American Healthy Homes Survey

Lead and Arsenic Findings

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ABSTRACT

The American Healthy Homes Survey (AHHS), conducted from June 2005 through March 2006, measured levels of lead, lead hazards, allergens, arsenic, pesticides and mold in homes nationwide. This report includes estimates of the prevalence and levels of lead in paint, dust and soil, and arsenic in dust and soil, both for all housing and for important subpopulations of housing defined by region, age, urbanization, presence of children under age 6, housing type, owned vs. rented, Government support, income, race and ethnicity. The report provides a comparison with the findings on the prevalence of lead-based paint and lead-based paint hazards from the National Survey of Lead and Allergens in Housing (NSLAH), conducted in 1998-1999.

Based on the survey results, it is estimated that 37.1 million homes (34.9%) have lead-based paint (LBP) somewhere in the building, of which 23.2 million (21.9% of all homes) have one or more lead-based paint hazards. Of homes with lead-based paint, 34.4 million (93%) were built before 1978. The prevalence of LBP and LBP hazards differs by region, with the highest prevalence found in the Northeast and Midwest. An estimated 3.6 million homes with children less than 6 years of age have one or more LBP hazards; this includes 1.1 million low income households (< $30,000/yr). Low income households had a higher prevalence of LBP hazards (29%) than higher income households (18%). Households receiving Government housing assistance had a lower prevalence of LBP hazards (12%) compared to those not receiving support (22%).

Less than 5% of homes nationwide are estimated to have detectable levels of arsenic in dust (detection limit is 5 $\mu g/ft^2$). The mean level of arsenic in soil nationwide, for homes with soil in the yard, is estimated as 6.6 ppm, with 11.6 million homes (11%) estimated to have soil arsenic levels of 20 ppm or greater.

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EXECUTIVE SUMMARY

The American Healthy Homes Survey (AHHS) was conducted from June 2005 through March 2006 to update the National Survey of Lead and Allergens in Housing (NSLAH), which was conducted 7 years earlier, in 1998-1999. AHHS measured levels of lead, lead hazards and allergens in homes nationwide, as did NSLAH. AHHS also surveyed additional potential health hazards such as arsenic, pesticides and mold. The present report includes estimates of the levels of lead in paint, dust and soil, and arsenic in dust and soil, both for all housing and for important subpopulations of housing defined by region, age, urbanization, presence of children under age 6, housing type, tenure, Government support, income, race and ethnicity. Because the AHHS was designed to ensure a high degree of comparability to NSLAH for lead, comparisons of AHHS and NSLAH lead estimates are provided in most cases. Results from the analyses of allergen, mold and pesticide samples will be presented in other reports and papers.

AHHS FINDINGS

Lead-Based Paint (LBP) in Housing

AHHS estimates that 37.1 million homes (35% of 106 million total housing units) have LBP somewhere in the building, down slightly from the NSLAH estimate of 37.9 million (40% of 96 million total housing units), see Table ES-1. Of 65.6 million homes built before 1978, when residential use of LBP was banned, 34.4 million (52%) have LBP compared to 35.9 million (54% of 65.9 million) in NSLAH, a decrease of 1.5 million in 7 years.

The incidence of LBP increases with the age of the housing, reaching 86% for homes built before 1940. Because it is older, a higher percentage of the housing stock in the Northeast and Midwest has LBP compared to the South and West. Of 16.8 million homes with children under the age of 6, 5.7 million (34%) have LBP, about the same incidence of LBP as in all homes. Poorer households have significantly more LBP (40%) than more affluent households (32.3%), as do single-family households (37.4%) compared to multifamily households (21.9%) and African American (45.3%) and Other Race (49.3%) households compared to White households (31.6%). No significant differences in LBP prevalence were found by tenure, urbanization, Government support of housing or ethnicity.

Significant Lead-Based Paint Hazards in Housing

A home is said to have a significant LBP hazard if it contains deteriorated LBP in greater than *de minimis* amounts[1], or has dust lead levels above the Federal threshold for floors or windowsills[2], or has bare soil lead levels above Federal thresholds[3]. AHHS estimates that 23.2 million homes (22%) have LBP hazards, also down slightly from the NSLAH estimate of 24.0 million (25%),

[1] Deterioration of more than 20 square feet (exterior) or 2 square feet (interior) of LBP on large surface area components (walls, doors), or damage to more than 10% of the total surface area of interior small surface components (windowsills, baseboards, trim). This definition is taken from Section 31.1350(d) of the Lead Safe Housing Rule (24 CFR Part 35), and is the same definition used in NSLAH.

[2] 40 $\mu g/ft^2$ for floors or 250 $\mu g/ft^2$ for windowsills.

[3] More than 9 square feet of bare soil with a lead concentration of 1,200 ppm or greater, or 400 ppm for bare soil in an area frequented by a child under the age of 6 years.

see Table ES-2. As in NSLAH, older homes have more LBP hazards (67% of homes built before 1940), as do homes in the Northeast and Midwest compared to the South and West. Of an estimated 16.8 million households with children under the age of 6, 3.6 million (21%) have LBP hazards; of 5.8 million households earning less than $30,000 per year with children under age 6, 1.1 million (20%) have LBP hazards. Clearly, homes with children do not differ from all homes in their likelihood of having LBP hazards, even when income is taken into account. In general, however, poorer households were significantly more likely to have LBP hazards (29%) than more affluent households (18%), as were single-family households (25%) compared to multifamily households (7%), and households not receiving Government support (22%) compared to those receiving Government support (12%). African American households were more likely (28%) to have LBP hazards than White households (20%), but the difference is only marginally statistically significant. No significant difference in incidence of LBP hazards was found by tenure, urbanization, or ethnicity.

By type of LBP hazard, AHHS found 15.3 million homes (14%) with significantly deteriorated LBP, 13.7 million with dust lead hazards (13%) and 3.8 million with soil lead hazards (4%), see Table ES-3. Note that some homes have more than one type of lead hazard. The comparable numbers from NSLAH were 13.6 million (14%) with significantly deteriorated LBP, 15.5 million (16%) with dust lead hazards and 6.5 million (7%) with soil lead hazards[4]. Thus, the modest drop in the total number of homes with LBP hazards (0.8 million) reflects larger drops in homes with lead dust hazards (1.8 million) and soil lead hazards (2.7 million), offset by an increase in homes with significantly deteriorated LBP (1.7 million). This suggests that, while the overall number of homes with LBP hazards has decreased only modestly in 7 years, there has been greater progress in reducing the number of homes with more than one type of hazard. This likely results in reduced overall exposure, because dust and soil are significant exposure pathways. It is also consistent with blood lead level data showing that children's blood lead levels declined from 1999 to 2006. According to NHANES data[5,6,7], the incidence of elevated blood lead (> 10 μg/dl) in children ages 1-5 declined from 1.6% in 1999-2002 to 0.6% in 2004-2006; the incidence of blood lead > 5 μg/dl declined from 9% to 4% in the same period.

Table ES-4 shows the prevalence of significant LBP hazards in housing, in both AHHS and NSLAH, by race, income and presence of a child under age 6. The only significant change noted is that the percent of White households with significant LBP hazards is lower in AHHS than in NSLAH. The reason for this is not known, although changing self-definitions of race could play a role.

[4] The number and percent of units with soil lead hazards in AHHS and NSLAH are not directly comparable because of differences in soil sampling strategy between the two surveys. However, even when the number and percent of units with soil lead hazards in AHHS are adjusted to compare better with NSLAH, there is still a substantial decrease in the incidence of soil lead hazards in AHHS as compared to NSLAH; see Appendix B for a full discussion.

[5] *Lead in the Blood of Children.* www.childstats.gov/americaschildren/phenviro3.asp (2009).

[6] *MMWR* Vol. 54, No. 20 (May 27, 2005).

[7] Mary Jean Brown (CDC), Personal Communication (July, 2009).

Similarities and Differences between AHHS and NSLAH Lead Estimates

As previously discussed, the AHHS results indicate modest progress in the 7 years since NSLAH in reducing the total number of homes with LBP and LBP hazards, although homes with multiple types of hazards have seen a larger decrease. Patterns of LBP and LBP hazards by region and age of housing are similar in the two surveys. Demographic and socioeconomic variables also exhibit similar general patterns in the two surveys. With respect to the likelihood of having LBP and/or LBP hazards in both surveys[8]:

- Single-family homes more likely than multifamily
- Low-income households more likely than higher-income
- Housing without Government support more likely than with Government support
- African American households more likely than White households

There are, however, a number of significant differences in detail between the two surveys. Tables ES-5 and ES-6 show differences between AHHS and NSLAH estimates for prevalence of LBP and LBP hazards, respectively, that are statistically significant at the 5% level ($p = 0.05$).

With respect to LBP prevalence, some of the differences shown in Table ES-5 appear to reflect incremental progress in reducing LBP over the 7 years between NSLAH and AHHS. Fewer housing units have both interior and exterior LBP, perhaps due to common lead hazard control actions, such as replacing windows, that remove some but not all of the LBP in a home. Fewer units have very high levels of lead in paint (10 mg/cm^2 or greater), perhaps reflecting hazard control actions directed to eliminating exterior LBP, which tends to have the highest levels of lead. The nationwide drop in the percent of housing units with LBP (as opposed to the absolute number) is due mainly to the approximately 10 million lead-free homes built between 1998 and 2005 (see Table ES-1), although demolition of older homes also contributed. The other statistically significant differences shown in Table ES-5 do not have immediately obvious explanations. The decrease in number and percent of White households with LBP, and the increase in number and percent of Other Race households with LBP, could be due in part to changing self-definitions of race. Other differences may be due to spurious statistical significance - at a significance level of $p = 0.05$, up to 5% of differences found to be statistically significant may not reflect true differences.

Turning to differences in significant LBP hazards, the large decrease in the percentage of multifamily units with LBP hazards is noteworthy, and is likely due to HUD's focus on lead hazard control in multifamily units, both Federally-assisted units to which the Lead Safe Housing Rule (24 CFR Part 35) applies directly and privately-owned units where a major effort to enforce

[8] Characteristic "A" is classified as "more likely" than Characteristic "B" if homes with Characteristic A have more LBP and more LBP hazards than homes with Characteristic B in both surveys, and the difference is statistically significant for at least one of LBP or LBP hazards in AHHS. For example, a higher percentage of African American households than White households had LBP (and also significant LBP hazards) in both NSLAH and AHHS. The difference was statistically significant for LBP in AHHS: 45.3% of African American households had LBP versus 31.6% of White households. Hence, African American households are classified as "more likely" than White households.

the 1018 disclosure rule[9] is in progress. Dust lead hazards have been significantly reduced nationwide, perhaps because of a focus on lead hazard control short of abatement (i.e., interim controls), which concentrates on cleaning, paint stabilization, and replacement of some key components, such as windows, without actually removing all LBP. The increase in significantly deteriorated LBP in housing built between 1960 and 1977, as compared to the NSLAH findings, could be due to greater relative aging in this group. As for LBP prevalence, the other differences in Table ES-6 do not have immediately obvious explanations.

Arsenic Findings

The AHHS provides the first statistically valid national estimates of the prevalence of arsenic in household dust and soil. The survey found that less than 5% of homes nationwide are estimated to have detectable levels of arsenic in dust (detection limit of 5 $\mu g/ft^2$). For arsenic in soil, 3,254 of 3,785 samples (86%) had detectable levels of arsenic (detection limit of 1 ppm). Table ES-7 shows estimates of the national mean level as well as differences by region and housing age. For samples below the detection limit, arsenic levels were calculated from raw analytical files provided by the laboratory. The mean level of arsenic in soil nationwide, for homes with soil in the yard, is estimated as 6.60 ppm. Arsenic levels increase with the age of the housing and are higher in the Northeast and Midwest than in the South and West, probably because housing in the Northeast and Midwest is older. However, both regional and age differences are much less pronounced for arsenic than they are for lead. Demographic and socioeconomic variables that are correlated with the incidence of LBP and LBP hazards are generally not important for arsenic, with the exception of household income. Unlike lead, high-income households have higher soil arsenic levels than low-income households, probably because they are more likely to have wooden structures, such as decks, that may be constructed of wood treated with chromated copper arsenate as a pesticide.

Homes with wooden structures in the yard were found to have higher levels of arsenic in soil, even though the soil samples for arsenic were generally not collected adjacent to wooden structures (if any). For example, 70% of homes with wooden structures have soil arsenic levels of 5 ppm or greater, while only 49% of homes without wooden structures have such levels; 16% of homes with wooden structures have soil arsenic at 20 ppm or greater, compared to 8% of homes without wooden structures. It should be noted that wooden structures were not tested in AHHS to determine whether they had been treated with arsenic-containing compounds.

The AHHS results have potentially important implications for regulation of arsenic in States. While there are no Federal regulatory limits on arsenic in soil, many States have established limits that vary widely. Of 19 States reporting residential action levels for soil in a 1998 survey[10], 12 were below the national mean level of 6.60 ppm arsenic in soil reported in AHHS. Only two had an action level greater than 20 ppm. Of 17 States reporting cleanup levels, only 1 exceeded

[9] Codified as Subpart A of 24 CFR Part 25, the disclosure rule requires lessors and sellers of residential housing to disclose known LBP hazards before entering into a lease or sale. HUD's Office of Healthy Homes and Lead Hazard Control (OHHLHC), in conjunction with EPA and the Department of Justice, is conducting enforcement of the disclosure rule. As part of settlements with large multifamily landlords found to have violated the disclosure rule, OHHLHC requires extensive lead-hazard control work to be conducted in the units.

[10] *Study of State Soil Arsenic Regulations.* Association for the Environmental Health of Soils. Amherst MA (1998).

20 ppm. AHHS estimates that 11.6 million homes (11%) have soil arsenic levels of 20 ppm or greater. Thus, the typical levels of arsenic actually found in soil across the U.S. are higher than many State regulatory limits.

AHHS DESIGN AND OPERATIONS

The target population for AHHS was all permanently occupied, non-institutional housing units in the U.S. in which children may live. Thus, vacant housing and seasonal housing, such as vacation homes, were ineligible for the AHHS, as well as any housing where children cannot reside, such as group housing and senior housing. Hotels/motels and military housing were also ineligible because of anticipated difficulties gaining access, although children may sometimes reside in such housing. . The target population contained approximately 106 million homes out of the estimated 124 million total housing units found in the 2005 American Housing Survey.

The survey design was a 3-stage cluster sample of the target population. The first stage consisted of 100 Primary Sampling Units (PSUs), which were Metropolitan Statistical Areas, single counties or groups of counties. The PSUs were randomly selected with probability proportional to population according to the 2000 Census. The second stage of sampling was to select segments from each PSU with probability proportional to the number of housing units. A segment typically consisted of several city blocks, although it could be much larger in rural areas. The number of segments in a PSU was usually 5, but ranged from 4-12 depending on the size (population) of the PSU. The third and final stage of sampling was to select a number of housing units in each segment at random. Four housing units per segment were selected in earlier PSUs and five in later PSUs. Ultimately, a sample of 2,224 housing units was drawn, from which 1,131 eligible homes were recruited and completed the survey. The principal reasons 49% of sampled homes did not complete the survey were ineligibility (10%), inability to contact a resident (10%) and refusal (23%). The NSLAH design was similar to AHHS, but the PSUs, segments and housing units selected were different.

Field operations began in late June 2005 and were completed in March 2006. A two-person team consisting of a trained interviewer and a State-certified Lead-Based Paint Inspector/Risk Assessor was dispatched to each PSU. The interviewer arrived first and spent 5 days locating, visiting and attempting to recruit and schedule the 16-25 selected housing units in the PSU, each of which had been mailed an advance letter explaining the survey and announcing the interviewer's visit. The advance letters contained a $10 bill to get the attention of the recipient and induce them to read the letter. An additional cash incentive of $130 (to be paid after completion of all sampling) was offered to households to induce them to participate in the survey. After 5 days, the Risk Assessor arrived in the PSU and began data collection with the interviewer in units already recruited. Between data collection visits, the interviewer continued to recruit additional units. The work in the PSU continued until data had been collected in all recruited units and no further units could be recruited. Total time in a PSU ranged from 2-3 weeks, depending on the number of units successfully recruited.

In each home, the interviewer conducted an inventory of rooms and then selected 4 in which sampling was to be conducted, one room at random from each of 4 room strata – kitchens, common living areas, bedrooms (children's only if present) and, all other rooms. If there was an

accessible basement used for habitation, the largest room in it was also selected. The interviewer administered a questionnaire to a household representative, entering all data into a tablet PC in which the questionnaire was programmed. The interviewer then collected vacuum dust samples for allergen and mold analysis from the floor of the home. Concurrently with the interviewer's activities, the Risk Assessor conducted lead testing in paint using a portable X-Ray Fluorescence (XRF) instrument, collected dust wipe floor samples for pesticides[11], lead and arsenic, and took soil samples in the yard for lead and arsenic. Data collection in a home took several hours, depending on the type and size of the home.

At the end of each day, lead testing data was downloaded from the XRF to the tablet PC and emailed, along with the questionnaire data, to QuanTech's offices. When work in a PSU was completed, the Tablet PC and all paper forms were returned to QuanTech. The Tablet PCs were then downloaded to provide a second copy of the data in addition to that sent by email. The XRF instruments were returned to the manufacturer for servicing between PSUs. The manufacturer downloaded all data from the instruments to provide a third copy of the XRF data. These redundancies in data handling ensured that no significant loss of data occurred in the AHHS.

Physical samples were stored in the PSU until all data collection was completed. Pesticide wipe samples were kept frozen in portable freezers provided to the field teams. Other samples were not frozen. At the end of activities in the PSU, all samples, with the exception of the pesticide wipes, were shipped to QuanTech's offices for inventory, data entry and transmittal to analysis laboratories. The pesticide samples were shipped frozen overnight to a laboratory designated by EPA.

[11] A random subsample of 500 housing units out of the 1,131 completed units were sampled for pesticides. See *American Healthy Homes Survey: a national study of residential pesticides measured from floor wipes.* Environ Sci Technol. 2009 Jun 15;43(12):4294-300.

Table ES-1. Prevalence of Lead-Based Paint (LBP) in AHHS (red) by Region and Housing Unit (HU) Age, with Comparisons to NSLAH (Statistically Significant Differences Highlighted)

HU Characteristic	*All HUs (000)*	*Number of HUs[a] with LBP (000)*			*Percent of HUs[b] with LBP (%)*			*HUs in Sample*
		Estimate	*Lower 95% CI[c]*	*Upper 95% CI*	*Estimate*	*Lower 95% CI*	*Upper 95% CI*	
Total Housing Units[a]	95,688	37,897	34,521	41,272	40%	36%	43%	831
	106,033	37,058	34,047	40,068	34.9%	32.1%	37.8%	1,131
Region:								
Northeast	19,290	10,600	8,306	12,895	55%	46%	64%	155
	20,190	10,121	8,722	11,519	50.1%	43.3%	57.0%	196
Midwest	22,083	11,748	10,546	12,950	53%	48%	59%	196
	23,994	9,358	7,924	10,791	39.0%	33.4%	44.6%	245
South	35,474	9,607	7,762	11,451	27%	22%	32%	277
	38,996	11,003	9,114	12,892	28.2%	23.2%	33.3%	440
West	18,841	5,942	4,747	7,137	32%	25%	38%	203
	22,853	6,576	5,345	7,808	28.8%	23.8%	33.8%	250
Construction Year:								
1978-1998	29,775	2,031	687	3,373	7%	2%	11%	220
1978-2005	40,458	2,675	1,458	3,893	6.6%	3.6%	9.6%	476
1960-1977	27,874	6,577	4,875	8,280	24%	18%	30%	267
	29,956	7,376	5,761	8,991	24.6%	19.5%	29.8%	306
1940-1959	20,564	14,171	12,203	16,139	69%	60%	77%	186
	18,117	11,921	10,645	13,197	65.8%	58.6%	73.0%	187
Before 1940	17,476	15,117	13,532	16,702	87%	82%	91%	158
	17,502	15,085	13,932	16,239	86.2%	79.7%	92.7%	162

[a] "Housing units" include permanently occupied, noninstitutional housing units in which children are permitted to live.
[b] All percentages are calculated with the "all HUs" on the left most column of each row as the denominator.
[c] CI = confidence interval for the estimated number or percent.

Table ES-2. Prevalence of Significant LBP Hazards in AHHS (red) by Region and Housing Unit (HU) Age, with Comparisons to NSLAH (Statistically Significant Differences Highlighted)

Characteristic	*All HUs (000)*[a]	*No. of HUs with Significant LBP Hazards (000)*			*Percent*[b] *of HUs with Significant LBP Hazards (%)*			HUs in Sample
		Estimate	*Lower 95% CI*[c]	*Upper 95% CI*	*Estimate*	*Lower 95% CI*	*Upper 95% CI*	
HUD Lead Safe Housing Rule: Significant LBP Hazards								
Total Occupied HUs	95,688 106,033	24,026 23,186	21,307 20,532	26,746 25,840	25% 21.9%	22% 19.4%	28% 24.3%	831 1,131
Region:								
Northeast	19,290 20,190	7,679 7,507	5,748 6,014	9,611 9,001	40% 37.2%	30% 29.7%	50% 44.7%	155 196
Midwest	22,083 23,994	7,250 6,398	6,402 5,257	8,097 7,539	33% 26.7%	29% 22.3%	37% 31.0%	196 245
South	35,474 38,996	6,191 6,067	4,964 4,454	7,419 7,680	17% 15.6%	14% 11.5%	21% 19.6%	277 440
West	18,841 22,853	2,906 3,214	1,856 2,202	3,956 4,225	15% 14.1%	10% 9.7%	21% 18.4%	203 250
Construction Year:								
1978-1998 1978-2005	29,774 40,458	1,042 1,083	169 453	1,915 1,713	3% 2.7%	1% 1.1%	6% 4.3%	220 476
1960-1977	27,874 29,956	2,340 3,415	1,445 1,899	3,235 4,930	8% 11.4%	5% 6.5%	12% 16.3%	267 306
1940-1959	20,564 18,117	8,826 6,999	6,720 5,391	10,933 8,607	43% 38.6%	33% 29.7%	53% 47.6%	186 187
Before 1940	17,476 17,503	11,818 11,689	10,045 10,425	13,591 12,954	68% 66.8%	57% 59.6%	78% 74.0%	158 162

[a] "HUs" include permanently occupied, noninstitutional housing units in which children are permitted to live.
[b] All percentages are calculated with total housing units (95,688) (106,033) as the denominator. Percentages may not total 100% due to rounding.
[c] CI = confidence interval for the estimated number or percent

Table ES-3. Prevalence of Significant Lead-Based Paint (LBP) Hazards in Housing Units by Type of Hazard (AHHS in RED; Statistically Significant Differences Highlighted)

Type of Hazard	*Number of HUs (000)*			*Percent of HUs (%)*		
	Estimate	*Lower 95% CI*	*Upper 95% CI*	*Estimate*	*Lower 95% CI*	*Upper 95% CI*
Significantly Deteriorated Lead Based Paint	13,634 15,331	10,928 12,784	16,341 17,879	14% 14.5%	11% 12.1%	17% 16.8%
Interior Lead Dust	15,468 13,740	12,982 11,776	17,954 15,704	16% 13.0%	14% 11.2%	19% 14.8%
Soil Lead Hazard[12]	6,460 3,848	3,122 2,235	9,799 5,461	7% 3.6%	3% 2.1%	10% 5.2%
Any LBP Hazard	24,026 23,186	21,306 20,532	26,746 25,840	25% 21.9%	22% 19.4%	28% 24.3%

[12] See footnote 4 and Appendix B for a discussion of differences in the incidence of soil lead hazards between NSLAH and AHHS.

