-10 have been done to investigate the sensitivity of the Centers for Disease Control and Prevention risk assessment questionnaire for predicting children with elevated BLLs. All but 1 of those3 reported that questions predicting elevated BLLs had a sensitivity of 60% to 70% or less. One reason for the low sensitivity of these questionnaires may be that parents cannot correctly answer the question pertaining to the age of their home. The main objective of this study was to determine what proportion of children who live in housing built before 1950 are correctly identified by parents.

METHODS

STUDY DESIGN

A cross-sectional survey was performed in Charleston, SC. Approximately 100 surveys were collected at the resident continuity clinic, and approximately 100 surveys were collected at 4 private pediatrician offices. The subjects were the adults accompanying children to their 9-month or 1- or 2-year well-child care visits.

SURVEY INSTRUMENT

The first 3 questions asked were the lead risk assessment questions published by the Centers for Disease Control and Prevention in 1997.3 Other questions are seen in Table 1. The primary investigator (L.T.S.) asked the questions and recorded the subjects’ answers.
All subjects provided informed consent. The institutional review board of the Medical University of South Carolina approved the study.

DATA ANALYSIS

After data collection was completed, investigators determined whether each home was built before or after 1950 using a database previously compiled from tax assessor records. When addresses were not found on the database, the age of the home was confirmed using tax assessor data that were accessible by the Internet (http://gisweb.charlestoncounty.org [accessed January 7, 2003]) or by speaking to the tax assessor. Children were excluded from the study if they did not live in the predetermined area (Charleston, Dorchester, and Berkley counties) or if the age of their home could not be verified. Parental responses to the survey were entered into a database using SPSS software, version 7.5 (SPSS Inc, Chicago, Ill). For question 1, an “I don’t know” answer was entered as a “yes.” This is because in clinical practice a BLL should be obtained if the parent answers “I don’t know” to any of the lead risk assessment questions.

STATISTICAL ANALYSIS

The sensitivity, specificity, positive predictive value, and negative predictive value for question 1 in determining which children lived in or regularly visited a home built before 1950 were calculated. The same analysis was repeated in various subgroups. For all comparisons, χ² test was used.

RESULTS

Of the 199 subjects who completed the survey, 26 were excluded because they did not live in the predetermined area (3 subjects) or because the age of their home could not be verified (21 subjects). Of the remaining 173 subjects (age range, 8-30 months), 51% were female. Fifty-six percent had Medicaid insurance, 46% lived in rented homes or apartments, and 98% were accompanied by their parent or primary guardian. Forty-two (24%) of the children had significant exposure to a home built before 1950.

The overall sensitivity, specificity, positive predictive value, and negative predictive value of parental report of the age of their home are seen in Table 2. Of the 42 children who lived in a home built before 1950, 22 of their parents accurately reported this exposure, for a sensitivity of 52% (95% confidence interval, 37%-67%). Of the 131 children who had no exposure to older homes, 108 of their parents accurately denied this exposure, for a specificity of 82% (95% confidence interval, 75%-89%). When the analysis was limited to only home addresses, the results did not change significantly (P>.28).

Families who rented their home were more likely to live in pre-1950 houses than families who owned their home (36% vs 14%; P=.002). There were no significant differences between homeowners and renters in the sensitivity of the question (P>.10).

Fourteen of the 32 parents of children with Medicaid insurance who lived in housing built before 1950 reported this exposure when asked, for a sensitivity of 44% (95% confidence interval, 27%-61%). In the privately insured group, the sensitivity was significantly higher at 80% (95% confidence interval, 55%-100%) (P=.02). The negative predictive value was higher in the privately insured group (P<.001).

The results of this study indicate that asking parents about the age of their home is no better than chance at determining which children are at risk for lead poisoning because of living in older housing.

COMMENT

The results of this study indicate that asking parents about the age of their home is no better than chance at determining which children are at risk for lead poisoning because of living in older housing.