Table ES-4. Prevalence of Significant Lead-Based Paint (LBP) Hazards in Housing Units by Race, Income and Presence of Children Under Age 6 (AHHS in RED; Statistically Significant Differences Highlighted)

Characteristic	*All HUs (000)*	*No. of HUs with Significant LBP Hazards (000)*			*Percent of HUs with Significant LBP Hazards (000)*			*HUs in Sample*
		Estimate	*Lower 95% CI*	*Upper 95% CI*	*Estimate*	*Lower 95% CI*	*Upper 95% CI*	
Race:								
White	77,005	19,089	16,475	21,703	25%	21%	28%	622
	82,739	16,778	14,533	19,022	20.3%	17.7%	22.8%	868
African American	10,365	2,969	1,807	4,131	29%	17%	40%	116
	13,161	3,727	2,455	5,000	28.3%	20.6%	36.1%	151
Other	6,571	1,496	672	2,321	23%	10%	35%	77
	10,134	2,681	1,863	3,499	26.5%	19.8%	33.1%	112
Refusal/Don't Know	1,746	472			27%			16
Imputed[1]								2
Household Income:								
Less than $30,000/year	33,830	12,007	9,336	14,679	35%	28%	43%	309
	37,059	10,635	8,827	12,443	28.7%	24.2%	33.2%	401
$30,000/year or more	56,111	10,464	8,250	12,678	19%	15%	23%	482
	68,975	12,551	10,027	15,075	18.2%	14.7%	21.7%	730
Refusal/Don't Know	5,747	1,555			27%			40
Imputed[1]								70
One or More Children Under Age 6:								
All Income Categories	16,402	4,155	2,948	5,363	25%	18%	33%	184
	16,833	3,585	2,205	4,966	21.3%	13.1%	29.5%	207
Less than $30,000/year	4,791	1,201	600	1,801	25%	13%	38%	61
	5,781	1,138	510	1,765	19.7%	8.8%	30.6%	74
$30,000/year or more	11,236	2,860	1,763	3,957	25%	16%	35%	117
	11,052	2,447	1,330	3,564	22.1%	12.6%	31.7%	133
Refusal/Don't Know	375	94			25%			6

[1] "Refusal/Don't Know" responses were imputed in AHHS based on Census Block data for Race and Income.

Table ES-5. Statistically Significant Differences in Estimates of LBP Prevalence (p=0.05) between AHHS and NSLAH		
Estimate (Housing Units with LBP)	**AHHS**	**NSLAH**
Percent of Housing Units (Nationwide)	34.9%	40%
Percent of Housing Units in the Midwest	39.0%	53%
Number of Housing Units in the Midwest	9,358,000	11,748,000
Number of Housing Units in the South Built 1960-1977	3,241,000	1,914,000
Percent of Housing Units Built 1960-1977 with Children Under 6	34.2%	17%
Percent of Owner-Occupied Units	33.3%	38%
Percent of White Households	31.6%	40%
Number of White Households	26,105,000	30,945,000
Percent of Households of Mixed or Other Race	49.3%	29%
Number of Households of Mixed or Other Race	4,996,000	1,913,000
Number of Housing Units with Both Interior and Exterior LBP	16,203,000	20,260,00
Percent of Housing Units with Both Interior and Exterior LBP	15.3%	21%
Percent of Housing Units with LBP $\geq$ 10 mg/cm^2	6.0%	14%

Table ES-6. Statistically Significant Differences in Estimates of Prevalence of Significant LBP Hazards (p=0.05) between AHHS and NSLAH		
Estimate (Housing Units with LBP Hazards)	**AHHS**	**NSLAH**
Percent of Housing Units in the Midwest	26.7%	33%
Percent of Multifamily Units	7.4%	19%
Percent of White Households	20.3%	25%
Percent of Housing Units with Significant LBP Hazards Interior and Exterior	6.2%	9%
Percent of Housing Units with Dust Lead Hazards	13.0%	16%
Percent of Housing Units Built 1960-1977 - Sig. Deteriorated LBP	6.1%	2%
Number of Housing Units Built 1960-1977 - Sig. Deteriorated LBP	1,822,000	610,000
Percent of Housing Units Built 1940-1959 with Soil Lead Hazards[13]	4.8%	12%
Number of Housing Units Built 1940-1959 with Soil Lead Hazards	877,000	2,562,000

[13] See footnote 4 and Appendix B for a discussion of differences in the incidence of soil lead hazards between NSLAH and AHHS.

Table ES-7. AHHS Mean Soil Arsenic Levels (ppm)			
Characteristic	***Soil Arsenic***		
	Mean	***Lower 95% CI***	***Upper 95% CI***
All Occupied HUs	6.60	5.87	7.33
Northeast	8.73	7.30	10.17
Midwest	7.82	6.01	9.63
South	5.32	4.37	6.28
West	5.55	3.89	7.21
1978-2005	5.62	4.59	6.64
1960-1977	6.35	5.24	7.45
1940-1959	7.04	5.55	8.52
Before 1940	8.65	7.48	9.81

INTRODUCTION AND REPORT ORGANIZATION

The American Healthy Homes Survey (AHHS) is an update to the National Survey of Lead and Allergens in Housing (NSLAH) [1] conducted in 1998-1999. Sponsored by the U.S. Department of Housing and Urban Development (HUD) and the Environmental Protection Agency (EPA), the primary focus of the AHHS was to monitor changes in the prevalence of lead-based paint (LBP) and LBP hazards in homes over time and to refine HUD's understanding of certain patterns identified in the NSLAH. As in the NSLAH, the AHHS incorporated the collection and analysis of settled dust samples for important residential allergens; however, the AHHS also included the analysis of arsenic in dust and soil samples and the sampling of a subset of homes for pesticide residues. The design of the AHHS was intended to maximize comparability of the two surveys where appropriate (e.g., environmental sampling methodologies), while reflecting significant scientific and technological advances and evolution of the specific housing conditions of greatest interest to HUD.

Tables of estimates are provided throughout this report. Some of these tables are large, spanning multiple pages. In order to improve the readability of the text, starting with Section 3.0 all tables introduced in a section have been placed at the end of that section.

Note: Unless otherwise noted, a**ll statements of statistical significance in this report are at the 5% level (p = 0.05)**.

The following threshold values for lead in various media were used during this study and are referenced throughout the document:

Substrate	***Threshold***	***Reference***
Paint (by XRF)	1.0 mg/cm^2	24 CFR Part 35.1320
Dust Floor Window Sill	 40 $\mu g/ft^2$ 250 $\mu g/ft^2$	24 CFR Part 35.1320
Bare Soil Non-play areas Play areas	 1,200 ppm (per 9 ft^2) 400 ppm (per 9 ft^2)	24 CFR Part 35.1320

1.0 SURVEY DESIGN AND OPERATIONS

1.1 Objectives of Sampling in the American Healthy Homes Survey

One of the two primary objectives of sampling in the AHHS was to provide statistically valid national estimates of the number and percent of homes in the U.S. with lead-based paint (LBP) and lead-based paint hazards (the other primary objective, estimation of the levels of specified allergens in dust in homes, is the subject of a separate report [2]). The Federal Government has a goal of eliminating childhood lead poisoning as a significant public health problem. Comparing the AHHS estimates (2005-2006) to similar estimates from the NSLAH provides an indication of progress toward the closely related goal of reducing the prevalence of LBP hazards in U.S. housing. Estimates and comparisons are also desired for important subpopulations of housing, categorized by variables such as presence of children; single- versus multifamily; owner- versus renter-occupied; housing age and geographic location; socioeconomic status, race and ethnicity of the household; urbanization; and, resident behavior.

Dust wipe and soil samples taken in the AHHS were analyzed for arsenic (As) as well as for lead. Thus, in addition to the lead-related estimates described above, this report also presents the first statistically valid national estimates of the levels of As found in interior household dust and exterior soil in U.S. housing. Estimates for subpopulations similar to those for lead are also presented.

1.2 AHHS Sample Design

The AHHS was conducted in a nationally representative sample of all permanently occupied, non-institutional housing units in the U.S. in which children may live. Thus, vacant housing and seasonal housing, such as vacation homes, were ineligible for the AHHS, as well as any housing where children could not reside, such as group housing and senior housing. Hotels/motels and military housing were also ineligible due to anticipated accessibility difficulties, although children may sometimes reside in such housing.

The AHHS sample was a three-stage, stratified cluster sample of all eligible housing units [3, 4]. The first stage of sampling consisted of 100 Primary Sampling Units (PSUs). The PSUs selected consist of Metropolitan Statistical Areas (MSAs), a single county, or groups of contiguous counties. Each PSU had a minimum population of 15,000 based on the 2000 Census and a maximum end-to-end distance of 100 miles, generally. With one exception (the District of Columbia and Virginia suburbs PSU), PSUs did not cross state boundaries or census tracts. Each MSA that consists of primary metropolitan statistical areas (PMSAs)[14] was divided into several PSUs based on PMSA boundaries. The PMSAs were defined by the Census Bureau and are based on commuting patterns within an MSA. In addition, because of their size, the Chicago and New York City PMSAs were further subdivided into two and three PSUs, respectively. MSAs containing no PMSAs were treated as a single PSU, unless the distance was too long or the traffic within the MSA was known to be heavy. In these cases the MSA was split into two PSUs.

[14] See www.census.gov/population/www/estimates/aboutmetro.html

A sample of 100 PSUs was drawn from a sampling frame consisting of 1,884 PSUs that completely covered the continental United States, plus Alaska and Hawaii. Every county in the United States was assigned to a PSU, so that every area in the country was provided a chance of selection and the 100 PSU sample represented the entire U.S. housing unit population. The distribution of the PSU frame by census region, MSA status, and size is given in Tables 1-1 and 1-2.

Table 1-1. Distribution of PSU frame by Region and MSA Status

Region	***Non-MSA***	***MSA***	***Total***
North East	88	55	143
Mid-West	510	100	610
South	695	158	853
West	204	74	278
Total	1,497	387	1,884

Table 1-2. Distribution of PSU frame by Geographic Characteristic

Characteristic	***Mean***	***Median***	***1st Quartile***	***3rd Quartile***	***95th Percentile***
Distance (miles)	62.4	49.3	38.3	69.3	127.7
Area (square miles)	2010	900	572	1716	5660
Number of counties	1.7	1.0	1.0	2.0	4.0

The frame of 1,884 PSUs was stratified by census division, metropolitan-area status (MSA vs. non-MSA), per capita income, percentage Hispanic, and percentage non-Hispanic black into 100 strata, of which 16 were certainty PSUs (selected with probability 100%) by virtue of their size. The remaining 84 noncertainty strata were created by first forming 17 major strata defined by census division and MSA status. Within each of the 17 major strata, substrata were created based on per capita income, percentage Hispanic, and percentage non-Hispanic black from the 2000 Census. The number of substrata created in each major stratum was proportional to the population in the major stratum. The goal was to keep the 84 strata as equally sized as possible. In each of the 84 noncertainty strata one PSU was selected with probability proportional to 2000 Census population, resulting in a sample of 100 PSUs. Stratification by census division and MSA status ensures representation of the full range of climate conditions and housing unit age across the United States. A map of the 100 PSUs is shown in Figure 1-1.

The second stage of sampling, within PSUs, was at the segment level. A segment consists of a Census block or set of geographically close blocks. Typically, a segment is part, often approximately half, of a Census Block Group, and consists of several city blocks. An average of 5 segments per PSU were selected, with probability proportional to the number of housing units in the segment, as reported in Census 2000**,** for a total of 500 segments**.** The typical PSU had 5 segments, but many smaller PSUs had only 4 and a small number had 6 or more, up to a maximum of 12 segments in the largest PSU, Los Angeles County, CA. The average number of housing units in an AHHS segment was 174, with a minimum of 60, a maximum of 2,545 and a median of 98.

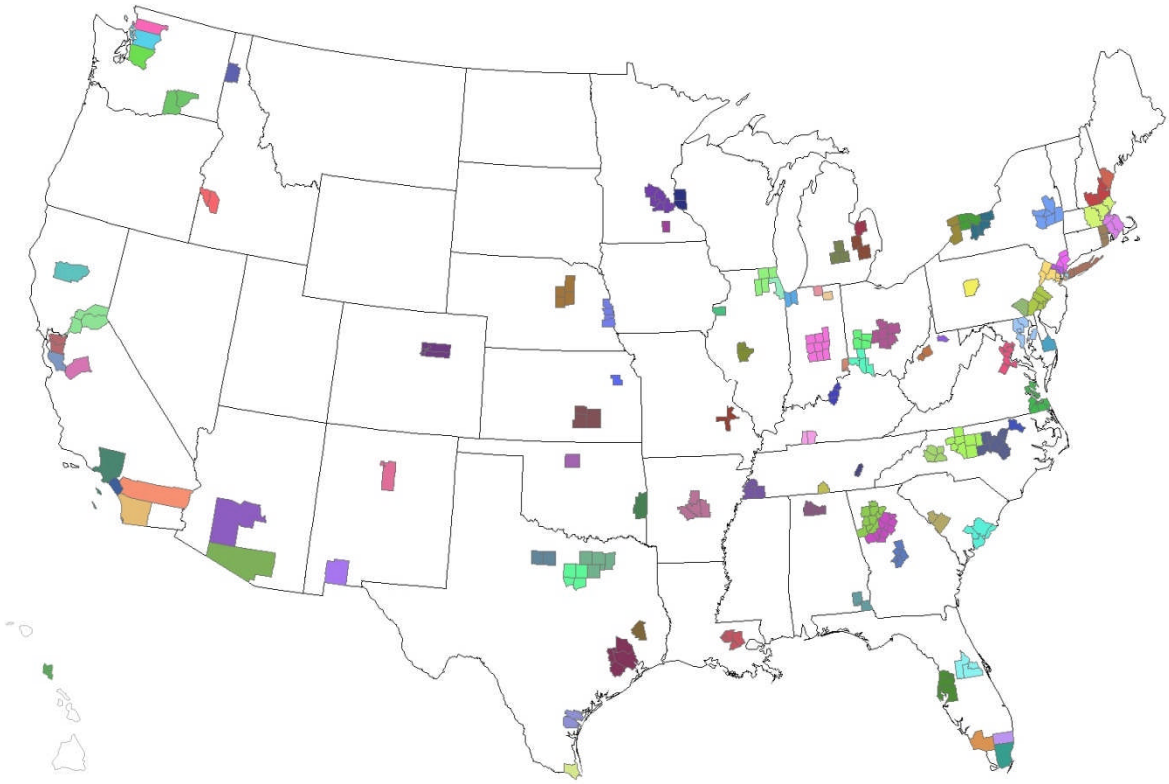

Figure 1-1. Map of 100 AHHS PSUs (Colors Used to Distinguish Contiguous PSUs)

The third stage of sampling was the selection of a systematic (equal probability) sample of 6 housing units within each segment. Before this sample could be selected, each segment was visited and all potentially eligible housing units in the segment were listed. Three of the segments turned out to consist entirely of ineligible housing, one a military base and the other two senior housing. This left a total of 497 segments that were listed and sampled in AHHS.

Segments with more than 300 housing units were considered too large to list. Such segments were divided into subsegments, called “chunks”. A chunk was then selected with probability proportional to the number of housing units and the selected chunk was listed and sampled. A total of 56 segments were chunked. The average number of potentially eligible housing units in the 497 segments was, after chunking, 119, with a minimum of 24, a maximum of 421 and a median of 98. The NSLAH design was similar, but had 75 PSUs, 10 segments per PSU and an average of 53 housing units per segment.

The AHHS was reviewed for human subject involvement by the Westat Institutional Review Board (IRB), and approved November 9, 2004. A Confidentiality Certificate protecting the identity of the survey respondents was issued to QuanTech by the National Institute of Environmental Health Sciences on February 22, 2005. The AHHS information collection was

approved by the Office of Management and Budget (OMB), in accordance with the Paperwork Reduction Act, on May 31, 2005 (OMB No. 2539-0021).

1.3 Field Work

The target minimum sample size for the AHHS was 1,080 housing units nationwide. Experience from the prior NSLAH survey suggested that approximately 90% of the sampled housing units would actually be eligible for the AHHS, and of these 90%, approximately 60% would complete the survey, for an overall completion rate of 54%. Thus, it was expected that a sample size of 4 housing units per segment in each of the 497 segments would result in an overall sample of approximately 1,080 completed units. Accordingly, 4 of the 6 selected housing units in each segment (designated M1-M4) were randomly assigned to be released for recruiting, with the other 2 (designated R1 and R2) kept as reserves. Operationally, the survey was conducted in 11 rounds of sampling between June 2005 and March 2006. To the extent feasible, we avoided sampling in colder climates from December through March. The number of PSUs in each round varied depending on the availability of field staff, but the typical round had 10 PSUs. After the completion of Round 4, at which point 46 PSUs had been completed, it was decided to increase the number of housing units recruited from 4 to 5 per segment to ensure that the target of 1,080 would be reached. Thus, in Round 5 and subsequent rounds (54 PSUs), the housing unit designated R1 was released for recruiting in addition to M1-M4.

The field team in each PSU consisted of a trained interviewer and a technician certified as a Lead Based Paint Inspector/Risk Assessor in the State where the PSU was located. The interviewer traveled to the PSU first and spent approximately 5 days locating and visiting the housing units released for recruitment in each segment of the PSU. All housing units released for recruitment were mailed an advance letter approximately 1 week before the interviewer traveled to the PSU. The advance letter explained the purpose of AHHS and contained a $10 bill to attract the interest of the recipient and increase the likelihood the letter would be read[15]. The advance letter explained that the resident would be paid an additional incentive of $130 for completing the survey. For each released housing unit, a recruitment questionnaire [4] was completed, on which the eligibility and recruitment status of the housing unit was recorded. If contact was established with a resident, a set of screening questions was asked to determine whether or not the housing unit was AHHS-eligible. If it was, the interviewer attempted to recruit the housing unit into the survey and to schedule a convenient time at which the interviewer and technician would return to conduct the survey and physical sampling. If contact was not established, and the housing unit could not be classified as ineligible (e.g., vacant), the interviewer left a copy of the advance letter at the housing unit, with a telephone number where he/she could be reached. At least 4 visits to each released housing unit were scheduled before contact attempts were ended.

[15] The $10 bill appeared to be successful in attracting the attention of recipients of the advance letter. In a small number of cases, however, recipients feared a “scam”. Those who contacted QuanTech or HUD to verify the legitimacy of the survey were generally easily reassured and most participated. It is perhaps worthy of note that almost all recipients who declined to participate by mailing the advance letter back to QuanTech also returned the $10 bill.

After 5 days, the technician arrived in the PSU and sampling of units began. Between sampling visits, the interviewer continued attempts to recruit additional housing units. In each sampled unit, the resident was interviewed using a tablet PC in which the questionnaire was programmed. The technician was responsible for conducting X-Ray Fluorescence (XRF) testing of interior and exterior paint to determine lead levels, for wipe sampling for lead and arsenic on floors and windowsills of up to 5 rooms in the house, and for collecting soil samples at various locations in the yard, including children's play areas if present. The XRF instrument recorded all lead readings electronically, and was programmed to also record the component type tested for each reading. XRF data was downloaded to the interviewer's tablet PC each evening. Interview and XRF data were then emailed to QuanTech headquarters. Data were also downloaded to a thumb drive to prevent data loss. In addition, the tablet PC was returned to QuanTech headquarters upon completion of work in the PSU and all data downloaded. XRF instruments were returned to the manufacturer for servicing after each PSU. The manufacturer downloaded the data from each XRF to CD as a further precaution against data loss. Upon completion of work in the PSU, the dust wipe and soil samples were shipped to QuanTech headquarters for inventory, processing and transmittal to the analytical laboratory (Corrosion Control, Inc.) for analysis.

2.0 RESPONSE RATES FOR AHHS

Recruitment was attempted at a total of 2,261 housing units. Table 2-1 below shows the disposition of the 2,261 units within broad categories.

Table 2-1. Disposition of Housing Units Recruited for AHHS

Units	*Disposition*	*Definition*
1,131	Complete	Completed resident questionnaire and sample collection
24	Partially Complete	Significant missing data (e.g., XRF malfunction, loss of tablet data, mid-interview refusal, etc.)
29	Unable to Schedule	Completed recruiting, resident willing but unable to schedule because of time constraints (e.g., resident going out of town)
459	Hard Refusal	Resident explicitly refused survey
56	Soft Refusal	Resident did not explicitly refuse but appeared to evade survey
226	Ineligible	Vacant, vacation home, group housing (e.g. college dorm), etc.
219	No contact	Interviewer never spoke to anyone at the unit
62	Insufficient Contact	Interviewer spoke to someone at the unit not qualified to answer the recruitment questionnaire (e.g., child, language barrier, etc.)
18	Could Not Find	Interviewer could not locate unit, but no reason to doubt it exists
37	Does Not Exist	Unit determined not to exist by field observation (e.g., empty lot, no such unit in apartment building, etc.)

For some of these disposition categories, it is not always known whether the housing unit is eligible for the AHHS. For example, "Hard Refusal" includes both units where the resident refused even to answer the screening questions (so eligibility is unknown) as well as units where the respondent completed the screener and was determined to be eligible but refused to participate in the interview or sampling. Table 2-2 breaks down the disposition categories by eligibility status (eligible, ineligible, unknown eligibility).

Table 2-2. Disposition Categories by Eligibility Status for AHHS Sample

Disposition	*Eligible*	*Ineligible*	*Unknown*	*Total*
Complete	1,131	0	0	**1,131**
Partially Complete	23	1	0	**24**
Unable to Schedule	27	0	2	**29**
Hard Refusal	252	2	205	**459**
Soft Refusal	47	0	9	**56**
Ineligible	0	226	0	**226**
No contact	0	0	219	**219**
Insufficient Contact	17	0	45	**62**
Could Not Find	0	0	18	**18**
Total	**1,497**	**229**	**498**	**2,224**

The 37 addresses where it was determined that no unit existed are excluded. In a small number of cases, field interviewer eligibility determinations were corrected after a review of data from the unit (e.g., one partially complete unit was determined to actually have been ineligible).

Units listed as Complete are respondents to AHHS. Units whose disposition is Partially Complete, Unable to Schedule, Hard/Soft Refusal or Insufficient Contact, and are known to be eligible, are nonrespondents. For purposes of calculating response and completion rates, Table 2-3 applies:

Table 2-3. AHHS Response Categories

Response Category	*Number of Housing Units*	*Percent*
Respondent	1,131	50.9%
Nonrespondent	366	16.5%
Ineligible	229	10.3%
Unknown Eligibility	498	22.4%
Total	**2,224**	**100%**

The completion rate (percent of the sample for which data collection was completed) for the AHHS is therefore 50.9%, somewhat lower than the target of 54%, but considerably higher than the 41.9% completion rate for NSLAH. The eligibility rate is the percentage of units of known eligibility status that are eligible, i.e. 1,497/(1,497+229) = 86.7%. This is lower than the projected eligibility rate of 90%, but higher than the 81.1% eligibility rate encountered in NSLAH. The response rate is defined as the percentage of eligible units that are respondents. It cannot be exactly calculated because of the 498 units whose eligibility is unknown. If one assumes that the same percentage of these units are eligible as for the units of known eligibility, i.e., 86.7%, the response rate can be calculated approximately as

$$1{,}131/[(2{,}224 - 498 - 229) + 0.867*498] = 58.6\%.$$

This compares to the 51.7% response rate for NSLAH. The major reason for the higher response rate in AHHS appears to be that only 22.4% of the sample was of unknown eligibility, compared to 39.1% in NSLAH. QuanTech's approach to interviewer compensation may also have contributed to a higher response rate. Interviewers were paid a fixed fee to conduct recruitment for a minimum of 5 days, plus an additional payment for each completed unit. Thus, interviewers had an incentive to achieve higher response rates and the most productive interviewers could earn considerably more than their less productive colleagues. In fact, most of the less productive interviewers either dropped out voluntarily or were terminated after the early rounds, leaving a cadre of very motivated and productive interviewers who made strong efforts to recruit all the units they were assigned. Call-backs were made to a random sample of respondents to check on the performance of the field teams.

3.0 CHARACTERISTICS OF THE AHHS SAMPLE

Table 3-1 (shown at the end of this section) characterizes the AHHS sample (completed units) by Census Region, age category (1978-2005, 1960-1977, 1940-1959 and pre-1940), urbanization (MSA or non-MSA), presence of a child under age 6, housing unit type (single- or multifamily), tenure (owner or renter), household income, Government support of housing costs, poverty, race (White, African American, other), and ethnicity (Hispanic or non-Hispanic). The table shows the estimated number and percent of AHHS-eligible housing units nationwide in the various categories, and compares these estimates to percentages of occupied, non-seasonal housing units from the 2005 AHS and, where available, to the 2006 Current Population Survey (CPS). For comparison purposes, the same estimates are shown for the NSLAH sample, but using the 1997 AHS and the 1998-1999 CPS as benchmarks.

Missing data for completed units in AHHS was imputed from Census 2000 data for housing age (34 units), tenure (2 units), household income (70 units), poverty (98 units), race (2 units) and ethnicity (2 units). Generally, the predominant classification in the Census 2000 Block Group containing the housing unit was assigned[16]. The potential bias introduced by this procedure is small, except for poverty, where it is unusual for a majority of units in a census Block Group to be in poverty. Thus, majority assignment would rarely classify a unit with missing data as in poverty, whereas approximately 15% of housing units nationwide are actually poor. Instead, a random assignment was made for units with missing poverty data: for each unit, a random number between 0 and 1 was drawn; if this number was less than the percent in poverty for the Census Block Group, the unit was classified as "In Poverty"; otherwise, it was classified as "Not In Poverty". This method reduces bias in the estimate of the number of AHHS units in poverty, compared to majority assignment by Census Block group. It resulted in classifying 16 of the 98 units with missing data as "In Poverty".

The total number of housing units eligible for AHHS in 2005 is estimated as 106.0 million ($\pm$ 1.5 million at 95% confidence), as compared to 95.7 million eligible for NSLAH 7-8 years ago. These totals compare with 108.9 million and 99.5 million occupied, non-seasonal housing units for the 2005 and 1997 AHS, respectively. The increase in eligible units from NSLAH to AHHS is estimated at 10.3 million, slightly more than the 9.4 million increase in occupied, non-seasonal housing units from the 1997 to 2005 AHS. The difference between the two rates of increase is not significant, however, since the uncertainty in the AHHS estimate alone is $\pm$ 1.5 million at 95% confidence. Uncertainty in the AHHS estimate is primarily due to instability in the estimate of the total number of senior units. This estimate is 2.9 million, the difference between the AHS and AHHS totals. The senior estimate is, however, based on a small sample consisting of 2 all-senior segments and 36 units found to be senior-only in the field. It compares to an estimate of 2.4 million age-restricted housing units in 2001 [12].

The distributions of eligible units by Census Region and age category closely match the AHS distributions, as indeed they should because the weights were poststratified[17] to the corresponding AHS totals, although senior housing was subsequently excluded from the AHHS estimates. The regional distribution also agrees very well with the 2006 CPS. Agreement with

[16] A slightly different imputation procedure was used for nonresponse adjustment (see Appendix A).
[17] See Appendix A for a discussion of poststratification.

the AHS is somewhat better for Census Region than for age category. This is because, as previously noted, AHS age categories do not exactly match those of AHHS. The AHS percentages for the 1978-2005 and 1960-1977 age categories are estimates only, obtained by assuming that 40% of the 1975-1979 AHS totals are attributable to 1978 and 1979. Differences in the distributions by region and age category combined, while modest, are attributable to the same cause.

There is very close agreement between AHHS and AHS/CPS distributions for presence of children under age 6, housing unit type and tenure. The AHHS has a lower percentage of MSA units (75.5%) than AHS (77.7%) or CPS (83.4%). Some of this difference is likely due to the fact that senior-only housing is predominantly within MSAs. The AHHS has 35% of households with income less than $30,000, compared to 37.2% for AHS, but only 31% for CPS. AHHS (13.8%) and AHS (13.9%) agree on the percentage of households in poverty. CPS has 9.8% of families in poverty, but does not report a percent of “non-family” households in poverty. Single-person households alone raise the poverty total to at least 11.8% of households. As noted in Section 2.3, AHHS data only allows an approximate determination of whether a household is in poverty or not.

With regard to race, the AHHS, AHS and CPS all have 12.4% African American households. However, AHHS has 78% White households versus 82.2% for AHS and 81.6% for CPS, and 9.6% “Other Race” households versus only 5.4% for AHS and 5.8% for CPS. The AHHS has more Hispanic households (12.4%) than AHS (10.7%) or CPS (10.4%). Some of these discrepancies are probably due to differences between AHS, CPS and AHHS in assigning race and ethnicity to a household. We assigned to the housing unit the race or ethnicity of the individual listed first in Q.38 of the resident questionnaire (generally the individual responding). AHS and CPS assign race and ethnicity based on the householder, defined as any individual on the title or lease for the unit. Changing self-definitions of race and ethnicity could also be partly responsible for the observed discrepancies.

Despite the differences noted above, there is good agreement between the AHHS and AHS distributions of key variables of interest to HUD, indicating that the AHHS respondents, with appropriate nonresponse adjustment and poststratification, provide a representative national sample for a variety of important population characteristics.

Table 3-1. Characteristics of the National Survey Population, with Comparisons to American Housing Survey (AHS) and Current Population Survey (CPS) Estimates (AHHS in RED)

Housing Unit Characteristic	*NSLAH (AHHS) Estimates*		*Housing Units in Sample*	*AHS (1997) (2005)*	*Current Population Survey (1998-1999)[b] (2006)*
	Estimate (000)	*Estimate (%)[a]*			
Total Housing Units[c]	95,688 106,033	100% 100%	831 1,131	99,487 108,871	
Region:					
Northeast	19,290 20,190	20% 19.0%	155 196	20% 18.7%	18.3%
Midwest	22,083 23,994	23% 22.6%	196 245	24% 22.9%	22.8%
South	35,474 38,996	37% 36.8%	277 440	35% 36.5%	36.7%
West	18,841 22,853	20% 21.6%	203 250	21% 21.9%	22.1%
Construction Year:					
1978-1998 1978-2005	29,774 40,458	31% 38.2%	220 476	30% 39.1%	
1960-1977	27,874 29,956	29% 28.3%	267 306	30% 27.9%	
1940-1959	20,564 18,117	21% 17.1%	186 187	20% 16.9%	
Before 1940	17,476 17,503	18% 16.5%	158 162	20% 16.2%	
Region by Construction Year:					
Northeast	19,290 20,190	20% 19.0%	155 196	20% 18.7%	
1978-1998 1978-2005	4,358 3,831	5% 3.6%	30 35	3% 4.1%	
1960-1977	3,754 5,288	4% 5.0%	30 57	5% 4.4%	
1940-1959	4,261 4,156	5% 3.9%	36 42	4% 3.8%	
Before 1940	6,917 6,915	7% 6.5%	59 62	7% 6.4%	
Midwest	22,083 23,994	23% 22.6%	196 245	24% 22.9%	
1978-1998 1978-2005	4,801 8,319	5% 7.9%	41 107	6% 7.6%	
1960-1977	6,283 5,849	7% 5.5%	55 58	7% 6.2%	
1940-1959	5,899 4,436	6% 4.2%	47 36	5% 4.2%	
Before 1940	5,101 5,395	5% 5.1%	53 44	6% 5.0%	

Table 3-1. Characteristics of the National Survey Population, with Comparisons to American Housing Survey (AHS) and Current Population Survey (CPS) Estimates (AHHS in RED)

Housing Unit Characteristic	*NSLAH (AHHS) Estimates*		*Housing Units in Sample*	*AHS (1997) (2005)*	*Current Population Survey (1998-1999)[b] (2006)*
	Estimate (000)	*Estimate (%)[a]*			
South	35,474 38,996	37% 36.8%	277 440	35% 36.5%	
1978-1998 1978-2005	14,447 18,625	15% 17.6%	95 221	14% 17.8%	
1960-1977	11,261 11,724	12% 11.1%	96 122	12% 10.7%	
1940-1959	6,320 5,575	7% 5.3%	57 71	6% 5.2%	
Before 1940	3,445 3,072	4% 2.9%	29 26	4% 2.8%	
West	18,841 22,853	20% 21.6%	203 250	21% 21.9%	
1978-1998 1978-2005	6,169 9,682	6% 9.1%	54 113	8% 9.6%	
1960-1977	6,536 7,101	7% 6.7%	85 69	7% 6.7%	
1940-1959	4,124 3,949	4% 3.7%	47 38	4% 3.7%	
Before 1940	2,013 2,121	2% 2.0%	17 30	2% 2.0%	
Urbanization:					
MSA	72,567 80,101	76% 75.5%	693 889	 77.7%	77% (**1999**) 83.4%
Non-MSA	23,121 25,933	24% 24.5%	138 242	 22.3%	23% (**1999**) 16.6%
One or More Children Under Age 6:					
	16,402 16,833	17% 15.9%	184 207	17% 15.9%	
Refusal/Don't Know[d]	352	0.4%	5		
Housing Unit Type:					
Single family	82,651 89,156	86% 84.1%	705 950	88% 84.0%	
Multi-family	13,037 16,877	14% 15.9%	126 181	12% 16.0%	
Tenure:					
Owner-occupied	66,232 73,627	69% 69.4%	539 772	 68.8%	67% (**1999**) 68.3%
Renter-occupied	29,074 32,407	30% 30.6%	289 359	 31.2%	33% (**1999**) 30.3%
Refusal/Don't Know	381	0.4%	3		
Imputed			2		

Table 3-1. Characteristics of the National Survey Population, with Comparisons to American Housing Survey (AHS) and Current Population Survey (CPS) Estimates (AHHS in RED)					
Housing Unit Characteristic	*NSLAH (AHHS) Estimates*		*Housing Units in Sample*	*AHS (1997) (2005)*	*Current Population Survey (1998-1999)[b] (2006)*
	Estimate (000)	*Estimate (%)[a]*			
Household Income:					
Less than $30,000/year	33,830 37,059	35% 35.0%	309 401	 37.2%	40% (**1998**) 31.0%
Equal to or more than $30,000/year	56,111 68,975	59% 65.0%	482 730	 62.8%	60% (**1998**) 69.0%
Refusal/Don't Know	5,747	6%	40		
Imputed			70		
Government Support:					
Government support	4,809 5,870	5% 5.5%	54 65		
No Government support	86,070 99,522	90% 93.9%	733 1059		
Refusal/Don't Know	4,809 641	5% 0.6%	44 7		
Poverty:					
In poverty	13,221 14,593	14% 13.8%	137 166	 13.9%	15% (**1998**) 9.8% - 11.8%+[18]
Not in poverty	76,336 91,441	80% 86.2%	651 965	 86.1%	85% (**1998**) 88.2% - 90.2%
Refusal/Don't Know	6,130	6%	43		
Imputed			98		
Race:					
White	77,005 82,739	80% 78.0%	622 868	83% 82.2%	 81.6%
African American	10,365 13,161	11% 12.4%	116 151	12% 12.4%	 12.4%
Other[e]	6,571 10,134	7% 9.6%	77 112	6% 5.4%	 5.8%
Refusal/Don't Know	1,746	2%	16		
Imputed			2		

[18] The 11.8% figure is low to the extent that it does not include non-family households with 2 or more people.

Table 3-1. Characteristics of the National Survey Population, with Comparisons to American Housing Survey (AHS) and Current Population Survey (CPS) Estimates (AHHS in RED)

Housing Unit Characteristic	*NSLAH (AHHS) Estimates*		*Housing Units in Sample*	*AHS (1997) (2005)*	*Current Population Survey (1998-1999)[b] (2006)*
	Estimate (000)	*Estimate (%)[a]*			
Ethnicity:					
Hispanic/Latino	7,434 13,175	8% 12.4%	86 158	9% 10.7%	 10.4%
Not Hispanic/Latino	87,008 92,858	91% 87.6%	736 973	91% 89.3%	 89.6%
Refusal/Don't Know	1,246	1%	9		
Imputed			2		

[a] All percentages are calculated with total housing units (95,688) (106,033) as the denominator. Percentages may not total 100% due to rounding.
[b] Current Population Survey (CPS) data was taken from either the **1998/1999** or **2006** CPS, as indicated.
[c] "Housing units" include permanently occupied, noninstitutional housing units in which children are permitted to live.
[d] Refusals and "don't know" responses by survey respondents.
[e] "Other" race includes Asian, American Indian or Alaskan Native, Native Hawaiian or other Pacific Islander, and more than one race.

4.0 LEAD-BASED PAINT IN HOUSING

In this and subsequent chapters of the report, we will for brevity use the term “housing unit” or "unit" to mean “occupied, non-seasonal non-institutional housing unit in which children are permitted to live”, i.e., an AHHS-eligible housing unit. Table 4-1 shows the prevalence of lead-based paint, for various housing characteristics, and compares NSLAH and AHHS estimates. Statistically significant changes from NSLAH to AHHS are highlighted.

The survey estimates that 37,058,000 housing units in the United States contain some lead-based paint (LBP), 34.9% of all housing units. The decrease in the absolute number of units with LPB since NSLAH was conducted in 1998 is modest, 839,000, and is not statistically significant. However, because of the increase in the total number of housing units since 1998, the percentage with LBP has decreased from 40% to 34.9%, a statistically significant drop. It is not surprising that the absolute decrease is small, since often the only practical way to remove all LBP from a unit is demolition or at least gut rehabilitation. The estimated number of pre-1978 homes with LBP decreased by 1,483,000 in the 7 years from NSLAH to AHHS, i.e., by 4.1% of the NSLAH total of 35,866,000 pre-1978 homes with LBP. This drop, which is not statistically significant, is generally consistent with estimates of demolition ranging from 0.6% - 0.96% per year [17]. The difference between the overall decrease in units with LBP, 839,000, and the decrease of 1,483,000 in pre-1978 units, is due to the fact that some post-1977 homes have “LBP” even though it was banned in 1978. The reason, discussed later in this section, is that lead in ceramic tile glazing, which was not banned, meets the regulatory definition of LBP and is counted as LBP in both surveys.

The survey estimates that 34.1% of housing units where a child under age 6 resides have LBP, almost the same percentage as for all housing units, and slightly higher than the 32% reported in NSLAH. For units with children under 6, income has no effect on percent with LBP, although units not in poverty have a slightly higher incidence of LBP than those in poverty (poverty status depends on household size as well as income). The distribution by age category for units with children under age 6 differs somewhat from the distribution by age category for all units, and from the NSLAH distribution for units with a child under age 6. In particular, 34.2% of AHHS units built 1960-1977, where a child under 6 resides, have LBP, compared to 17% for NSLAH, a statistically significant difference.

Greater changes between NSLAH and AHHS are seen by Census Region than for the U.S as a whole, with estimated decreases in the number of LBP units for the Northeast and Midwest, and increases for the South and West, although only the decrease for the Midwest is statistically significant. The percent LBP units decreases for the Northeast, Midwest (statistically significant) and West, with a small increase in the South. The decrease in the Midwest seems too large to be entirely credible. However, since the NSLAH and AHHS had somewhat different designs and sampling protocols, and paint testing was conducted with different XRF instruments (although from the same manufacturer), some differences are to be expected, especially for subpopulations, such as Census Regions. It should also be remembered that some findings of statistical significance will be spurious when a large number of simultaneous comparisons are made.

The percent LBP units by construction year is consistent between NSLAH and AHHS, and increases significantly with age. However there is a large (though not quite statistically significant) estimated drop from NSLAH to AHHS in the absolute number of LBP units built between 1940 and 1959.

In each of the Census Regions, the percent of units with LBP shows a similar pattern as a function of age, although differing somewhat from region to region in the same age category. For example, the estimated percent of units with LBP in pre-1940 housing ranges from 82.6% in the Midwest to 89.9% in the West, but differences between regions are not statistically significant. The AHHS shows a statistically significantly greater number (3,241,000 vs. 1,914,000) of LBP units in the South in the 1960-1977 age category. In reality, the number of LBP units in this subpopulation almost certainly actually decreased slightly from 1998 to 2005 due to demolition and hurricane damage. The reason for the difference between NSLAH and AHHS is unknown, although housing lost to hurricane Katrina in September 2005 was not accounted for in AHHS because New Orleans and the Mississippi Gulf Coast did not happen to be selected in the sample. However, the percent LBP units in each age category has a considerably narrower range across regions in AHHS than in NSLAH. For the 1960-1977 age category, the AHHS range is 21.4% - 27.7%, while the NSLAH range is 17% - 39%.

The percent of LBP units shows a consistent drop from NSLAH to AHHS for the variables Urbanization (MSA versus non-MSA), Unit Type (Single- versus Multifamily), Tenure (Owner or Renter), Income (less than $30,000 per annum or not) and Government Support (yes or no). The decrease is statistically significant for units not located in an MSA, and for owner-occupied units. There are large decreases for Government-supported units (36% to 26%), and for multifamily housing (29% to 21.9%) but neither is statistically significant because of small sample sizes.

With regard to race and ethnicity, the NSLAH survey showed essentially the same percent of White and African American units with LBP, but in AHHS, White units showed a statistically significant drop from 40% LBP to 31.6%, while African American units rose from 41% to 45.3% LBP. The difference between White and African American units is now statistically significant. The “Other Race” category showed a statistically significant increase in percent with LBP from NSLAH to AHHS. The decrease in number and percent of White households with LBP, and the increase in number and percent of African American and Other Race households with LBP, could be due in part to changing self-definitions of race. The percent LBP decreased for both Hispanic and non-Hispanic units, and the gap narrowed from 45% Hispanic vs. 39% non-Hispanic in NSLAH, to 36.9% Hispanic vs. 34.7% non-Hispanic in AHHS.

As mentioned previously, AHHS found that some post-1977 housing (6.6%) has LBP, despite the 1978 ban. There were 34 post-1978 units in the AHHS sample with at least one XRF measurement of 1.0 mg/cm^2 or greater. These 34 units had a total of 54 such readings, of which 42 (78%) were on ceramic substrates, 9 (17%) were on relatively unusual substrates such as metal (some metal primers are still allowed to contain lead) or stone, and only 3 (6%) were on wood. In the survey as a whole, 80% of positive LBP measurements were on wood, 7% on ceramic, 7% on plaster or drywall and 6% on unusual substrates. Thus, it is clear that most LBP-containing post-1978 units are so classified because of lead in ceramic tile, usually in bathrooms

or kitchens. Anecdotal information from risk assessors confirms that lead in ceramic tile is not uncommon. Table 4-2 shows that an estimated 6,940,000 units nationwide (6.5%) have lead present in ceramic surfaces at a level of 1.0 mg/cm^2 or greater (the Federal definition of lead-based paint). The incidence of lead in ceramic surfaces increases slightly with the age of the housing, from 5.4% of post-1978 housing to 8.3% of homes built before 1940. The true incidence of homes with lead in ceramic surfaces is almost certainly higher than these estimates, because the room selection procedure used in the AHHS did not necessarily select bathrooms, many of which have ceramic floors and/or walls. Bathrooms were classified as "Other Rooms", together with studies, guest bedrooms, dining rooms, etc., from which a single room was sampled at random.

Of the 2,675,000 post-1978 housing units classified as containing LBP, Table 4-2 shows that 1,977,000 (74%) have LBP based only on ceramic surfaces with lead $\geq$ 1.0 mg/cm^2. Overall, 4,451,000 of the 37,058,000 units with LBP (12%) are so classified purely because of lead in ceramic surfaces. Since lead is not banned in ceramic tile glazing (unlike paint), a concern could be raised about potential lead exposure from ceramic tile in the 7 million or more homes with tile lead levels of 1.0 mg/cm^2 or greater. In the AHHS, a total of 270 XRF measurements were taken on ceramic tile floors for which a corresponding dust wipe sample was also taken. Of these XRF measurements, 42 were greater than or equal to 1.0 mg/cm^2. Of the corresponding floor dust wipe samples, 39 were below the detection limit of 5 μg/ft^2; the highest level was 13.1 μg/ft^2, well below the regulatory limit of 40 μg/ft^2. The highest floor dust lead loading of all 270 samples was only 20.8 μg/ft^2, and was taken on a floor for which the XRF reading was 0. Thus, it appears that lead in ceramic tile does not commonly result in elevated levels of lead in dust on tile surfaces, presumably because the surface glaze encapsulates the lead. However, it is certainly possible that lead could be released under some circumstances, such as demolition [13], exposure to acidic agents, abrasion or drilling through the tile.