Table 1. Parental Survey

<table>
<thead>
<tr>
<th>Question</th>
<th>Number of Subjects</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Does your child live in or regularly visit a house that was built before 1950?</td>
<td>199</td>
</tr>
<tr>
<td>2. Does your child live in or regularly visit a house built before 1978 with recent or ongoing renovations or remodeling (within the last 6 months)?</td>
<td>199</td>
</tr>
<tr>
<td>3. Does your child have a sibling or playmate who has or did have lead poisoning?</td>
<td>199</td>
</tr>
<tr>
<td>4. What is your relationship to the patient?</td>
<td>199</td>
</tr>
<tr>
<td>5. Are you the patient’s primary caregiver? If not, who is?</td>
<td>199</td>
</tr>
<tr>
<td>6. Does the patient have this medical insurance? [Show the name of the medical insurance for the patient that is on his or her record.]</td>
<td>199</td>
</tr>
<tr>
<td>7. Is the address that we have on file [show the person the address] the address where the child currently lives? If not, at what address does the child live?</td>
<td>199</td>
</tr>
<tr>
<td>8. In the house where the child lives, have you noted any areas of peeling paint? How much?</td>
<td>199</td>
</tr>
<tr>
<td>9. Does the child spend a significant amount of time (at least 5 hours a day, 5 days a week) at another house? If so, what is the address of that house?</td>
<td>199</td>
</tr>
<tr>
<td>10. What are the names of the child’s siblings and playmates?</td>
<td>199</td>
</tr>
</tbody>
</table>

Table 2. Sensitivity, Specificity, Positive Predictive Value, and Negative Predictive Value for Question 1 of the Screening Survey

<table>
<thead>
<tr>
<th>Analysis</th>
<th>All Addresses</th>
<th>Primary Residence Only</th>
<th>Renter Occupied</th>
<th>Owner Occupied</th>
<th>Medicaid</th>
<th>Private Insurance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prevalence, %</td>
<td>24</td>
<td>22</td>
<td>36</td>
<td>14</td>
<td>33</td>
<td>13</td>
</tr>
<tr>
<td>Sensitivity, %</td>
<td>52</td>
<td>53</td>
<td>52</td>
<td>54</td>
<td>44</td>
<td>80</td>
</tr>
<tr>
<td>Specificity, %</td>
<td>82</td>
<td>82</td>
<td>77</td>
<td>86</td>
<td>80</td>
<td>85</td>
</tr>
<tr>
<td>Positive predictive value, %</td>
<td>49</td>
<td>44</td>
<td>56</td>
<td>39</td>
<td>52</td>
<td>44</td>
</tr>
<tr>
<td>Negative predictive value, %</td>
<td>84</td>
<td>86</td>
<td>74</td>
<td>92</td>
<td>74</td>
<td>97</td>
</tr>
</tbody>
</table>

*Prevalence indicates the percentage of each category that lives in a pre-1950 home.
Medicaid recipients constitute a high-risk group for lead poisoning. The sensitivity of question 1 was significantly lower in children with Medicaid insurance vs those with private insurance (44% vs 80%). More children with Medicaid lived in rental property; however, this is probably not the cause of the low sensitivity, as renters who lived in pre-1950 housing were not less accurate in reporting than home owners who lived in pre-1950 housing.

Among our subjects, 24% of the houses were pre-1950. This prevalence of pre-1950 houses approximates the 27% threshold of pre-1950 houses recommended by the Centers for Disease Control and Prevention. This prevalence also is in the range in which risk factor determination is considered most useful in targeted screening. A higher prevalence calls for a universal screening strategy.

One limitation of the study is that the definition of “significant time” (at least 5 hours per day, 5 days per week) spent at nonhome addresses was somewhat arbitrary and may have caused us to miss children spending several hours per week at another home. However, the wording of the Centers for Disease Control and Prevention questionnaire does not specify what “regularly visit” implies; therefore, practitioners must decide whether to screen the child based on this question. An additional limitation was that all children living in mobile homes had to be excluded because the age of their home could not be verified.

This study provides evidence that reliance on risk assessment questions alone is inadequate to determine whether a child should be screened for lead poisoning.

Accepted for publication January 27, 2003.

This work was supported by a fellowship training grant (Dr Schwab) from the Health Resources and Services Administration, Rockville, Md.

This study was presented in part at the Pediatric Academic Societies Meeting; April 28, 2001; Baltimore, Md.

Corresponding author: James R. Roberts, MD, MPH, Department of Pediatrics, Medical University of South Carolina, 326 Calhoun St, PO Box 250106, Charleston, SC 29425 (e-mail: robertsj@musc.edu).

REFERENCES