Table 4-3 breaks down LBP prevalence by interior and exterior occurrence. There is a statistically significant decrease in both the number and percent of units with both interior and exterior LBP. The number with both types of LBP has decreased from 20,260,000 in 1998 to 16,203,000 in 2005. Since the total number of units with LBP anywhere has only slightly decreased, there are corresponding increases in the numbers of units with interior LBP only or exterior LBP only. These changes are consistent with the effect of renovation, remodeling and lead hazard control activities. For example, a gut interior renovation of an older home removes all the interior LBP, but probably not the exterior LBP, moving the unit from "both interior and exterior LBP" to "exterior LBP only".

The next table, Table 4-4, compares the prevalence of housing units with deteriorated and significantly deteriorated LBP between NSLAH and AHHS. NSLAH defined significantly deteriorated LBP as follows:

> "…LBP with deterioration larger than the *de minimis* levels per Section 35.1350(d) of the Lead Safe Housing rule - deterioration of more than 20 square feet (exterior) or 2 square feet (interior) of LBP on large surface area components (walls, doors), or damage to more than 10% of the total surface area of interior small surface area components (windowsills, baseboards, trim)."

In AHHS, the XRF was programmed so that a "percent deteriorated paint" for the component was required to be entered into the instrument before each reading was taken. The possible entries were: 0% (no deteriorated paint); 1-10%; 11-25%; 25-50%; 51-75%; 76-90%; 91-99%; and, 100% (all paint on the component was deteriorated). Thus, the NSLAH definition of "significantly deteriorated" cannot be exactly replicated. To maximize comparability between the two surveys, the following definition of "significantly deteriorated" was adopted:

> INTERIOR PAINT: $\geq$1% deteriorated on walls; $\geq$11% deteriorated on other components;
> EXTERIOR PAINT: $\geq$1% deteriorated on siding; $\geq$91% deteriorated on doors; $\geq$11% deteriorated on other components.

If one assumes that a typical interior wall has an area of 150 ft^2, 1% deteriorated paint is 1.5 ft^2, close to the NSLAH definition. Likewise, a typical door has area of approximately 20 ft^2, so that 11% is roughly 2 ft^2, close to the NSLAH figure. On the exterior, the siding on one side of a typical 2-story house might be 800 ft^2, so that 1% represents 8 ft^2, while 10% represents 80 ft^2. Clearly, the 1-10% category comes close to the 20 ft^2 NSLAH definition for a large exterior surface component. For a 20 ft^2 exterior door, the 91-99% deteriorated paint category matches the NSLAH definition best. To summarize, the NSLAH and AHHS definitions of "significantly deteriorated paint" should closely match in most cases.

There is an estimated 20% increase from NSLAH to AHHS in the total number of housing units with some deteriorated LBP, attributable mostly to a larger 28% increase in units with exterior deterioration. There is a smaller increase (12%) in the number of units with significantly deteriorated LBP. Significant deterioration increased for both interior and exterior paint. These increases are probably due to aging of the housing stock with LBP. Table 4-5 shows the prevalence of deteriorated and significantly deteriorated LBP by housing age category. This table supports the aging hypothesis, in that the largest (and only statistically significant) increase in prevalence of both deteriorated and significantly deteriorated LBP is for units built between 1960 and 1977. One would expect that these more recently constructed units would be more likely to change from intact to deteriorated paint in the years between NSLAH and AHHS than older units, for which more deterioration would have occurred already by 1998. In addition, post-1960 units have received less attention by national LBP outreach and education activities.

Table 4-6 shows the distribution of paint lead levels for interior and exterior paint, and for all paint. Table 4-7 breaks down Table 4-6 by housing age. The overall percent of housing units with LBP exceeding the selected levels (0.3 mg/cm^2 through 10.0 mg/cm^2) has decreased in every case, for both interior and exterior paint, and most of the decreases are statistically significant. The greatest impact is on the highest lead levels (4 and 10 mg/cm^2), with the prevalence of exterior levels 4 mg/cm^2 or greater dropping from 18% to 11.6% and the percent 10 mg/cm^2 or greater dropping from 10% to 2.7%. For interior levels, the percentage of units with lead levels 4 mg/cm^2 or greater dropped from 17% to 12.3% and the percent 10 mg/cm^2 or greater from 9% to 3.8%. Table 4-7 shows that these decreases occurred mainly in pre-1960 housing. These changes in the distribution of lead levels in paint are significant, because the very highest levels represent the greatest potential for exposure to children. A curious difference between NSLAH and AHHS is that AHHS found 20% of units with all exterior XRF readings

equal to 0. Table 4-7 shows, as one would expect, that this occurs mainly in post-1978 housing (40%) and 1960-1977 housing (16%). The NSLAH report shows 100% of units with at least one exterior XRF readings greater than 0. This is attributed by Westat, the contractor for NSLAH, to measurement variability of the XRF instruments used in that survey [18].

Table 4-1. Comparison of Prevalence of Lead-Based Paint (LBP) by Selected Housing Unit (HU) Characteristics between NSLAH and AHHS (in red) (Statistically Significant Changes Highlighted)

HU Characteristic	*All HUs (000)*	*Number of HUs[a] with LBP (000)*			*Percent of HUs[b] with LBP (%)*			*HUs in Sample*
		Estimate	*Lower 95% CI[c]*	*Upper 95% CI*	*Estimate*	*Lower 95% CI*	*Upper 95% CI*	
Total Housing Units[a]	95,688	37,897	34,521	41,272	40%	36%	43%	831
	106,033	37,058	34,047	40,068	34.9%	32.1%	37.8%	1,131
Region:								
Northeast	19,290	10,600	8,306	12,895	55%	46%	64%	155
	20,190	10,121	8,722	11,519	50.1%	43.3%	57.0%	196
Midwest	22,083	11,748	10,546	12,950	53%	48%	59%	196
	23,994	9,358	7,924	10,791	39.0%	33.4%	44.6%	245
South	35,474	9,607	7,762	11,451	27%	22%	32%	277
	38,996	11,003	9,114	12,892	28.2%	23.2%	33.3%	440
West	18,841	5,942	4,747	7,137	32%	25%	38%	203
	22,853	6,576	5,345	7,808	28.8%	23.8%	33.8%	250
Construction Year:								
1978-1998[d]	29,775	2,031	687	3,373	7%	2%	11%	220
1978-2005	40,458	2,675	1,458	3,893	6.6%	3.6%	9.6%	476
1960-1977	27,874	6,577	4,875	8,280	24%	18%	30%	267
	29,956	7,376	5,761	8,991	24.6%	19.5%	29.8%	306
1940-1959	20,564	14,171	12,203	16,139	69%	60%	77%	186
	18,117	11,921	10,645	13,197	65.8%	58.6%	73.0%	187
Before 1940	17,476	15,117	13,532	16,702	87%	82%	91%	158
	17,502	15,085	13,932	16,239	86.2%	79.7%	92.7%	162
Region by Construction Year:								
Northeast								
HUs built 1978-1998	4,358	76	0	225	2%	0%	5%	30
HUs built 1978-2005	3,831	224	0	544	5.9%	0%	14.1%	35
HUs built 1960-1977	3,794	1,478	348	2,609	39%	9%	69%	31
	5,288	1,228	659	1,797	23.2%	12.4%	34.0%	57
HUs built 1940-1959	4,221	3,089	2,179	3,999	73%	52%	95%	35
	4,156	2,492	1,748	3,237	60.0%	42.1%	77.9%	42
HUs built before 1940	6,917	5,957	5,187	6,728	86%	75%	97%	59
	6,915	6,176	5,473	6,878	89.3%	79.2%	99.5%	62
Midwest								
HUs built 1978-1998	4,801	533	0	1,134	11%	0%	24%	41
HUs built 1978-2005	8,319	244	2	487	2.9%	0.0%	5.9%	107
HUs built 1960-1977	6,283	1,771	872	2,670	28%	14%	42%	55
	5,844	1,389	573	2,204	23.8%	11.4%	36.1%	58
HUs built 1940-1959	5,899	4,785	4,011	5,559	81%	68%	94%	47
	4,436	3,268	2,603	3,933	73.7%	58.0%	89.3%	36
HUs built before 1940	5,101	4,658	3,888	5,429	91%	76%	100%	53
	5,395	4,456	3,708	5,204	82.6%	69.1%	96.1%	44

Table 4-1. Comparison of Prevalence of Lead-Based Paint (LBP) by Selected Housing Unit (HU) Characteristics between NSLAH and AHHS (in red) (Statistically Significant Changes Highlighted)

HU Characteristic	*All HUs (000)*	*Number of HUs[a] with LBP (000)*			*Percent of HUs[b] with LBP (%)*			*HUs in Sample*
		Estimate	*Lower 95% CI[c]*	*Upper 95% CI*	*Estimate*	*Lower 95% CI*	*Upper 95% CI*	
South								
HUs built 1978-1998	14,447	1,197	0	2,436	8%	0%	17%	95
HUs built 1978-2005	18,625	1,742	678	2,805	9.4%	3.7%	15.0%	221
HUs built 1960-1977	11,261	1,914	1,216	2,612	17%	11%	23%	96
	11,724	3,241	2,138	4,344	27.6%	18.7%	36.6%	122
HUs built 1940-1959	6,320	3,431	2,329	4,532	54%	37%	72%	57
	5,575	3,475	2,976	3,974	62.3%	52.9%	71.8%	71
HUs built before 1940	3,445	3,065	2,676	3,453	89%	78%	100%	29
	3,072	2,545	2,075	3,015	82.9%	67.7%	98.0%	26
West								
HUs built 1978-1998	6,169	225	0	473	4%	0%	8%	54
HUs built 1978-2005	9,682	465	24	906	4.8%	0.4%	9.2%	113
HUs built 1960-1977	6,536	1,414	816	2,011	22%	12%	31%	85
	7,101	1,518	864	2,172	21.4%	11.9%	30.9%	69
HUs built 1940-1959	4,124	2,866	1,715	4,017	69%	42%	97%	47
	3,949	2,686	2,090	3,281	68.0%	53.1%	82.9%	38
HUs built before 1940	2,013	1,437	376	2,498	71%	19%	100%	17
	2,121	1,908	1,684	2,131	89.9%	79.4%	100%	30
Urbanization:								
MSA (total) (estimated)	72,567	27,071	23,089	31,053	37%	32%	43%	693
	80,101	28,455	25,178	31,732	35.5%	31.8%	39.2%	889
Non-MSA	23,121	10,826	7,458	14,193	47%	35%	59%	138
	25,933	8,603	6,145	11,061	33.2%	24.7%	41.6%	242
One or More Children Under Age 6:								
All HU Ages	16,402	5,328	4,048	6,609	32%	26%	39%	184
	16,833	5,742	4,237	7,247	34.1%	25.2%	43.1%	207
HUs built 1978-1998	5,847	202	0	436	3%	0%	7%	56
HUs built 1978-2005	7,995	442	92	792	5.5%	1.1%	10.0%	103
HUs built 1960-1977	5,098	876	416	1,337	17%	8%	26%	61
	4,002	1,370	819	1,920	34.2%	20.8%	47.7%	48
HUs built 1940-1959	3,055	1,997	1,341	2,654	65%	44%	87%	40
	2,641	2,117	1,234	2,999	80.2%	63.5%	96.8%	33
HUs built before 1940	2,401	2,253	1,426	3,079	94%	59%	100%	27
	2,196	1,813	878	2,749	82.6%	63.8%	100%	23
Housing Unit Type:								
Single family	82,651	34,081	30,874	37,289	41%	37%	45%	705
	89,156	33,354	30,699	36,010	37.4%	34.4%	40.4%	950
Multi-family	13,037	3,815	2,470	5,160	29%	20%	39%	126
	16,877	3,703	2,104	5,303	21.9%	13.5%	30.4%	181

Table 4-1. Comparison of Prevalence of Lead-Based Paint (LBP) by Selected Housing Unit (HU) Characteristics between NSLAH and AHHS (in red) (Statistically Significant Changes Highlighted)

HU Characteristic	*All HUs (000)*	*Number of HUs[a] with LBP (000)*			*Percent of HUs[b] with LBP (%)*			*HUs in Sample*
		Estimate	*Lower 95% CI[c]*	*Upper 95% CI*	*Estimate*	*Lower 95% CI*	*Upper 95% CI*	
Tenure:								
Owner-occupied	66,232	25,172	22,400	27,943	38%	35%	41%	539
	73,627	24,513	21,644	27,381	33.3%	29.8%	36.8%	772
Renter-occupied	29,074	12,409	9,538	15,281	43%	35%	50%	289
	32,407	12,545	10,466	14,624	38.7%	32.8%	44.6%	359
Refusal/Don't Know[e]	381							3
Imputed								2
Household Income:								
Less than $30,000/year	33,830	15,007	11,604	18,411	44%	37%	52%	309
	37,059	14,808	12,632	16,984	40.0%	34.2%	45.7%	401
Equal to or more than $30,000/year	56,111	20,815	17,745	23,885	37%	32%	42%	482
	68,975	22,249	19,461	25,038	32.3%	28.7%	35.8%	730
Refusal/Don't Know	5,747							40
Imputed								70
One or More Children Under Age 6:								
All Income Categories	16,402	5,328	4,048	6,609	32%	26%	39%	184
	16,833	5,742	4,237	7,247	34.1%	25.2%	43.1%	207
Less than $30,000/year	4,791	1,375	784	1,965	29%	16%	41%	61
	5,781	1,978	1,063	2,895	34.2%	19.6%	48.9%	74
Equal to or more than $30,000/year	11,236	3,820	2,579	5,061	34%	23%	45%	117
	11,052	3,764	2,491	5,036	34.1%	23.4%	44.7%	133
Refusal/Don't Know	375							6
One or More Children Under Age 6:								
All Income Categories	16,833	5,742	4,237	7,247	34.1%	25.2%	43.1%	207
In Poverty	3,423	1,019	317	1,720	29.8%	12.4%	47.1%	43
Not in Poverty	13,410	4,724	3,414	6,033	35.2%	25.8%	44.7%	164
Imputed								16
Government Support:								
Government support	4,809	1,741	678	2,805	36%	16%	56%	54
	5,870	1,528	724	2,332	26.0%	14.6%	37.4%	65
No government support	86,070	33,871	30,681	37,062	39%	36%	43%	733
	99,522	35,237	32,276	38,199	35.4%	32.6%	38.2%	1,059
Refusal/Don't Know	4,809							44
	641							7
Poverty by Urbanization:								
MSA (total)(estimated)								
In poverty	9,958	5,000	3,383	6,617	50.2%	34.0%	66.4%	110
	10,469	4,226	2,769	5,682	40.4%	30.6%	50.1%	125
Not in poverty	57,791	20,213	16,940	23,486	35.0%	29.3%	40.6%	549
	69,632	24,229	21,101	27,357	34.8%	30.8%	38.8%	764
Non-MSA								
In poverty	3,264	1,362	310	2,414	42%	9%	74%	27
	4,124	1,586	529	2,643	38.5%	16.9%	60.0%	41
Not in poverty	18,544	8,684	5,071	12,297	47%	27%	66%	102
	21,809	7,017	4,338	9,697	32.2%	21.7%	42.7%	201
All Housing								

Table 4-1. Comparison of Prevalence of Lead-Based Paint (LBP) by Selected Housing Unit (HU) Characteristics between NSLAH and AHHS (in red) (Statistically Significant Changes Highlighted)

HU Characteristic	*All HUs (000)*	*Number of HUs[a] with LBP (000)*			*Percent of HUs[b] with LBP (%)*			*HUs in Sample*
		Estimate	*Lower 95% CI[c]*	*Upper 95% CI*	*Estimate*	*Lower 95% CI*	*Upper 95% CI*	
In poverty	14,593	5,811	4,035	7,588	39.8%	30.4%	49.3%	166
Not in poverty	91,441	31,246	28,079	34,414	34.2%	31.0%	37.4%	965
Imputed								98
Race:								
White	77,005	30,945	28,037	33,853	40%	37%	44%	622
	82,739	26,105	23,449	28,760	31.6%	28.5%	34.6%	868
African American	10,365	4,228	2,767	5,689	41%	30%	52%	116
	13,161	5,957	4,292	7,622	45.3%	35.1%	55.6%	151
Other[f]	6,571	1,913	1,015	2,811	29%	17%	41%	77
	10,134	4,996	3,467	6,525	49.3%	41.7%	56.9%	112
Unknown	1,746							16
Imputed								2
Ethnicity:								
Hispanic/Latino	7,434	3,329	2,044	4,614	45%	31%	59%	86
	13,175	4,860	3,430	6,290	36.9%	28.7%	45.1%	158
Not Hispanic/Latino	87,008	33,830	30,436	37,223	39%	35%	42%	736
	92,858	32,198	28,989	35,406	34.7%	31.5%	37.8%	973
Refusal/Don't Know	1,246							9
Imputed								2

[a] "Housing units" include permanently occupied, noninstitutional housing units in which children are permitted to live.
[b] All percentages are calculated with the "all HUs" on the left most column of each row as the denominator.
[c] CI = confidence interval for the estimated number or percent.
[d] Estimate calculated by QuanTech.
[e] Refusals and "don't know" responses by survey respondents.
[f] "Other" race includes Asian, American Indian or Alaskan Native, Native Hawaiian or other Pacific Islander, and more than one race.

Table 4-2. Lead in Ceramic Surfaces							
HU[a] Age	*All HUs (000)*	*Number of HUs (000)*			*Percent of HUs[b]*		
		Estimate	*Lower 95% CI[c]*	*Upper 95% CI*	*Estimate*	*Lower 95% CI*	*Upper 95% CI*
Prevalence of Lead ≥ 1.0 mg/cm² in Ceramic Surfaces by Dwelling Unit Age							
Built1978-Present	40,458	2,196	1,139	3,258	5.4%	2.8%	8.0%
Built 1960-1977	29,956	2,055	937	3,172	6.9%	3.1%	10.6%
Built1940-1959	18,117	1,237	555	1,919	6.8%	3.1%	10.6%
Built before 1940	17,503	1,452	578	2,326	8.3%	3.3%	13.3%
All Years	106,033	6,940	4,790	9,089	6.5%	4.5%	8.6%
HUs Classified as Containing LBP Due Only to Ceramic Reading(s)							
Built1978-Present	40,458	1,977	1,095	2,859	4.9%	2.7%	7.1%
Built 1960-1977	29,956	1,516	307	2,725	5.1%	1.0%	9.1%
Built1940-1959	18,117	670	169	1,171	3.7%	0.9%	6.5%
Built before 1940	17,503	287	0	628	1.6%	0%	3.6%
All Years	106,033	4,451	2,585	6,316	4.2%	2.4%	6.0%

No NSLAH values available, only AHHS values shown.

[a] "Housing units" include permanently occupied, noninstitutional housing units in which children are permitted to live.

[b] All percentages are calculated with the "all HUs" on the left most column of each row as the denominator.

[c] CI = confidence interval for the estimated number or percent.

Table 4-3. Prevalence of LBP by Location in the Building (AHHS in RED)(Statistically Significant Differences Highlighted)							
LBP Location	*Number of HUs[a] with LBP (000)*			*Percent of HUs[b] with LBP (%)*			*HUs in Sample*
	Estimate	*Lower 95% CI[c]*	*Upper 95% CI*	*Estimate*	*Lower 95% CI*	*Upper 95% CI*	
Interior Only	8,609	6,102	11,116	9%	6%	12%	77
	11,115	8,396	13,835	10.5%	7.9%	13.1%	118
Both Interior and Exterior	20,260	17,961	22,558	21%	19%	24%	181
	16,203	14,065	18,340	15.3%	13.3%	17.3%	155
Exterior Only	9,028	6,535	11,521	9%	7%	12%	80
	9,740	8,058	11,422	9.2%	7.6%	10.8%	100
Subtotal – LBP anywhere in Building	37,897	34,521	41,272	40%	36%	43%	338
	37,058	34,047	40,068	34.9%	32.1%	37.8%	373
No LBP in Building	57,791	54,624	60,959	60%	57%	64%	493
	68,976	65,769	72,183	65.1%	62.2%	67.9%	758
All HUs	95,688			100%			831
	106,033			100%			1,131

[a] "Housing units" include permanently occupied, noninstitutional housing units in which children are permitted to live.

[b] All percentages are calculated with total housing units (95,688) (106,033) as the denominator. Percentages may not total 100% due to rounding.

[c] CI = confidence interval for the estimated number or percent.

Table 4-4. Prevalence of Deteriorated and Significantly Deteriorated Lead-Based Paint (LBP) by Location in the Building (AHHS in RED; Statistically Significant Differences Highlighted)

Deteriorated LBP							
Location	***Number of HUs[a] with Deteriorated LBP (000)***			***Percent[b] of HUs with Deteriorated LBP(%)***			***HUs in Sample***
	Estimate	***Lower 95% CI[c]***	***Upper 95% CI***	***Estimate***	***Lower 95% CI***	***Upper 95% CI***	
Interior Only	4,180 3,952	2,851 2,546	5,509 5,357	4% 3.7%	3% 2.4%	6% 5.1%	39 40
Both Interior and Exterior	6,236 8,204	4,661 6,072	7,811 10,336	7% 7.7%	5% 5.8%	8% 9.7%	62 80
Exterior Only	7,009 8,764	4,922 6,965	9,097 10,564	7% 8.3%	5% 6.6%	10% 10.0%	61 88
Total with Deteriorated LBP	17,425 20,920	14,816 18,222	19,735 23,617	18% 19.7%	15% 17.2%	21% 22.2%	162 208
No Deteriorated LBP	78,263 85,114	75,953 82,370	80,572 87,857	82% 80.3%	79% 77.8%	84% 82.8%	669 923
All HUs	95,688 106,033			100% 100%			831 1,131
Significantly Deteriorated LBP							
Location	***Number of HUs with Significant Deteriorated LBP (000)***			***Percent[b] of HUs with Significant Deteriorated LBP(%)***			***HUs in Sample***
	Estimate	***Lower 95% CI***	***Upper 95% CI***	***Estimate***	***Lower 95% CI***	***Upper 95% CI***	
Interior Only	2,629 3,497	1,692 2,362	3,566 4,631	3% 3.3%	2% 2.2%	4% 4.4%	28 35
Both Interior and Exterior	3,487 3,182	2,132 1,952	4,842 4,413	4% 3.0%	2% 1.9%	5% 4.2%	34 31
Exterior Only	7,518 8,652	5,357 6,835	9,679 10,469	8% 8.2%	6% 6.5%	10% 9.9%	65 84
Total with Significantly Deteriorated LBP	13,634 15,331	10,928 12,784	16,341 17,879	14% 14.5%	11% 12.1%	17% 16.8%	127 150
No Significantly Deteriorated LBP	82,053 90,702	79,347 88,200	84,760 93,204	86% 85.5%	83% 83.2%	89% 87.9%	704 981
All HUs	95,688 106,033			100% 100%			831 1,131

[a] "Housing units" include permanently occupied, noninstitutional housing units in which children are permitted to live.
[b] Percentages are calculated with total housing units (95,688) (106,033) as the denominator. Percentages may not total 100% due to rounding.
[c] CI = confidence interval for the estimated number or percent.

Table 4-5. Distribution of Housing Units (HUs) with Deteriorated and Significantly Deteriorated Lead-Based Paint (LBP) by Construction Year
(AHHS in RED; Statistically Significant Differences Highlighted)

Deteriorated LBP							
Construction Year	***Total HUs[a] (000)***	***Number of HUs with Deteriorated LBP (000)***			***Percent[b] of HUs with Deteriorated LBP (%)***		
		Estimate	***Lower 95% CI[c]***	***Upper 95% CI***	***Estimate***	***Lower 95% CI***	***Upper 95% CI***
1978-1998	29,774	139	0	330	0%	0%	1%
1978-2005	40,458	308	0	669	0.8%	0.0%	1.7%
1960-1977	27,874	910	235	1,586	3%	1%	6%
	29,956	2,953	1,795	4,110	9.9%	6.1%	13.6%
1940-1959	20,564	6,510	4,603	8,418	32%	22%	41%
	18,117	6,579	4,906	8,251	36.3%	27.1%	45.6%
Before 1940	17,476	9,866	8,111	11,620	56%	46%	66%
	17,503	11,081	9,616	12,546	63.3%	55.0%	71.6%
All Years	95,688	17,425	15,222	19,628	18%	16%	21%
	106,033	20,920	18,222	23,617	19.7%	17.2%	22.2%

Significantly Deteriorated LBP							
Construction Year	***Total HUs[a] (000)***	***Number of HUs with Significantly Deteriorated LBP (000)***			***Percent[b] of HUs with Significantly Deteriorated LBP (%)***		
		Estimate	***Lower 95% CI[c]***			***Estimate***	***Lower 95% CI[c]***
1978-1998	29,774	83	0	238	0%	0%	1%
1978-2005	40,458	109	0	265	0.3%	0%	0.7%
1960-1977	27,874	610	97	1,122	2%	0%	4%
	29,956	1,822	853	2,792	6.1%	3.0%	9.2%
1940-1959	20,564	5,190	3,387	6,993	25%	16%	34%
	18,117	4,547	2,998	6,097	25.1%	16.5%	33.7%
Before 1940	17,476	7,752	6,048	9,456	44%	35%	54%
	17,503	8,852	7,426	10,279	50.6%	42.5%	58.7%
All Years	95,688	13,635	9,893	16,582	14%	10%	17%
	106,033	15,331	12,784	17,879	14.5%	12.1%	16.8%

[a] "Housing units" include permanently occupied, noninstitutional housing units in which children are permitted to live.
[b] All percentages are calculated with the "total HUs" on the left most column of each row as the denominator.
[c] CI = confidence interval for the estimated number or percent.

Table 4-6. Distribution of Maximum Paint Lead Loading by Location in the Building (AHHS in RED; Statistically Significant Changes Highlighted)

Maximum Paint Lead Loading in HU[c]	*Interior (% HUs)*[a]			*Exterior (% HUs)*			*Anywhere (% HUs)*		
	Estimate	*Lower 95% CI*[b]	*Upper 95% CI*	*Estimate*	*Lower 95% CI*	*Upper 95% CI*	*Estimate*	*Lower 95% CI*	*Upper 95% CI*
GT 0 mg/cm^2	100%	100%	100%	100%			100%		
	98.4%	97.6%	99.1%	78.3%	75.7%	81.0%	98.9%	98.3%	99.6%
Missing				1.6%	0.7%	2.5%			
GTE 0.3 mg/cm^2	51%	47%	55%	42%	39%	46%	62%	58%	67%
	39.5%	36.2%	42.8%	34.5%	32.1%	37.0%	48.9%	45.8%	52.1%
GTE 0.6 mg/cm^2	37%	34%	39%	35%	32%	38%	47%	44%	50%
	31.4%	28.4%	34.3%	29.4%	27.1%	31.7%	41.2%	38.3%	44.1%
GTE 0.8 mg/cm^2	31%	29%	34%	32%	29%	36%	42%	39%	45%
	27.9%	25.0%	30.9%	26.4%	24.1%	28.6%	36.8%	33.9%	39.7%
GTE 1.0 mg/cm^2	30%	27%	33%	31%	27%	34%	40%	36%	43%
	25.8%	22.9%	28.6%	24.5%	22.1%	26.8%	34.9%	32.1%	37.8%
GTE 1.3 mg/cm^2	26%	24%	29%	29%	26%	33%	36%	33%	40%
	23.9%	21.2%	26.5%	23.1%	20.6%	25.7%	32.6%	29.9%	35.3%
GTE 4.0 mg/cm^2	17%	14%	20%	18%	15%	22%	24%	20%	27%
	12.3%	9.9%	14.6%	11.6%	9.3%	13.9%	18.9%	16.2%	21.5%
GTE 10.0 mg/cm^2	9%	7%	12%	10%	8%	13%	14%	11%	17%
	3.8%	2.8%	4.9%	2.7%	1.6%	3.8%	6.0%	4.3%	7.6%

[a] All percentages are calculated with total housing units (95,688) (106,033) as the denominator. "Housing units" include permanently occupied, noninstitutional housing units in which children are permitted to live.
[b] CI = confidence interval for the estimated number or percent.
[c] GT equals "greater than." GTE equals "greater than or equal to."

Table 4-7. Distribution of Maximum Paint Lead Loading by Location in the Building and Construction Year (AHHS in RED)					
Largest Paint Lead Loading in the Housing Unit[c]	*Percent of HUs*[a,b] *by Year of Construction*				
	1978-1998	*1960-1977*	*1940-1959*	*Before 1940*	*Subtotal*
Interior					
GT 0 mg/cm²	100% 96.6%	100% 98.7%	100% 100%	100% 100%	100% 98.4%
GTE 0.3 mg/cm²	23% 13.1%	39% 30.6%	77% 69.5%	91% 84.6%	51% 39.5%
GTE 0.6 mg/cm²	9% 8.6%	21% 21.3%	59% 55.7%	83% 76.1%	37% 31.4%
GTE 0.8 mg/cm²	6% 6.6%	16% 18.5%	48% 48.5%	80% 72.1%	31% 27.9%
GTE 1.0 mg/cm²	4% 6.2%	16% 16.7%	46% 43.1%	79% 68.8%	30% 25.8%
GTE 1.3 mg/cm²	3% 4.2%	12% 15.7%	41% 39.9%	72% 66.7%	26% 23.9%
GTE 4.0 mg/cm²	1% 2.1%	6% 6.8%	19% 15.4%	60% 41.8%	17% 12.3%
GTE 10.0 mg/cm²	1% 0.2%	2% 1.3%	7% 2.6%	38% 17.8%	9% 3.8%
Exterior					
GT 0 mg/cm²	100% 59.8%	100% 83.7%	100% 94.9%	100% 95.0%	100% 78.3%
GTE 0.3 mg/cm²	11% 4.1%	31% 29.2%	69% 65.9%	81% 81.5%	42% 34.5%
GTE 0.6 mg/cm²	7% 1.6%	18% 21.5%	64% 59.5%	76% 75.9%	35% 29.4%
GTE 0.8 mg/cm²	4% 0.7%	16% 16.6%	61% 55.3%	73% 72.4%	32% 26.4%
GTE 1.0 mg/cm²	3% 0.6%	13% 14.3%	59% 50.7%	72% 69.8%	31% 24.5%
GTE 1.3 mg/cm²	3% 0.6%	11% 13.5%	56% 46.8%	71% 67.2%	29% 23.1%
GTE 4.0 mg/cm²	0% 0.3%	6% 4.0%	28% 19.9%	56% 42.4%	18% 11.6%
GTE 10.0 mg/cm²	0% 0%	2% 1.1%	10% 4.0%	41% 10.4%	10% 2.7%
Anywhere in Building					
GT 0 mg/cm²	100% 97.4%	100% 99.7%	100% 100%	100% 100%	100% 98.9%
GTE 0.3 mg/cm²	30% 16.6%	57% 45.4%	89% 83.4%	95% 94.1%	62% 48.9%
GTE 0.6 mg/cm²	15% 9.8%	31% 33.4%	80% 75.5%	89% 91.5%	47% 41.2%
GTE 0.8 mg/cm²	10% 7.1%	26% 27.2%	70% 68.8%	88% 88.8%	42% 36.8%
GTE 1.0 mg/cm²	7% 6.6%	24% 24.6%	69% 65.8%	87% 86.2%	40% 34.9%
GTE 1.3 mg/cm²	5% 4.7%	18% 23.1%	65% 60.8%	84% 84.0%	36% 32.6%

Table 4-7. Distribution of Maximum Paint Lead Loading by Location in the Building and Construction Year (AHHS in RED)

Largest Paint Lead Loading in the Housing Unit[c]	*Percent of HUs*[a,b] *by Year of Construction*				
	1978-1998	*1960-1977*	*1940-1959*	*Before 1940*	*Subtotal*
GTE 4.0 mg/cm^2	1% 2.4%	10% 9.6%	34% 29.6%	73% 61.8%	24% 18.9%
GTE 10.0 mg/cm^2	1% 0.2%	3% 2.4%	14% 6.1%	55% 25.3%	14% 6.0%

[a] "Housing units" include permanently occupied, noninstitutional housing units in which children are permitted to live.
[b] All percentages are calculated with total housing units in each age category as the denominator.
[c] GT equals "greater than." GTE equals "greater than or equal to."

5.0 SIGNIFICANT LEAD-BASED PAINT HAZARDS IN HOUSING

The NSLAH survey considered that there is a *significant LBP hazard* in a housing unit if, at any location in the unit, there was (a) significantly deteriorated LBP (as defined previously), or (b) a dust lead hazard, i.e., a floor dust lead level equal to 40 $\mu g/ft^2$ or greater, or a windowsill dust lead level equal to 250 $\mu g/ft^2$ or greater, or (c) a soil lead hazard, i.e., more than 9 ft^2 of bare soil with a lead concentration of 1,200 ppm or greater, or 400 ppm for bare soil in an area frequented by a child under the age of 6 years. As described earlier, the definition of significantly deteriorated LBP for AHHS closely matches that for NSLAH. The same definition of lead-contaminated dust was used in AHHS and NSLAH. For soil essentially the same definition was used in AHHS as in NSLAH. Thus, the definition of a significant LBP hazard is very similar between the two surveys, though not exactly the same in all cases, as discussed in Chapter 4. Table 5-1 shows the prevalence of significant LBP hazards for various subpopulations. Overall, the estimated total number of units with significant LBP hazards has decreased slightly, from 24,026,000 in NSLAH to 23,186,000 in AHHS. The percent with significant LBP hazards has decreased from 25% to 21.9%, largely because of the increase in the total number of units (but see the discussion of Table 5-2 below). Neither decrease is statistically significant. The pattern by region is similar, with Northeast, West and Midwest showing a modest decrease in the number of units with significant LBP hazards, while the West shows a small (non-significant) increase. The percentages decrease for all regions, statistically significantly so for the Midwest. This is no doubt related to the corresponding statistically significant drop in the number of units with LBP in the Midwest. The largest percent change in the number of units with significant hazards is in the 1960-1977 age category, which shows a substantial increase from 2,340,000 to 3,415,000, due to the previously noted increase in the number of housing units with significantly deteriorated LBP in this age category. The presence of a small number and percent of post-1978 units with LBP hazards is less surprising on its face than the corresponding finding for LBP, since there are sources of LBP hazards other than paint, such as occupational exposure to lead that can result in lead being transported into the home, and the presence of soil contaminated by lead from non-paint sources.

The patterns of significant LBP hazards by age are consistent among the different regions. The statistically significant drop in percent of units with LBP hazards in the Midwest is due to post-1960 housing. There are other relatively large unexplained changes from NSLAH to AHHS in some combinations of Region and Age , e.g., Northeast post-1978 and 1940-1959 and South 1960-1977, but none are statistically significant.

For homes with children under the age of 6, the percent with significant LBP hazards decreased from 25% in NSLAH to 21.3% in AHHS, slightly more than for all housing. The decrease was greater (from 25% to 19.7%) for homes with children under 6 where household income was less than $30,000. For homes in poverty with children under 6, only 18.8% had significant LBP hazards.

There are also decreases in the number of units with significant LBP hazards when urbanization, unit type, tenure, household income, Government support and poverty are considered. The largest of these drops is from 19% to 7.4% for multifamily units. This drop is statistically significant, and is consistent with the focus of HUD's enforcement efforts for the Lead-Safe Housing Rule, particularly those efforts focusing on the compliance of major landlords with the

Disclosure Rule. There is also a substantial drop for non-MSA units. The gap between units with Government support and those without, noted in NSLAH, has widened slightly in AHHS. Both Hispanic and non-Hispanic units have decreased percentages with significant LBP hazards, but the drop for Hispanic units is greater. By race, AHHS shows a statistically significant drop in the percent of units with significant LBP hazards for White households, but a small increase for African American households and a larger increase for units with occupants of other races.

Table 5-2 shows the prevalence of significant LBP hazards by location in the building (interior or exterior). The table demonstrates that the drop in the percent of units with significant LBP hazards from NSLAH to AHHS is largely due to the statistically significant drop in the percent of units with both interior and exterior LBP hazards. The number of units with interior only or exterior only LBP hazards both increased slightly, suggesting a shift away from units with both interior and exterior hazards. This could be accounted for by, for example, renovation activities that result in elimination of either interior or exterior lead hazards, but not both, such as gut rehabilitation or removal/replacement of siding.

Table 5-3 breaks down prevalence of LBP hazards for all units and units with children under age 6 by the type of hazard. There are consistent and substantial drops in the number and percent of units with dust and soil hazards, offset by increases in the number of units with significantly deteriorated LBP. Table 5-4 breaks down prevalence of LBP hazards by poverty status (the NSLAH report [1] did not tabulate these statistics). The percent of units in poverty with significant LBP hazards (30.2%) is statistically significantly greater than the corresponding percent of units not in poverty (20.5%). Table 5-5 shows the pattern of significant LBP hazards by housing age category and type of hazard. Again, there are consistent drops in the percent of units with dust lead hazards and with lead contaminated soil. For significantly deteriorated LBP, however, the statistically significant increase in number and percent of units built 1960-1977 is an offsetting factor. This explains the increase in percent and number of units with LBP hazards for this age category, noted above in the discussion of Table 5-1.

Table 5-6 shows the number and percent of housing units with characteristics that may be related to presence or absence of LBP hazards. Table 5-7 shows the prevalence of significant interior LBP hazards in homes with these characteristics. “Lead Related Occupation” refers to units where at least one resident performed an activity at work in the last 6 months that might have resulted in exposure to lead (e.g., paint removal, plumbing, battery manufacture, welding, etc.). “Lead Related Hobby” refers to units where someone has conducted an activity in the home in the last 6 months that might have resulted in exposure to or release of lead (e.g., making bullets or fishing sinkers, paint removal, soldering, etc.). The tables also present estimates for cleanliness and clutter, based on a subjective visual assessment by the interviewer.

Table 5-6 shows statistically significant decreases in the percent of units with lead-related occupations and hobbies from NSLAH to AHHS, although the definitions used in AHHS are exactly the same as those in NSLAH. The decline in industrial jobs in the U.S. may explain some of the reduction in lead-related occupations. Also, increased awareness of the hazards of lead could contribute to a reduction in lead-related hobbies. The number and percent of houses rated “clean” and rated “organized” are statistically significantly greater in AHHS than in NSLAH. Some of these differences are due to missing data in NSLAH (6% of units). If the NSLAH

percentages are recalculated using the number of units reporting as the denominator (rather than 95,688,000, the total number of units), the percent appearing clean rises to 61.6% and the percent with clutter organized increases to 45.3%. The clutter percent is no longer significantly different from AHHS, though the percent clean still is. It should also be borne in mind that the cleanliness and clutter classifications are subjective, so that some differences between the NSLAH and AHHS interviewers are inevitable.

Table 5-7 shows the likelihood of a home having significant interior LBP hazards in AHHS based on the characteristics tabulated in Table 5-6. Overall, 15.3% of homes had interior LBP hazards. Of homes reporting a lead related occupation, 16.8% had interior LBP hazards, slightly more than the 14.8% of homes not reporting a lead-related occupation. Slightly fewer homes reporting a lead related hobby had significant interior hazards (14.1%) as compared to homes without a lead related hobby (15.6%). Differences for lead related occupations and hobbies are not statistically significant. Thus, lead-related occupations and hobbies do not seem to increase the risk of interior lead hazards. It should be noted, however, that the occupations and hobbies listed as "lead related" in the questionnaire do not always involve lead exposure. For example, paint removal may involve only non-leaded paint.

Of homes that appeared clean in the judgment of the interviewer, only 11.4% had significant interior LBP hazards, statistically significantly less than the percent of homes with some or no evidence of cleaning (22.1% and 28.8%, respectively). Likewise, only 10.1% of organized homes had significant interior hazards, also statistically significantly less than the percent of homes with average clutter or no organization at all (17.1% and 29.7%, respectively). Thus, cleanliness and lack of clutter are significant predictors of reduced incidence of interior LBP hazards. This is presumably due to lower dust levels and/or better maintenance of paint in clean/organized households. The conclusions concerning the impact of lead-related occupations/hobbies and cleanliness/clutter from AHHS are the same as those from NSLAH.

Table 5-1. Comparison of Prevalence of Housing Units with Significant Lead-Based Paint (LBP) Hazards, by Selected Housing (HU) Characteristics between NSLAH and AHHS (in RED) (Statistically Significant Differences Highlighted)

Characteristic	*All HUs (000)*[b]	*No. of HUs with Significant LBP Hazards (000)*			*Percent*[c] *of HUs with Significant LBP Hazards (%)*			HUs in Sample
		Estimate	*Lower 95% CI*[d]	*Upper 95% CI*	*Estimate*	*Lower 95% CI*	*Upper 95% CI*	
Total Occupied HUs	95,688	24,026	21,307	26,746	25%	22%	28%	831
	106,033	23,186	20,532	25,840	21.9%	19.4%	24.3%	1,131
HUD Lead Safe Housing Rule: Significant LBP Hazards[a]								
Region:								
Northeast	19,290	7,679	5,748	9,611	40%	30%	50%	155
	20,190	7,507	6,014	9,001	37.2%	29.7%	44.7%	196
Midwest	22,083	7,250	6,402	8,097	33%	29%	37%	196
	23,994	6,398	5,257	7,539	26.7%	22.3%	31.0%	245
South	35,474	6,191	4,964	7,419	17%	14%	21%	277
	38,996	6,067	4,454	7,680	15.6%	11.5%	19.6%	440
West	18,841	2,906	1,856	3,956	15%	10%	21%	203
	22,853	3,214	2,202	4,225	14.1%	9.7%	18.4%	250
Construction Year:								
1978-1998	29,774	1,042	169	1,915	3%	1%	6%	220
1978-2005	40,458	1,083	453	1,713	2.7%	1.1%	4.3%	476
1960-1977	27,874	2,340	1,445	3,235	8%	5%	12%	267
	29,956	3,415	1,899	4,930	11.4%	6.5%	16.3%	306
1940-1959	20,564	8,826	6,720	10,933	43%	33%	53%	186
	18,117	6,999	5,391	8,607	38.6%	29.7%	47.6%	187
Before 1940	17,476	11,818	10,045	13,591	68%	57%	78%	158
	17,503	11,689	10,425	12,954	66.8%	59.6%	74.0%	162
Region by Construction Year:								
Northeast								
HUs built 1978-1998	4,358	213	0	625	5%	0%	14%	30
HUs built 1978-2005	3,831	109	0	321	2.8%	0%	8.4%	35
HUs built 1960-1977	3,794	188	0	575	5%	0%	15%	31
	5,288	1,028	222	1,833	19.4%	4.2%	34.7%	57
HUs built 1940-1959	4,221	2,370	1,252	3,487	56%	30%	83%	35
	4,156	1,527	581	2,473	36.7%	13.9%	59.6%	42
HUs built before 1940	6,917	4,909	3,682	6,135	71%	53%	89%	59
	6,915	4,844	4,043	5,645	70.1%	58.5%	81.7%	62
Midwest								
HUs built 1978-1998	4,801	183	0	545	4%	0%	11%	41
1978-2005	8,319	97	0	229	1.2%	0%	2.7%	107
HUs built 1960-1977	6,283	1,019	416	1,622	16%	7%	26%	55
	5,844	448	31	866	7.7%	1.3%	14.1%	58
HUs built 1940-1959	5,899	2,716	1,529	3,902	46%	26%	66%	47
	4,436	2,160	1,365	2,955	48.7%	30.3%	67.1%	36
HUs built before 1940	5,101	3,333	2,353	4,312	65%	46%	85%	53
	5,395	3,693	3,150	4,236	68.5%	58.9%	78.0%	44

Table 5-1. Comparison of Prevalence of Housing Units with Significant Lead-Based Paint (LBP) Hazards, by Selected Housing (HU) Characteristics between NSLAH and AHHS (in RED) (Statistically Significant Differences Highlighted)

Characteristic	*All HUs (000)*[b]	*No. of HUs with Significant LBP Hazards (000)*			*Percent*[c] *of HUs with Significant LBP Hazards (%)*			**HUs in Sample**
		Estimate	*Lower 95% CI*[d]	*Upper 95% CI*	*Estimate*	*Lower 95% CI*	*Upper 95% CI*	
HUD Lead Safe Housing Rule: Significant LBP Hazards[a]								
South								
HUs built 1978-1998	14,447	646	0	1,340	4%	0%	11%	95
1978-2005	18,625	664	143	1,185	3.6%	0.7%	6.5%	221
HUs built 1960-1977	11,262	686	289	1,083	6%	3%	10%	96
	11,724	1,311	256	2,365	11.2%	2.5%	19.8%	122
HUs built 1940-1959	6,320	2,366	1,325	3,406	37%	21%	54%	57
	5,575	2,145	1,261	3,030	38.5%	22.6%	54.3%	71
HUs built before 1940	3,445	2,493	2,151	2,836	72%	62%	82%	29
	3,072	1,947	1,170	2,724	63.4%	38.2%	88.6%	26
West								
HUs built 1978-1998	6,169	0	0	0	0	0	0	54
1978-2005	9,682	213	0	462	2.2%	0%	4.8%	113
HUs built 1960-1977	6,536	446	83	809	7%	1%	12%	85
	7,101	628	1	1,256	8.9%	0.1%	17.6%	69
HUs built 1940-1959	4,124	1,376	892	1,859	33%	22%	45%	47
	3,949	1,167	635	1,699	29.6%	15.9%	43.2%	38
HUs built before 1940	2,013	1,084	382	1,787	54%	19%	89%	17
	2,121	1,206	959	1,452	56.8%	45.2%	68.5%	30
Urbanization								
MSA (all – estimated)	72,567	17,025	14,279	19,771	23.5%	19.7%	27.2%	693
	80,101	17,590	14,772	20,408	22.0%	18.7%	25.2%	889
Non-MSA	23,121	7,001	3,848	10,153	30%	17%	44%	138
	25,933	5,596	3,889	7,304	21.6%	15.6%	27.6%	242
One or More Children Under Age 6:								
All HU ages	16,402	4,155	2,948	5,363	25%	18%	33%	184
	16,833	3,585	2,205	4,966	21.3%	13.1%	29.5%	207
HUs built 1978-1998	5,847	<58[f]	-	-	<1[f]	-	-	56
	7,995	170	0	409	2.1%	0%	5.2%	103
HUs built 1960-1977	5,098	469	0	940	9%	0%	18%	61
	4,002	737	229	1,246	18.4%	6.2%	30.7%	48
HUs built 1940-1959	3,055	1,732	1,088	2,375	57%	36%	78%	40
	2,641	1,414	675	2,153	53.5%	33.2%	73.9%	33
HUs built before 1940	2,401	1,955	1,190	2,720	81%	50%	113%[g]	27
	2,196	1,264	416	2,113	57.6%	35.3%	79.9%	23
Housing Unit Type:								
Single family	82,651	21,584	18,974	24,194	26%	23%	29%	705
	89,156	21,942	19,478	24,406	24.6%	21.9%	27.3%	950
Multi-family	13,037	2,442	1,208	3,676	19%	9%	28%	126
	16,877	1,244	426	2,062	7.4%	2.6%	12.1%	181

Table 5-1. Comparison of Prevalence of Housing Units with Significant Lead-Based Paint (LBP) Hazards, by Selected Housing (HU) Characteristics between NSLAH and AHHS (in RED) (Statistically Significant Differences Highlighted)

Characteristic	*All HUs (000)*[b]	*No. of HUs with Significant LBP Hazards (000)*			*Percent*[c] *of HUs with Significant LBP Hazards (%)*			**HUs in Sample**
		Estimate	*Lower 95% CI*[d]	*Upper 95% CI*	*Estimate*	*Lower 95% CI*	*Upper 95% CI*	
HUD Lead Safe Housing Rule: Significant LBP Hazards[a]								
Tenure:								
Owner-occupied	66,232	15,305	13,191	17,419	23%	20%	26%	539
	73,627	15,036	12,167	17,905	20.4%	16.7%	24.2%	772
Renter-occupied	29,074	8,721	6,583	10,859	30%	23%	37%	289
	32,407	8,150	6,383	9,916	25.2%	19.7%	30.6%	359
Refusal/Don't Know[e]	381							3
Imputed								2
Household Income:								
Less than $30,000/year	33,830	12,007	9,336	14,679	35%	28%	43%	309
	37,059	10,635	8,827	12,443	28.7%	24.2%	33.2%	401
$30,000/year or more	56,111	10,464	8,250	12,678	19%	15%	23%	482
	68,975	12,551	10,027	15,075	18.2%	14.7%	21.7%	730
Refusal/Don't Know	5,747							40
Imputed								70
One or More Children Under Age 6:								
All Income Categories	16,402	4,155	2,948	5,363	25%	18%	33%	184
	16,833	3,585	2,205	4,966	21.3%	13.1%	29.5%	207
Less than $30,000/year	4,791	1,201	600	1,801	25%	13%	38%	61
	5,781	1,138	510	1,765	19.7%	8.8%	30.6%	74
$30,000/year or more	11,236	2,860	1,763	3,957	25%	16%	35%	117
	11,052	2,447	1,330	3,564	22.1%	12.6%	31.7%	133
Refusal/Don't Know	375							6
Imputed								16
One or More Children Under Age 6:								
All Income Categories	16,833	3,585	2,205	4,966	21.3%	13.1%	29.5%	207
In Poverty	3,423	645	27	1,263	18.8%	1.9%	35.8%	43
Not in Poverty	13,410	2,940	1,754	4,126	21.9%	13.1%	30.7%	164
Imputed								16
Government Support:								
Government support	4,809	805	275	1,335	17%	6%	28%	54
	5,870	721	205	1,238	12.3%	3.0%	21.6%	65
No government support	86,070	22,198	19,252	25,144	26%	22%	29%	733
	99,522	22,320	19,590	25,050	22.4%	19.8%	25.1%	1,059
Refusal/Don't Know	4,809							44
	641							7
Poverty:								
In Poverty	13,221	4,976	3,458	6,494	38%	26%	49%	137
	14,593	4,407	2,986	5,828	30.2%	22.8%	37.6%	166
Not in Poverty	76,336	16,576	13,598	19,555	22%	18%	26%	651
	91,441	18,779	16,180	21,378	20.5%	17.8%	23.3%	965
Refusal/Don't Know	6,130							43
Imputed								98
Poverty by Urbanization:								
MSA (all- NSLAH estimated)								

Table 5-1. Comparison of Prevalence of Housing Units with Significant Lead-Based Paint (LBP) Hazards, by Selected Housing (HU) Characteristics between NSLAH and AHHS (in RED) (Statistically Significant Differences Highlighted)

Characteristic	*All HUs (000)*[b]	*No. of HUs with Significant LBP Hazards (000)*			*Percent*[c] *of HUs with Significant LBP Hazards (%)*			**HUs in Sample**
		Estimate	*Lower 95% CI*[d]	*Upper 95% CI*	*Estimate*	*Lower 95% CI*	*Upper 95% CI*	
HUD Lead Safe Housing Rule: Significant LBP Hazards[a]								
In poverty	9,958 10,469	3,738 3,370	2,521 2,142	4,955 4,597	38% 32.2%	25% 24.4%	50% 40.0%	110 125
Not in poverty	57,791 69,632	11,507 14,220	9,177 11,561	13,837 16,879	20% 20.4%	16% 16.9%	24% 23.9%	549 764
Non-MSA								
In poverty	3,264 4,124	1,238 1,037	178 312	2,299 1,763	38% 25.2%	5% 9.5%	70% 40.8%	27 41
Not in poverty	18,545 21,809	5,070 4,559	1,879 2,817	8,261 6,301	27% 20.9%	10% 13.9%	45% 27.9%	102 201
Refusal/Don't Know if in Poverty	6,131							43
Imputed								98
Race:								
White	77,005 82,739	19,089 16,778	16,475 14,533	21,703 19,022	25% 20.3%	21% 17.7%	28% 22.8%	622 868
African American	10,365 13,161	2,969 3,727	1,807 2,455	4,131 5,000	29% 28.3%	17% 20.6%	40% 36.1%	116 151
Other[h]	6,571 10,134	1,496 2,681	672 1,863	2,321 3,499	23% 26.5%	10% 19.8%	35% 33.1%	77 112
Refusal/Don't Know	1,746							16
Imputed								2
Ethnicity:								
Hispanic/Latino	7,434 13,175	2,399 2,400	1,235 1,607	3,564 3,194	32% 18.2%	17% 12.7%	48% 23.7%	86 158
Not Hispanic/Latino	87,008 92,858	21,196 20,786	18,674 18,082	23,719 23,490	24% 22.4%	21% 19.8%	27% 25.0%	736 973
Refusal/Don't Know	1,246							9
Imputed								2

[a] Significant LBP hazard as defined in text and HUD Lead Safe Housing Rule.
[b] "Housing units" include permanently occupied, noninstitutional housing units in which children are permitted to live.
[c] All percentages are calculated with the "All HUs" column in each row used as the denominator.
[d] CI = confidence interval for the estimated number or percent.
[e] Refusals and "don't know" responses by survey respondents.
[f] No 1978-1988 housing units with one or more children < 6 years old in this sample have lead-based paint hazards.
[g] Upper 95% CI value > 100% reflects uncertainty in number of housing units in first data column.
[h] "Other" race includes Asian, American Indian or Alaskan Native, Native Hawaiian or other Pacific Islander, and more than one race.

Table 5-2. Prevalence of Significant Lead-Based Paint (LBP) Hazards by Location in the Building (AHHS in RED; Statistically Significant Results Highlighted)

HUD Lead Safe Housing Rule: Significant LBP Hazards							
LBP Hazard Location	***Number of HUs[a] (000)***			***Percent of HUs[b]***			***HUs in Sample***
	Estimate	***Lower 95% CI[c]***	***Upper 95% CI***	***Percent***	***Lower 95% CI***	***Upper 95% CI***	
Interior only	8,823 9,661	6,439 7,646	11,207 11,677	9% 9.1%	7% 7.2%	12% 11.0%	63 98
Both Interior and Exterior	8,869 6,558	6,634 4,779	11,104 8,337	9% 6.2%	7% 4.5%	12% 7.8%	99 61
Exterior only	6,334 6,967	4,741 5,267	7,928 8,667	7% 6.6%	5% 5.0%	8% 8.2%	48 69
Anywhere	24,026 23,186	21,307 20,532	26,746 25,840	25% 21.9%	22% 19.4%	28% 24.3%	210 228
No Significant LBP Hazard	71,661 82,847	68,498 80,116	74,825 85,579	75% 78.1%	72% 75.7%	78% 80.6%	621 903
Total HUs	95,688 106,033			100% 100%			831 1,131

[a] "Housing units" include permanently occupied, noninstitutional housing units in which children are permitted to live.
[b] All percentages are calculated with total housing units (95,688) (106,033) as the denominator. Percentages may not total 100% due to rounding.
[c] CI = confidence interval for the estimated number or percent

Table 5-3. Prevalence of Significant Lead-Based Paint (LBP) Hazards in Housing Units with a Child Under 6 Years of Age by Type of Hazard
(AHHS in RED; Statistically Significant Differences Highlighted)

HUD Lead Safe Housing Rule: Significant LBP Hazards						
Type of Hazard	***Number of HUs[a] (000)***			***Percent of HUs[b] (%)***		
	Estimate	***Lower 95% CI[c]***	***Upper 95% CI***	***Estimate***	***Lower 95% CI***	***Upper 95% CI***
Significantly Deteriorated Lead Based Paint						
All HUs	13,634 15,331	10,928 12,784	16,341 17,879	14% 14.5%	11% 12.1%	17% 16.8%
HUs w/ Child Under 6	2,519 2,727	1,715 1,395	3,324 4,060	15% 16.2%	10% 8.3%	20% 24.1%
Interior Lead Dust						
All HUs	15,468 13,740	12,982 11,776	17,954 15,704	16% 13.0%	14% 11.2%	19% 14.8%
HUs w/ Child Under 6	2,634 2,144	1,587 1,350	3,681 2,939	16% 12.7%	10% 8.0%	22% 17.5%
Soil Lead Hazard						
All HUs	6,460 3,848	3,122 2,235	9,799 5,461	7% 3.6%	3% 2.1%	10% 5.2%
HUs w/ Child Under 6	1,511 1,042	0 367	3,108 1,717	9% 6.2%	0% 2.2%	19% 10.2%
Any LBP Hazard						
All HUs	24,026 23,186	21,306 20,532	26,746 25,840	25% 21.9%	22% 19.4%	28% 24.3%
HUs w/ Child Under 6	4,155 3,585	2,948 2,205	5,363 4,966	25% 21.3%	18% 13.1%	33% 29.5%

[a] "Housing units" include permanently occupied, noninstitutional housing units in which children are permitted to live.
[b] Percentages are calculated with total housing units (95,688) (106,033) or with housing units with a child under age 6 (16,402) as the denominator, as applicable.
[c] CI = confidence interval for the estimated number or percent.

Table 5-4. Prevalence of Significant Lead-Based Paint (LBP) Hazards in Housing Units by Type of Hazard and Poverty Status						
HUD Lead Safe Housing Rule: Significant LBP Hazards						
Type of Hazard	***Number of HUs[a] (000)***			***Percent of HUs[b] (%)***		
	Estimate	***Lower 95% CI[c]***	***Upper 95% CI***	***Estimate***	***Lower 95% CI***	***Upper 95% CI***
Significantly Deteriorated Lead Based Paint						
All HUs	15,331	12,784	17,879	14.5%	12.1%	16.8%
HUs in Poverty	2,803	1,707	3,899	19.2%	12.3%	26.1%
HUs not in Poverty	12,528	10,317	14,739	13.7%	11.4%	16.0%
Interior Lead Dust						
All HUs	13,740	11,776	15,704	13.0%	11.2%	14.8%
HUs in Poverty	2,706	1,487	3,926	18.6%	11.3%	25.8%
HUs not in Poverty	11,033	9,171	12,896	12.1%	10.1%	14.1%
Soil Lead Hazard						
All HUs	3,848	2,235	5,461	3.6%	2.1%	5.2%
HUs in Poverty	352	0	720	2.4%	0%	4.9%
HUs not in Poverty	3,496	1,960	5,032	3.8%	2.1%	5.5%
Any LBP Hazard						
All HUs	23,186	20,532	25,840	21.9%	19.4%	24.3%
HUs in Poverty	4,407	3,986	5,828	30.2%	22.8%	37.6%
HUs not in Poverty	18,779	16,180	21,378	20.5%	17.8%	23.3%

No NSLAH values available, only AHHS values shown .

[a] "Housing units" include permanently occupied, noninstitutional housing units in which children are permitted to live.

[b] Percentages are calculated with HUs (95,688), total HUs in poverty (14,593) or total HUs not in poverty (91,441) as the denominator, as applicable.

[c] CI = confidence interval for the estimated number or percent.

Table 5-5. Prevalence of Significant Lead-Based Paint (LBP) Hazards in Housing Units by Type of Hazard and Housing Unit Age
(AHHS in RED; Statistically Significant Differences Highlighted)

HUD Lead Safe Housing Rule: Significant LBP Hazards

Type of Hazard	*Number of HUs[a] (000)*			*Percent of HUs[b] (%)*		
	Estimate	*Lower 95% CI[c]*	*Upper 95% CI*	*Estimate*	*Lower 95% CI*	*Upper 95% CI*
Significantly Deteriorated Lead Based Paint						
Built 1978-1998	83	0	240	0%	0%	1%
Built 1978-2005	109	0	265	0.3%	0%	0.7%
Built 1960-1977	610	91	1,128	2%	0%	4%
	1,822	853	2,792	6.1%	3.0%	9.2%
Built 1940-1959	5,190	3,367	7,013	25%	16%	34%
	4,547	2,998	6,097	25.1%	16.5%	33.7%
Built Before 1940	7,752	6,029	9,475	44%	34%	54%
	8,852	7,426	10,279	50.6%	42.5%	58.7%
Interior Lead Dust						
Built 1978-1998	959	98	1,821	3%	0%	6%
Built 1978-2005	865	289	1,441	2.1%	0.7%	3.6%
Built 1960-1977	1,943	1,173	2,714	7%	4%	10%
	1,970	1,002	2,939	6.6%	3.4%	9.8%
Built 1940-1959	4,665	3,181	6,150	23%	15%	30%
	4,148	2,882	5,414	22.9%	15.9%	29.9%
Built Before 1940	7,735	5,982	9,489	44%	34%	54%
	6,756	5,545	7,967	38.6%	31.7%	45.5%
Soil Lead Hazard						
Built 1978-1998	0	0	0	0%	0%	0%
Built 1978-2005	109	0	321	0.3%	0%	0.8%
Built 1960-1977	130	0	263	0%	0%	1%
	178	0	429	0.6%	0%	1.4%
Built 1940-1959	2,562	1,294[d]	3,830	12%	6%[d]	19%
	877	209	1,544	4.8%	1.2%	8.5%
Built Before 1940	3,867	2,993[d]	4,741	22%	17%[d]	27%
	2,685	1,511	3,859	15.3%	8.6%	22.1%
Any LBP Hazard						
Built 1978-1998	1,042	169	1,915	3%	1%	6%
Built 1978-2005	1,083	453	1,713	2.7%	1.1%	4.3%
Built 1960-1977	2,340	1,445	3,235	8%	5%	12%
	3,415	1,899	4,930	11.4%	6.5%	16.3%
Built 1940-1959	8,826	6,720	10,933	43%	33%	53%
	6,999	5,391	8,607	38.6%	29.7%	47.6%
Built Before 1940	11,818	10,045	13,591	68%	57%	78%
	11,689	10,425	12,954	66.8%	59.6%	74.0%

[a] "Housing units" include permanently occupied, noninstitutional housing units in which children are permitted to live.
[b] Percentages are calculated with total housing units built in that time period as the denominator.
[c] CI = confidence interval for the estimated number or percent.
[d] Calculated by QuanTech

Table 5-6. Prevalence of Housing Units with Selected Lead-Related Characteristics (AHHS in RED; Statistically Significant Differences Highlighted)

Lead Related Behavior	*Number of HUs (000)*[a]			Percent of HUs (%)[b]			HUs in Sample
	Estimate[c]	*Lower 95% CI*[d]	*Upper 95% CI*	*Estimate*	*Lower 95% CI*	*Upper 95% CI*	
Lead Related Occupation	22,673 20,082	19,732 16,517	25,615 23,646	24% 19.0%	21% 15.6%	27% 22.4%	203 206
Lead Related Hobby	39,281 30,876	35,020 27,041	43,543 34,712	41% 29.2%	36% 25.6%	46% 32.7%	347 334
Cleanliness							
House Appears Clean	56,058 73,099	51,887 69,700	60,228 77,128	59% 68.9%	54% 65.3%	63% 72.6%	462 777
Some Evidence of Cleaning	25,347 24,016	21,417 20,282	29,277 27,751	26% 22.7%	22% 19.1%	31% 26.2%	237 260
No Evidence of Cleaning	9,646 8,919	7,577 7,048	11,714 10,789	10% 8.4%	8% 6.7%	12% 10.2%	86 94
Clutter							
Clutter Organized	41,158 51,548	37,650 46,947	44,666 56,148	43% 48.6%	40% 44.2%	46% 53.0%	347 534
Average Amount of Clutter	38,601 41,159	35,663 36,847	41,539 45,472	40% 38.8%	37% 34.8%	43% 42.8%	336 456
No Organization	11,045 13,327	8,859 10,802	13,231 15,851	12% 12.6%	9% 10.2%	14% 14.9%	100 141
Total HUs	95,688 106,033						831 1,131

[a] "Housing units" include permanently occupied, noninstitutional housing units in which children are permitted to live.
[b] All percentages are calculated with total housing units (95,688) as the denominator. Percentages may not total 100% due to rounding.
[c] Estimates are based on the full weighted sample.
[d] CI = confidence interval for the estimated number or percent.

Table 5-7. Prevalence of Significant Interior LBP Hazards in Homes with Selected Characteristics in AHHS							
Characteristic	***Number of HUs (000)[a]***			***Percent of HUs (%)[b]***			***HUs in Sample***
	Estimate	***Lower 95% CI[c]***	***Upper 95% CI***	***Estimate***	***Lower 95% CI***	***Upper 95% CI***	
Occupations and Hobbies							
Lead Related Occupation	3,383	2,003	4,763	16.8%	10.6%	23.1%	45
No Lead Related Occupation	12,616	10,440	14,792	14.8%	12.3%	17.2%	127
Lead Related Hobby	4,354	2,665	6,042	14.1%	9.3%	18.9%	57
No Lead Related Hobby	11,726	9,565	13,887	15.6%	13.0%	18.3%	118
Cleanliness							
House Appears Clean	8,331	5,970	10,692	11.4%	8.4%	14.4%	80
Some Evidence of Cleaning	5,318	3,334	7,302	22.1%	15.7%	28.6%	53
No Evidence of Cleaning	2,570	1,512	3,627	28.8%	19.1%	38.5%	26
Clutter							
Clutter Organized	5,212	3,487	6,937	10.1%	7.0%	13.2%	48
Average Amount of Clutter	7,051	5,210	8,893	17.1%	13.3%	21.0%	70
No Organization	2,956	2,516	5,396	29.7%	20.9%	38.5%	41
Overall							
ALL HOUSING UNITS	16,219	13,883	18,556	15.3%	13.1%	17.5%	159

[a] "Housing units" include permanently occupied, noninstitutional housing units in which children are permitted to live.
[b] All percentages are calculated with total housing units reporting the corresponding characteristic as the denominator. Percentages may not total 100% due to rounding.
[c] CI = confidence interval for the estimated number or percent.

6.0 DUST LEAD HAZARDS IN HOUSING

Table 6-1 shows mean floor and windowsill dust lead loadings, in micrograms per square foot ($\mu g/ft^2$), broken down by various housing characteristics of interest. In the AHHS, the detection limit for dust wipe samples was 5 $\mu g/ft^2$. Of 5,612 floor dust wipe samples taken in completed units, only 404 (7.2%) were above the detection limit. For windowsill dust wipe samples, 1,306 of 3,170 (35.2%) were detectable. Therefore, QuanTech obtained raw analytical data files from the laboratory from which analysis results could be calculated for all samples, including those below the limit of detection. These calculated values were used in the estimation of mean values in Table 6-1 (the arithmetic mean of all sample values in a unit, for floors and sills separately, was first calculated). This procedure provides unbiased estimates of means, provided that measurements below the detection limit are normally distributed about the true value of the analyte, as is generally assumed in discussions of the detection limit [14]. The higher relative variability of values below the detection limit is incorporated into the calculation of the variability of the estimated means. That is, the confidence intervals in Table 6-1 reflect the true variability of the values below the detection limit. By contrast, procedures that replace non-detect values by the detection limit, or some fraction thereof, generally result in biased estimates [14], especially when a substantial number of values are below the detection limit.

The estimated mean dust lead loading on floors nationwide is 3.56 $\mu g/ft^2$; for windowsills, the mean is 156 $\mu g/ft^2$. The floor mean is less than 10% of the regulatory standard of 40 $\mu g/ft^2$, but the windowsill mean is relatively much higher - 62% of the regulatory level of 250 $\mu g/ft^2$. Both means follow regional and age patterns one would expect from the prevalence of LBP: mean dust lead levels are highest in the Northeast and Midwest and increase with the age of the housing. Confidence limits for the means are rather wide ($\pm$31% even at the national level), reflecting the skewed distribution of dust lead levels. Even so, mean floor dust levels in the Northeast and Midwest are statistically significantly higher than in the West and mean windowsill levels are statistically significantly higher in the Northeast than in any other region. Indeed, the mean windowsill level in the Northeast (489 $\mu g/ft^2$) is almost twice the regulatory standard of 250 $\mu g/ft^2$. Likewise, both mean floor and windowsill dust lead levels are statistically significantly higher for pre-1960 housing than for newer homes. The mean windowsill dust lead level for pre-1940 homes is 584 $\mu g/ft^2$, more than twice the regulatory limit. Estimates by age within region are of course more variable than national estimates, but the age pattern generally still holds.

Patterns for subpopulations (e.g., homes with children under the age of 6) are generally consistent with those for prevalence of LBP, with some exceptions. Mean floor dust lead levels are statistically significantly higher for single family vs. multifamily homes, and for units without Government support vs. units with Government support. Mean windowsill dust lead levels are statistically significantly higher for MSA homes vs. non-MSA homes, for units without Government support vs. units with Government support, and for African American households vs. White households. However, both mean floor and mean windowsill dust lead levels are statistically significantly higher in non-Hispanic than Hispanic homes, although slightly more Hispanic homes have LBP.

Table 6-2 shows the distribution of the maximum dust lead loading in housing units, separately for floors and windowsills. For the AHHS, the level 5 μg/sq ft^2 represents the limit of detection of the analytical method used to analyze the dust wipes in the laboratory; in NSLAH, the limit of detection was lower (1.5 – 3.5 μg/sq ft^2). For floors, the number and percent of units exceeding each threshold level is lower, except for the number exceeding 100 μg/sq ft^2, which increased slightly in AHHS. For floors, the extent of decrease from NSLAH to AHHS is greatest for the lower loadings, and statistically significant only for the very lowest. For windowsill lead loadings, the number and percent exceeding all thresholds show decreases from NSLAH to AHHS. The decreases in percent are statistically significant in all cases. Overall, then, the number and percent of homes with dust lead loadings exceeding specific thresholds has decreased from NSLAH to AHHS, with the exception of the highest levels on floors.

Tables 6-3 and 6-4 break down Table 6-2 by age of housing, for floors and windowsills, respectively. The overall pattern of a decrease from NSLAH to AHHS for all but the highest floor dust lead level holds up well for each of the separate age categories, with the exception of the most recent units. There are increases in the number and percent of post-1978 units with maximum floor dust levels exceeding 20, 40 and 100 μg/ft^2. The increases for 20 μg/ft^2 are statistically significant. For windowsills, the overall pattern (decrease from NSLAH to AHHS) is repeated in each age category with the one exception of the highest level (500 μg/sq ft^2) in 1960-1977.

Tables 6-5 and 6-6 break down Table 6-2 by annual household income (less than $30,000 versus $30,000 or greater). For households earning less than $30,000, there are decreases in the number and percent of units exceeding every threshold for floors. For households earning $30,000 or more, however, there are increases in the number of units with maximum floor levels exceeding all thresholds except 5 μg/sq ft^2 (statistically significant for the 100 μg/sq ft^2 level). For windowsills, however, the overall pattern of a decrease from NSLAH to AHHS, seen in Table 6-2, holds for both income categories.

Table 6-7 breaks down Table 6-2 by carpeted and uncarpeted floors. As one would expect, lead levels on uncarpeted floors are much higher than on carpeted floors, probably largely due to the difficulty and inefficiency of wipe sampling on carpeted surfaces.

Tables 6-8 and 6-9 show the relationship between lead levels in interior paint and floor and window dust lead loadings, respectively. The percent shown in each cell is the estimated percentage of all housing units with maximum interior paint lead level in the stated range that have maximum floor lead loadings in the stated range. For example, an estimated 13.9% of all units where the maximum interior paint lead level is 4.0 mg/cm^2 or greater have a floor lead loading 100 μg/ft^2 or greater. Both tables show the expected patterns: the higher the paint lead level, the higher the dust lead loadings on both floors and windowsills. For example, an estimated 21.5% of units with paint lead levels of 4.0 mg/cm^2 or greater have floor dust hazards (40 μg/ft^{2}or greater), compared to only 1.3% of units with paint lead below 0.5 mg/cm^2. Table 6-10 shows the relation between exterior paint lead levels and windowsill dust lead loading. The relationship is generally similar to Table 6-9 for interior paint. For example, 35.4% of homes with exterior paint lead levels equal or greater than 4 mg/cm^2 have windowsill lead loading greater than or equal to the Federal standard of 250 μg/ft^2, compared to 39.2% of homes with

interior paint lead 4 mg/cm^2 or greater. The exception is for homes with interior lead between 0.5 and 1.0 mg/cm^2, where 6.1% have a windowsill hazard, compared to 18.2% of homes with exterior lead between 0.5 and 1 mg/cm^2. However, in this case the estimates for the exterior table have unusually large standard errors, so the difference is less significant than it appears. Tables 6-11 and 6-12 correspond to Tables 6-8 and 6-9, but include only units with significantly deteriorated paint. As one would expect, the presence of deteriorated paint significantly increases the likelihood of floor and window dust hazards. For example, an estimated 9.7% of units with maximum paint lead level between 1.0 and 4.0 mg/cm^2 have floor dust hazards, but the percentage with hazards rises to 26.0% when the paint is also significantly deteriorated. Table 6-13 is the companion table to 6-10 for significantly deteriorated exterior paint. Here, however, significantly deteriorated exterior paint is a weaker predictor of high windowsill dust lead loadings than significantly deteriorated interior paint. For example, 61.9% of homes with significantly deteriorated interior paint at lead levels of 4 mg/cm^2 or greater have a windowsill lead hazard, compared to only 41.7% of homes with the same exterior paint condition.

Table 6-14 shows the estimated national percentage of housing units exceeding various floor and windowsill dust lead thresholds as a function of various housing characteristics and the presence or absence of LBP, deteriorated LBP and significantly deteriorated LBP (interior, exterior or both). Three thresholds are used for floors: the current regulatory limit of 40 μg/ft^2 and two lower thresholds (20 μg/ft^2 and 10 μg/ft^2). For windowsills the two thresholds are the current regulatory limit of 250 μg/ft^2 and one-half that level (125 μg/ft^2).

The table clearly demonstrates that LBP is the primary driver of elevated dust lead levels. Only 1.2% (95% confidence interval 0.3% - 2.1%) of homes without LBP have floor dust hazards (40 μg/ft^2 or greater) and only 3.1% (1.9% - 4.3%) have windowsill dust lead hazards (250 μg/ft^2 or greater). However, 11.9% (8.8% - 15.1%) of homes with LBP have floor dust hazards and 24.2% (19.5% -28.9%) have windowsill dust hazards. Both differences are highly statistically significant ($p < 0.0001$). The table also shows that the degree of deterioration of the LBP has an effect on dust hazards: homes with deteriorated LBP have more floor dust hazards (16.8%) than homes with just LBP, and those with significantly deteriorated LBP still have more (18.3%). Only the difference for significantly deteriorated LBP is statistically significant. Results are similar for windowsill dust hazards.

Interestingly, the presence of LBP or deteriorated LBP on both the interior and exterior of the unit greatly increases the likelihood of elevated dust lead levels compared to units with LBP or deteriorated LBP on either the interior or exterior only. For example, 19.0% (7.6% - 30.3%) of homes with significantly deteriorated LBP on the interior only have floor dust hazards (40 μg/ft^2 or greater) while 10.5% (3.1% - 18.0%) of homes with significantly deteriorated LBP on the exterior only have floor dust hazards**.** However**,** fully 38.9% (23.6% - 54.2%) of homes with significantly deteriorated LBP on the both interior and exterior have floor dust hazards**,** a statistically significantly higher percentage than for either interior or exterior alone.

The presence of soil lead hazards is also associated with higher levels of lead in interior dust. While 20.6% of homes with soil lead hazards have interior dust hazards, only 4% of those without soil hazards do. Results for windowsills are similar – 36.8% of homes with soil lead hazards have windowsill dust hazards compared to only 8.9% of homes without soil lead

hazards. Some of this may be due to tracking or blowing of soil in from the yard, but it should be remembered that soil hazards are also caused by deteriorated exterior LBP, so that elevated lead levels in interior dust and in soil have a common cause. Unfortunately, only 35 homes in the survey had soil lead hazards, of which only 2 had no LBP, so that the effect of soil lead hazards on interior dust independent of LBP cannot be evaluated.

Table 6-1. Mean Floor and Windowsill Dust Lead Loadings (µg/ft^2) by Various Housing Characteristics							
Characteristic	***Floors***			***Windowsills***			***HUs in Sample (Floor/Sill)***
	Mean	***Lower 95% CI[a]***	***Upper 95% CI***	***Mean***	***Lower 95% CI***	***Upper 95% CI***	
All Occupied HUs	3.56	2.45	4.68	156	108	203	1,131/1043
Region:							
Northeast	5.19	2.47	7.91	489	285	694	196/189
Midwest	4.70	2.63	6.78	122	37	207	245/225
South	3.14	0.90	5.39	75	35	115	440/393
West	1.65	0.34	2.95	21	9	32	250/236
Construction Year:							
1978-2005	0.62	0.23	1.00	14	1	26	476/421
1960-1977	1.65	0.57	2.72	27	17	37	306/280
1940-1959	5.64	3.32	7.96	230	32	429	187/183
Before 1940	11.50	5.77	17.23	584	240	927	162/159
Region by Construction Year:							
Northeast							
Built 1978-2005	0.46	0.15	0.77	3.5	0.1	6.8	35/34
Built 1960-1977	3.82	0	9.41	39	18	60	57/52
Built 1940-1959	3.04	0	6.27	631	0	1,468	42/42
Built before 1940	10.15	4.90	15.39	989	182	1,797	62/61
Midwest							
Built 1978-2005	0.58	0.17	1.00	4.9	3.0	6.7	107/96
Built 1960-1977	1.07	0	2.21	13	4	21	58/51
Built 1940-1959	9.25	3.23	15.26	128	2	253	36/35
Built before 1940	11.26	4.08	18.43	395	69	720	44/43
South							
Built 1978-2005	0.53	0.31	0.76	26	0	53	221/189
Built 1960-1977	1.41	0.50	2.32	29	10	48	122/111
Built 1940-1959	5.63	2.44	8.83	152	64	240	71/68
Built before 1940	21.04	0	48.86	366	0	774	26/25
West							
Built 1978-2005	0.87	0	2.36	4.1	1.8	6.4	113/102
Built 1960-1977	0.90	0.55	1.25	26	5	48	69/66
Built 1940-1959	4.35	0	10.34	29	14	44	38/38
Built before 1940	2.68	1.55	3.82	59	1	118	30/30
Urbanization							
MSA	2.86	2.04	3.67	180	119	241	889/835
Non-MSA	5.75	1.70	9.79	76	21	130	242/208
Children Under Age 6:							
All HU ages	3.34	1.04	5.64	304	0	681	207/189
Built 1978-2005	0.38	0.18	0.59	2.4	0.9	3.8	103/89
Built 1960-1977	1.28	0.47	2.09	43	7	80	48/46
Built 1940-1959	4.57	1.53	7.61	425	0	1,096	33/31
Built before 1940	16.36	1.87	30.85	1,565	0	3,897	23/23

Table 6-1. Mean Floor and Windowsill Dust Lead Loadings (µg/ft^2) by Various Housing Characteristics							
Characteristic	***Floors***			***Windowsills***			***HUs in Sample (Floor/Sill)***
	Mean	***Lower 95% CI[a]***	***Upper 95% CI***	***Mean***	***Lower 95% CI***	***Upper 95% CI***	
No Children Under Age 6:							
All HU ages	3.61	2.31	4.90	128	74	182	924/854
Built 1978-2005	0.67	0.20	1.15	16	1	31	373/332
Built 1960-1977	1.70	0.46	2.94	25	14	35	258/234
Built 1940-1959	5.83	3.14	8.51	198	4	393	154/152
Built before 1940	10.80	4.54	17.06	439	224	655	139/136
Housing Unit Type:							
Single family	4.11	2.76	5.45	172	120	225	950/876
Multi-family	0.70	0.44	0.96	65	0	154	181/167
Tenure:							
Owner-occupied	3.65	2.12	5.18	108	51	165	772/712
Renter-occupied	3.37	2.03	4.70	264	52	476	359/331
Household Income:							
Less than $30,000/year	5.16	2.60	7.72	225	87	363	401/356
$30,000/year or more	2.71	1.81	3.60	120	32	208	730/687
Children Under Age 6:							
All Income Categories	3.34	1.04	5.64	304	0	681	207/189
Less than $30,000/year	2.13	1.17	3.09	221	0	572	74/63
$30,000/year or more	3.97	0.53	7.41	342	0	852	133/126
No Children Under Age 6:							
All Income Categories	3.61	2.31	4.90	128	74	182	924/854
Less than $30,000/year	5.72	2.65	8.79	225	80	371	327/293
$30,000/year or more	2.46	1.58	3.35	78	30	125	597/561
Government Support:							
Government support	1.25	0.59	1.92	28	5	51	65/63
No government support	3.70	2.52	4.89	164	114	215	1059/974
Refusal/Don't Know[b]							7/6
Poverty:							
In Poverty	3.46	1.71	5.21	273	0	549	166/143
Not in Poverty	3.58	2.34	4.82	138	69	208	965/900
Poverty by Urbanization:							
MSA							
In poverty	3.13	1.79	4.47	343	0	702	125/116
Not in poverty	2.81	1.93	3.70	155	66	245	764/719
Non-MSA							
In poverty	4.30	0	9.39	44	4	84	41/27
Not in poverty	6.02	1.35	10.69	80	17	144	201/181

Table 6-1. Mean Floor and Windowsill Dust Lead Loadings (µg/ft^2) by Various Housing Characteristics

Characteristic	*Floors*			*Windowsills*			*HUs in Sample (Floor/Sill)*
	Mean	*Lower 95% CI*[a]	*Upper 95% CI*	*Mean*	*Lower 95% CI*	*Upper 95% CI*	
Race:							
White	3.60	2.27	4.94	119	66	172	868/795
African American	4.46	2.35	6.58	437	212	662	151/141
Other[c]	2.06	1.12	3.01	84	15	152	112/107
Ethnicity:							
Hispanic/Latino	1.79	0.96	2.61	63	9	117	158/147
Not Hispanic/Latino	3.81	2.56	5.07	169	114	223	973/896

No NSLAH values available, only AHHS values shown.
[a] CI = confidence interval for the mean.
[b] Refusals and "don't know" responses by survey respondents.
[c] "Other" includes Asian, American Indian or Alaskan Native, Native Hawaiian or other Pacific Islander, or more than one race.

Table 6-2. Distribution of Maximum Dust Lead Loadings in Housing Units by Surface (AHHS in RED; Statistically Significant Differences Highlighted)

Maximum Dust Lead Loading in HU (µg/ft²)	*Number of HUs (000)*[a]			*Percent of HUs (%)*[b]		
	Estimate	*Lower 95% CI*[c]	*Upper 95% CI*	*Estimate*	*Lower 95% CI*	*Upper 95% CI*
Floors[d]						
GTE[e] 5	28,200 20,698	24,920 17,484	31,481 23,911	30% 19.5%	26% 16.5%	33% 22.5%
GTE 10	15,964 12,992	13,141 10,206	18,787 15,778	17% 12.3%	14% 9.7%	20% 14.9%
GTE 20	8,989 8,259	6,871 6,298	11,108 10,220	9% 7.8%	7% 6.0%	12% 9.6%
GTE 40	5,495 5,237	3,770 3,809	7,220 6,665	6% 4.9%	4% 3.6%	8% 6.3%
GTE 100	2,426 2,988	1,470 1,929	3,382 4,047	3% 2.8%	2% 1.8%	4% 3.8%
Missing[f]	123			0%		
Windowsills						
GTE 125	20,338 15,680	17,590 13,452	23,085 17,909	21% 14.8%	19% 12.8%	24% 16.8%
GTE 250	13,439 11,090	11,516 9,126	15,362 13,053	14% 10.5%	12% 8.7%	16% 12.3%
GTE 500	9,042 7,361	7,136 5,943	10,949 8,779	10% 6.9%	8% 5.6%	12% 8.3%
No sill present in HU[g]	2,221 2,857	848 1,667	3,594 4,047	2% 2.7%	1% 1.6%	4% 3.8%
Missing[f]	1,731 4,411			2% 4.2%		

[a] "Housing units" include permanently occupied, noninstitutional housing units in which children are permitted to live.
[b] All percentages are calculated with total housing units (95,688) (106,033) as the denominator.
[c] CI = confidence interval for the estimated number or percent.
[d] Floors include both carpeted and uncarpeted floors.
[e] GTE equals "greater than or equal to."
[f] Missing means that the floor, or sill, exists but no lead value is available (either the sample was not collected, e.g., due to inaccessibility or respondent refusal, or the laboratory did not submit a value).
[g] "No sill present" means that there was no sill in the HU, e.g., windows were flush with the wall, or awning windows were installed.

Table 6-3. Maximum Floor Dust Lead Loading by Year of Construction
(AHHS in RED; Statistically Significant Differences Highlighted)

Maximum Floor Dust Lead Loading(µg/ ft²)[a]		*Year of Construction*							
		1978-1998 (1978-2005)		*1960-1977*		*1940-1959*		*Before 1940*	
		Number (000)	*Percent (%)*[b]	*Number (000)*	*Percent (%)*	*Number (000)*	*Percent (%)*	*Number (000)*	*Percent (%)*
GTE[c] 5	Number HUs[d]	3,233 2,268	11% 5.6%	4,968 4,574	18% 15.3%	8,753 5,842	43% 32.3%	11,245 8,014	64% 45.8%
	Lower 95% CI[e]	2,285 1,485	8% 3.7%	3,567 3,268	13% 10.8%	7,060 4,299	35% 23.7%	9,635 6,205	55% 35.5%
	Upper 95% CI	4,181 3,051	14% 7.5%	6,370 5,881	23% 19.7%	10,446 7,386	50% 40.8%	12,855 9,822	73% 56.1%
GTE 10	Number HUs	1,153 1,442	4% 3.6%	2,488 1,973	9% 6.6%	4,938 3,674	24% 20.3%	7,386 5,903	42% 33.7%
	Lower 95% CI	370 895	1% 2.2%	1,607 1,112	6% 3.7%	3,447 2,492	17% 13.7%	5,802 4,125	33% 23.6%
	Upper 95% CI	1,935 1,989	7% 4.9%	3,369 2,835	12% 9.5%	6,428 4,856	31% 26.8%	8,970 7,680	52% 43.8%
GTE 20	Number HUs	97 691	0% 1.7%	1,112 898	4% 3.0%	2,784 2,319	14% 12.8%	4,996 4,351	29% 24.9%
	Lower 95% CI	0 256	0% 0.6%	516 314	2% 1.1%	1,283 1,407	6% 7.8%	3,759 2,898	22% 16.6%
	Upper 95% CI	267 1,125	1% 2.8%	1,708 1,483	6% 5.%	4,286 3,231	21% 17.9%	6,234 5,805	35% 33.2%
GTE 40	Number HUs	97 212	0% 0.5%	588 598	2% 2.0%	1,967 1,549	10% 8.6%	2,843 2,879	16% 16.5%
	Lower 95% CI	0 0	0% 0.0%	216 35	1% 0.1%	718 844	4% 4.7%	1,989 1,815	11% 10.4%
	Upper 95% CI	267 472	1% 1.2%	961 1,160	4% 3.9%	3,215 2,253	16% 12.5%	3,698 3,944	21% 22.5%
GTE 100	Number HUs	97 103	0% 0.3%	280 400	1% 1.3%	935 913	5% 5.0%	1,114 1,571	6% 9.0%
	Lower 95% CI	0 0	0% 0.0%	0 0	0% 0.0%	121 345	1% 1.9%	587 879	3% 5.0%
	Upper 95% CI	267 311	1% 0.8%	640 886	2% 3.0%	1,750 1,482	9% 8.2%	1,642 2,263	9% 12.9%
Missing[f]	Number HUs	0	0%	0	0%	77	0%	0	0%

[a] Floors include both carpeted and uncarpeted floors.
[b] All percentages are calculated with total housing units in the age category as the denominator.
[c] GTE equals "greater than or equal to."
[d] "HUs" include permanently occupied, noninstitutional housing units in which children are permitted to live.
[e] CI = confidence interval for the estimated number or percent.
[f] "Missing" means that no lead value is available (either the sample was not collected, e.g., due to respondent refusal, or the laboratory did not submit a value).

Table 6-4. Maximum Windowsill Dust Lead Loading by Year of Construction (AHHS in RED; Statistically Significant Differences Highlighted)

Maximum Floor Dust Lead Loading(µg/ ft²)[a]		*Year of Construction*							
		1978-1998 (1978-2005)		*1960-1977*		*1940-1959*		*Before 1940*	
		Number (000)	*Percent (%)*[a]	*Number (000)*	*Percent (%)*	*Number (000)*	*Percent (%)*	*Number (000)*	*Percent (%)*
GTE[b] 125	Number HUs[c]	1,806 1,414	6% 3.5%	4,097 3,042	15% 10.2%	5,407 4,687	26% 25.9%	9,028 6,536	52% 37.4%
	Lower 95% CI[d]	578 774	2% 1.9%	2,444 1,866	9% 6.2%	3,954 3,527	19% 19.5%	7,196 5,184	42% 29.6%
	Upper 95% CI	3,033 2,054	10% 5.1%	5,749 4,219	21% 14.1%	6,860 5,848	33% 32.3%	10,861 7,889	61% 45.1%
GTE 250	Number HUs	1,029 653	4% 1.6%	1,755 1,663	6% 5.6%	3,712 3,318	18% 18.3%	6,943 5,455	40% 31.2%
	Lower 95% CI	139 134	1% 0.3%	1,086 730	4% 2.4%	2,556 2,189	12% 12.1%	5,476 4,231	31% 24.2%
	Upper 95% CI	1,919 1,173	7% 2.9%	2,424 2,597	9% 8.7%	4,867 4,446	24% 24.5%	8,410 6,680	48% 38.2%
GTE 500	Number HUs	447 293	2% 0.7%	747 969	3% 3.2%	2,869 1,942	14% 10.7%	4,980 4,157	29% 23.8%
	Lower 95% CI	0 0	0% 0.0%	274 319	1% 1.1%	1,779 959	9% 5.3%	3,712 3,146	21% 18.0%
	Upper 95% CI	1,024 598	3% 1.5%	1,219 1,618	4% 5.4%	3,959 2,925	19% 16.1%	6,247 5,169	36% 29.6%
Missing[e]	Number HUs	299 2,122	1% 5.3%	851 1,694	3% 5.7%	361 236	2% 1.3%	220 358	1% 2.0%
No sills[e]	Number HUs	1,456 2,061	5% 5.1%	371 796	1% 2.7%	349 0	2% 0.0%	45 0	0% 0.0%
	Lower 95% CI	456 1,030	2% 2.6%	0 172	0% 0.6%	0 0	0% 0.0%	0 0	0% 0.0%
	Upper 95% CI	2,456 3,092	8% 7.6%	762 1,420	3% 4.7%	730 0	4% 0.0%	143 0	1% 0.0%

[a] All percentages are calculated with total housing units in the age category as the denominator.
[b] GTE equals "greater than or equal to."
[c] "HUs" include permanently occupied, noninstitutional housing units in which children are permitted to live.
[d] CI = confidence interval for the estimated number or percent.
[e] Missing means that the sill was present, but that no lead value is available (either the sample was not collected, e.g., due to inaccessibility or respondent refusal, or the laboratory did not submit a value). "No sill" means that there was no sill in the HU, e.g., windows were flush with the wall, or awning windows were installed.

Table 6-5. Maximum Floor Dust Lead Loadings by Household Income (AHHS in RED; Statistically Significant Differences Highlighted)

Maximum Floor Dust Lead Loading(µg/ ft²)[a]		*Household Income*			
		Less than $30,000/year		*Equal to or above $30,000/year*	
		Number (000)	*Percent (%)*[a]	*Number (000)*	*Percent (%)*
GTE[b] 5	Number HUs[c]	13,364 9,080	40% 24.5%	13,215 11,618	24% 16.8%
	Lower 95% CI[d]	10,562 6,970	32% 19.3%	10,859 9,381	20% 13.6%
	Upper 95% CI	16,166 11,190	47% 29.7%	15,571 13,854	27% 20.1%
GTE 10	Number HUs	8,276 5,604	25% 15.1%	6,792 7,388	12% 10.7%
	Lower 95% CI	6,219 3,915	19% 10.8%	5,052 5,383	9% 7.8%
	Upper 95% CI	10,332 7,294	30% 19.4%	8,532 9,393	15% 13.6%
GTE 20	Number HUs	4,282 3,390	13% 9.2%	4,135 4,870	7% 7.1%
	Lower 95% CI	3,117 2,336	9% 6.3%	2,782 3,284	5% 4.7%
	Upper 95% CI	5,447 4,443	17% 12.0%	5,488 6,445	10% 9.4%
GTE 40	Number HUs	2,819 2,305	8% 6.2%	2,170 2,932	4% 4.3%
	Lower 95% CI	1,710 1,447	5% 4.0%	924 1,763	2% 2.5%
	Upper 95% CI	3,927 3,162	12% 8.5%	3,415 4,102	6% 6.0%
GTE 100	Number HUs	1,637 1,239	5% 3.3%	435 1,749	1% 2.5%
	Lower 95% CI	728 501	2% 1.4%	57 876	0% 1.3%
	Upper 95% CI	2,546 1,977	8% 5.3%	813 2,621	1% 3.8%
Missing[e]	Number HUs	46	0%	77	0%

[a] All percentages are calculated with total housing units in that income class as the denominator.
[b] GTE equals "greater than or equal to."
[c] "HUs" include permanently occupied, noninstitutional housing units in which children are permitted to live.
[d] CI = confidence interval for the estimated number or percent.
[e] Missing means that no lead value is available (either the sample was not collected, e.g., due to respondent refusal, or the laboratory did not submit a value).

Table 6-6. Maximum Windowsill Lead Dust Loadings by Household Income (AHHS in RED; Statistically Significant Differences Highlighted)

Windowsill Dust Lead Loading ($\mu g/ ft^2$)[a]		*Household Income*			
		Less than $30,000/year		*Equal to or Above $30,000/year*	
		Number (000)	*Percent*[a]	*Number (000)*	*Percent*
GTE[b] 125	Number HUs[c]	10,322 7,318	31% 19.8%	8,865 8,362	16% 12.1%
	Lower 95% CI[d]	7,909 5,361	26% 14.9%	6,896 6,551	13% 9.8%
	Upper 95% CI	12,735 9,275	36% 24.6%	10,835 10,174	19% 14.5%
GTE 250	Number HUs	7,671 5,891	23% 15.9%	4,772 5,198	9% 7.5%
	Lower 95% CI	5,776 4,112	18% 11.6%	3,611 3,503	7% 5.2%
	Upper 95% CI	9,565 7,670	28% 20.2%	5,933 6,894	11% 9.9%
GTE 500	Number HUs	4,395 3,911	13% 10.6%	3,893 3,449	7% 5.0%
	Lower 95% CI	2,943 2,551	9% 7.1%	2,773 2,274	5% 3.3%
	Upper 95% CI	5,846 5,272	17% 14.0%	5,014 4,624	9% 6.7%
Missing[e]	Number HUs	1,137 2,442	3% 6.6%	594 1,969	1% 2.9%
No sill[e]	Number HUs	1,297 1,244	4% 3.4%	809 1,613	1% 2.3%
	Lower 95% CI	250 428	1% 1.3%	151 767	0% 1.2%
	Upper 95% CI	2,345 2,059	7% 5.4%	1,466 2,459	3% 3.5%

[a] All percentages are calculated with total housing units in that income class as the denominator.
[b] GTE equals "greater than or equal to."
[c] "HUs" include permanently occupied, noninstitutional housing units in which children are permitted to live.
[d] CI = confidence interval for the estimated number or percent.
[e] Missing means that the sill was present, but that no lead value is available (either the sample was not collected, e.g., due to inaccessibility or respondent refusal, or the laboratory did not submit a value). "No sill" means that there was no sill in the HU, e.g., windows were flush with the wall, or awning windows were installed.

Table 6-7. AHHS Distribution of Maximum Dust Lead Loadings in Housing Units for Carpeted and Uncarpeted Floors						
Average Dust Lead Loading in HU (µg/ ft²)	*Number of HUs (000)[a]*			*Percent of HUs (%)[b]*		
	Estimate	*Lower 95% CI[c]*	*Upper 95% CI*	*Estimate*	*Lower 95% CI*	*Upper 95% CI*
Floors (Uncarpeted)						
GTE[d] 5	13,894	10,999	16,790	13.1%	10.4%	15.8%
GTE 10	9,138	6,512	11,763	8.6%	6.2%	11.1%
GTE 20	5,880	3,966	7,794	5.6%	3.8%	7.3%
GTE 40	4,090	2,617	5,564	3.9%	2.5%	5.2%
GTE 100	2,173	1,254	3,092	2.0%	1.2%	2.9%
No Uncarpeted	1,823			1.7%		
Floors (Carpeted)						
GTE 5	4,054	2,597	5,512	3.8%	2.5%	5.2%
GTE 10	1,629	990	2,268	1.5%	0.9%	2.1%
GTE 20	832	285	1,378	0.8%	0.3%	1.3%
GTE 40	243	0	567	0.2%	0%	0.5%
GTE 100	0	0	0	0%	0%	0%
No Carpeted	17,858			16.8%		

Only AHHS values shown.
[a] "Housing units" include permanently occupied, noninstitutional housing units in which children are permitted to live.
[b] All percentages are calculated with total housing units (106,033) as the denominator.
[c] CI = 95% confidence interval for the estimated number or percent.
[d] GTE equals "greater than or equal to."

Table 6-8. AHHS Lead Levels in Interior Paint (Pb mg/cm²) Versus Floor Dust Lead Levels (µg/ft²)				
Floor Dust Lead	*Interior Paint Lead Level*			
	0 ≤ Pb[a] < 0.5	*0.5 ≤ Pb < 1.0*	*1.0 ≤ Pb < 4.0*	*4.0 ≤ Pb*
0 ≤ FD[b] < 5	89.4%	82.1%	64.8%	48.3%
5 ≤ FD < 10	5.1%	10.8%	9.0%	14.9%
10 ≤ FD < 20	3.1%	5.3%	8.8%	6.8%
20 ≤ FD < 40	1.1%	0%	7.8%	8.5%
40 ≤ FD < 100	0.5%	1.8%	5.3%	7.6%
100 ≤ FD	0.8%	0.0%	4.4%	13.9%
ALL	100%	100%	100%	100%

No NSLAH values available, only AHHS values shown.
[a] Pb equals interior paint lead level in mg/cm²
[b] FD equals floor dust lead level in µg/ft²

Table 6-9. AHHS Lead Levels in Interior Paint (Pb mg/cm^2) Versus Windowsill Dust Lead Levels (µg/ft^2)				
Windowsill Dust Lead	***Interior Paint Lead Level***			
	0 ≤ Pb[a] < 0.5	***0.5 ≤ Pb < 1.0***	***1.0 ≤ Pb < 4.0***	***4.0 ≤ Pb***
0 ≤ WD[b] < 5	48.7%	23.9%	24.8%	9.8%
5 ≤ WD < 125	36.0%	60.5%	45.0%	39.8%
125 ≤ WD < 250	2.6%	3.8%	7.1%	10.8%
250 ≤ WD < 500	2.0%	3.3%	6.0%	9.1%
500 ≤ WD	1.6%	2.8%	14.7%	30.1%
No Windowsill	3.9%	1.0%	0.0%	0.0%
Missing	5.1%	4.7%	2.5%	0.3%
ALL	100%	100%	100%	100%

No NSLAH values available, only AHHS values shown.
[a] Pb equals interior paint lead level in mg/cm^2
[b] WD equals windowsill dust lead level in µg/ft^2

Table 6-10. AHHS Lead Levels in Exterior Paint (Pb mg/cm^2) Versus Windowsill Dust Lead Levels (µg/ft^2)				
Windowsill Dust Lead	***Exterior Paint Lead Level***			
	0 ≤ Pb[a] < 0.5	***0.5 ≤ Pb < 1.0***	***1.0 ≤ Pb < 4.0***	***4.0 ≤ Pb***
0 ≤ WD[b] < 5	50.6%	25.3%	15.3%	6.9%
5 ≤ WD < 125	34.5%	52.3%	51.2%	50.5%
125 ≤ WD < 250	2.7%	3.0%	10.0%	7.2%
250 ≤ WD < 500	1.7%	5.2%	5.5%	11.3%
500 ≤ WD	1.9%	13.0%	14.8%	24.1%
No Windowsill	3.7%	0.0%	0.0%	0.0%
Missing	4.0%	1.2%	3.2%	0.0%
ALL	100%	100%	100%	100%

No NSLAH values available, only AHHS values shown.
[a] Pb equals exterior paint lead level in mg/cm^2
[b] WD equals windowsill dust lead level in µg/ft^2

Table 6-11. AHHS Lead Levels in Significantly Deteriorated Interior Paint (Pb mg/cm^2) Versus Floor Dust Lead Levels (µg/ft^2)				
Floor Dust Lead	***Significantly Deteriorated Interior Paint Lead Level***			
	0 ≤ Pb[a] < 0.5	***0.5 ≤ Pb < 1.0***	***1.0 ≤ Pb < 4.0***	***4.0 ≤ Pb***
0 ≤ FD[b] < 5	74.8%	33.6%	48.6%	33.9%
5 ≤ FD < 10	11.5%	47.7%	7.0%	11.2%
10 ≤ FD < 20	5.2%	6.0%	8.9%	14.3%
20 ≤ FD < 40	2.6%	4.4%	9.9%	7.5%
40 ≤ FD < 100	2.9%	0.0%	9.5%	13.4%
100 ≤ FD	3.1%	8.3%	16.5%	19.7%
ALL	100%	100%	100%	100%

No NSLAH values available, only AHHS values shown.
[a] Pb equals interior paint lead level in mg/cm^2
[b] FD equals floor dust lead level in µg/ft^2

Table 6-12. AHHS Lead Levels in Significantly Deteriorated Interior Paint (Pb mg/cm^2) Versus Windowsill Dust Lead Levels (µg/ft^2)				
Windowsill Dust Lead	***Significantly Deteriorated Interior Paint Lead Level***			
	0 ≤ Pb[a] < 0.5	***0.5 ≤ Pb < 1.0***	***1.0 ≤ Pb < 4.0***	***4.0 ≤ Pb***
0 ≤ WD[b] < 5	28.7%	8.4%	2.7%	0.0%
5 ≤ WD < 125	47.6%	47.9%	33.9%	21.2%
125 ≤ WD < 250	6.0%	9.9%	14.3%	16.9%
250 ≤ WD < 500	5.1%	16.3%	13.0%	10.2%
500 ≤ WD	7.3%	17.6%	37.1%	51.7%
No Windowsill	3.1%	0.0%	0.0%	0.0%
Missing	2.3%	0.0%	0.0%	0.0%
ALL	100%	100%	100%	100%
No NSLAH values available, only AHHS values shown. [a] Pb equals interior paint lead level in mg/cm^2 [b] WD equals windowsill dust lead level in µg/ft^2				

Table 6-13. AHHS Lead Levels in Significantly Deteriorated Exterior Paint (Pb mg/cm^2) Versus Windowsill Dust Lead Levels (µg/ft^2)				
Windowsill Dust Lead	***Significantly Deteriorated Exterior Paint Lead Level***			
	0 ≤ Pb[a] < 0.5	***0.5 ≤ Pb < 1.0***	***1.0 ≤ Pb < 4.0***	***4.0 ≤ Pb***
0 ≤ WD[b] < 5	32.2%	22.7%	10.6%	3.5%
5 ≤ WD < 125	46.0%	44.5%	47.2%	47.2%
125 ≤ WD < 250	5.7%	14.3%	7.6%	7.5%
250 ≤ WD < 500	3.4%	3.9%	4.5%	17.3%
500 ≤ WD	14.6%	14.6%	26.3%	24.4%
No Windowsill	4.4%	0.0%	0.0%	0.0%
Missing	3.7%	0.0%	3.9%	0.0%
ALL	100%	100%	100%	100%
No NSLAH values available, only AHHS values shown. [a] Pb equals significantly deteriorated exterior paint lead level in mg/cm^2 [b] WD equals windowsill dust lead level in µg/ft^2				

Table 6-14. Percent of HUs with Maximum Floor and Windowsill Dust Lead Levels (µg/ft^2) Greater than or Equal to Various Thresholds by Housing Characteristic

Characteristic	*Floor Dust Pb*			*Windowsill Dust Pb*	
	GTE [a] 10	*GTE 20*	*GTE 40*	*GTE 125*	*GTE 250*
All Housing	12.3%	7.8%	4.9%	14.8%	10.5%
Built 1978-2005	3.6%	1.7%	0.5%	3.5%	1.6%
Built 1960-1977	6.6%	3.0%	2.0%	10.2%	5.6%
Built 1940-1959	20.3%	12.8%	8.6%	25.9%	18.3%
Built pre-1940	33.7%	24.9%	16.5%	37.4%	31.2%
Income < $30K	15.1%	9.2%	6.2%	19.8%	15.9%
Income ≥ $30K	10.7%	7.1%	4.3%	12.1%	7.5%
Single Family	14.3%	9.3%	5.9%	16.5%	11.9%
Multifamily	1.6%	0%	0%	5.9%	3.1%
Government Support	9.9%	4.6%	0%	9.0%	9.0%
No Government Support	12.3%	8.0%	5.3%	15.2%	10.6%
White	11.9%	7.2%	4.7%	13.1%	9.4%
African American	15.8%	11.5%	7.2%	24.4%	16.7%
Other Race	10.5%	7.9%	3.8%	16.4%	11.1%
Hispanic	7.0%	5.8%	2.6%	10.4%	7.7%
Not Hispanic	13.0%	8.1%	5.3%	15.4%	10.9%
LBP - INTERIOR only	16.0%	8.1%	6.7%	23.3%	16.5%
LBP - EXTERIOR only	15.5%	4.5%	2.4%	15.4%	9.3%
LBP - INT and EXT	41.7%	34.0%	21.2%	48.7%	38.4%
LBP	27.1%	18.4%	11.9%	32.3%	24.2%
No LBP	4.3%	2.1%	1.2%	5.4%	3.1%
Deteriorated LBP - INTERIOR only	35.3%	22.6%	17.0%	59.2%	45.5%
Deteriorated LBP - EXTERIOR only	21.6%	12.6%	6.0%	26.2%	19.0%
Deteriorated LBP - INT and EXT	50.0%	42.3%	28.1%	57.6%	45.7%
Deteriorated LBP	35.3%	26.1%	16.8%	44.8%	34.5%
No Deteriorated LBP	6.6%	3.3%	2.0%	7.4%	4.6%
Sig. Det. LBP - INTERIOR only	35.7%	22.1%	19.0%	71.1%	49.2%
Sig. Det. LBP - EXTERIOR only	31.9%	23.2%	10.5%	35.3%	27.9%
Sig. Det. LBP - INT and EXT	62.4%	54.2%	38.9%	67.5%	59.4%
Significantly Deteriorated LBP	39.1%	29.4%	18.3%	50.2%	39.3%
No Significantly Deteriorated LBP	7.7%	4.1%	2.7%	8.8%	5.6%
Soil Lead Hazard Present	43.5%	36.35	20.6%	47.7%	36.8%
No Soil Lead Hazard Present	10.4%	6.1%	4.0%	12.8%	8.9%

No NSLAH values available, only AHHS values shown.
[a] GTE equals "greater than or equal to."

7.0 SOIL LEAD HAZARDS IN HOUSING

As discussed in Chapter 5, a soil lead hazard in a housing unit is defined as the presence of more than 9 ft^2 of bare soil with a lead concentration of 1,200 ppm (mg/kg) or greater, or 400 ppm for bare soil in an area frequented by a child under the age of 6 years[19]. The definition of soil lead hazard in AHHS is the same as in NSLAH. However, there were two major differences between NSLAH and AHHS in the collection and classification of soil-related data. First, in AHHS, a soil sample was collected only if there was soil associated with the specific unit sampled. In multifamily housing, for example, AHHS typically collected a soil sample only for units where the residents had use of a yard or patio with some soil. In NSLAH, however, soil samples were collected whenever there was soil anywhere on the property associated with the building containing the selected unit, even if there was little or no connection between the specific unit and the soil sampled. For example, if a large apartment building had a planter outside the front entrance, and a 7^{th} floor unit was selected, the soil in the planter would have been sampled in NSLAH but not in AHHS. The result of this difference is that AHHS found an estimated 15,540,000 units with no soil to sample (14.7%) compared to only 2,242,000 in NSLAH (2.3%). The second difference between the surveys was in the definition of a children's "play area". In AHHS, only units where there was play equipment, such as swing sets, sand boxes, jungle jims, etc., were considered to have a play area, where soil was sampled. In NSLAH, however, any area where children might play was considered a "play area". As a result, AHHS found an estimated 60,108,000 homes with no play area (57%), compared to only 12,368,000 in NSLAH (13%). Because of these differences between the surveys, comparisons between AHHS and NSLAH soil data can be misleading, and are therefore not presented in this chapter. Appendix B contains calculations that approximately adjust the AHHS data for the differences in soil sampling between the two surveys.

Table 5-3 showed that an estimated 3.6% of all housing units have a soil lead hazard. Table 7-1 breaks down soil hazards by whether or not they occur in children's play areas. It is clear that the great majority of soil hazards are due to soil not in play areas.

Table 7-2 presents estimates of mean soil and bare soil lead concentrations (ppm) by various housing characteristics. Mean estimates for each housing unit were first calculated as the arithmetic average of all sample concentrations for the unit. For samples below the detection limit of 20 ppm for lead in soil, raw analytical data from the laboratory was used to calculate a lead concentration. The national mean soil lead level is 169 ppm, and slightly higher for bare soil at 184 ppm (the difference is not statistically significant). These levels are well below the regulatory standard of 1,200 ppm for bare soil in non-play areas, and comfortably below the play area standard of 400 ppm[19]. The patterns by region and age are generally consistent with those for LBP and interior lead dust: the Northeast has the highest mean soil and bare soil lead levels (statistically significantly higher than any other region for all soil); pre-1940 housing has the highest mean soil and bare soil lead at 604 and 691 ppm, respectively - more than 50% of the bare soil standard of 1,200 ppm. The differences between pre-1940 levels and those for other age groups are statistically significant. As for other housing characteristics, mean soil lead levels are statistically significantly higher for MSA units vs. non-MSA units, rented vs. owner-occupied units and units without Government support vs. units with Government support. The same is true

[19] 24 CFR Part 35.1320

for mean bare soil levels, except that the difference for rented vs. owner-occupied is not significant.

Table 7-3 shows the distribution of maximum bare soil lead concentrations found in AHHS. Table 7-4 breaks down the national distribution in Table 7-3 by age of the housing. The patterns by age are as expected, with the oldest housing having the highest levels. In particular, less than 1% of post-1960 units in the survey had bare soil lead above the standard of 1,200 ppm, compared to 14.1% of pre-1940 units. Tables 7-5 and 7-6 are the companion tables for maximum bare soil lead concentrations in children's play areas. Only 0.5% of units have bare soil lead levels above the 400 ppm standard for children's play areas. Even for pre-1940 units, the frequency is less than 2%. Tables 7-7 and 7-8 are the companion tables to 7-5 and 7-6 for bare soil lead concentrations in the "rest of the yard", i.e., not in play areas. The percentages of units by age exceeding the various thresholds in Table 7-8 are very similar to those in Table 7-4, reflecting the fact that most soil hazards are not in play areas (as defined in AHHS).

Table 7-9 examines the relationship between exterior LBP, and significantly deteriorated exterior LBP, and maximum bare soil lead concentrations. Housing units with exterior LBP, even in good condition, have a higher likelihood of exceeding every bare soil concentration threshold. The likelihood for each threshold increases very significantly if the exterior LBP is significantly deteriorated. For example, 15.6% of housing units with significantly deteriorated LBP have bare soil lead levels of 1,200 ppm or greater, compared to only 1.7% when there is no significantly deteriorated LBP and only 0.4% when there is no exterior LBP at all. Clearly, most soil lead hazards could be prevented if exterior paint were kept in good repair. Table 7-10 shows similar relationships to Table 7-9, but for maximum bare soil lead concentrations in play areas.

Table 7-11 shows the estimated national percentage of housing units exceeding selected bare soil and play area bare soil lead thresholds as a function of various housing characteristics and the presence or absence of LBP, deteriorated LBP and significantly deteriorated LBP (interior, exterior or both). The bare soil thresholds are the current regulatory limit of 1,200 ppm and one-half that limit (600 ppm). The play area bare soil thresholds are the current regulatory limit of 400 ppm and one-half that limit (200 ppm). As for dust lead levels (Table 6-12 and discussion), elevated bare soil lead levels are driven by LBP, particularly when it is deteriorated. For example, only 1.4% of homes without significantly deteriorated LBP have bare soil lead levels above the 1,200 ppm standard, but 14% of homes with significantly deteriorated LBP do. Homes with significantly deteriorated LBP on both the interior and exterior have the highest percentages of hazardous soil lead levels ($\geq$1,200 ppm or $\geq$400 ppm in play areas).

Table 7-1. Prevalence of Soil Lead Hazards in Play and Non-Play Areas						
Soil Hazard Location	*Number of HUs [a] (000)*			*Percent [b] of HUs (%)*		
	Estimate	*Lower 95% CI[c]*	*Upper 95% CI*	*Estimate*	*Lower 95% CI*	*Upper 95% CI*
Play Area	512	65	960	0.5%	0.1%	0.9%
Play Area Only	413	0	833	0.4%	0%	0.8%
Non-Play Area	3,435	2,003	4,866	3.2%	1.9%	4.6%
Non-Play Area Only	3,336	1,936	4,736	3.2%	1.8%	4.5%
Both Play and Non-Play Area	99	0	290	0.1%	0%	0.3%
Any Soil Hazard	3,848	2,235	5,461	3.6%	2.1%	5.2%

No NSLAH values available, only AHHS values shown

[a] "Housing units" include permanently occupied, noninstitutional housing units in which children are permitted to live.

[b] All percentages are calculated with total housing units (106,033) as the denominator.

[c] CI = 95% confidence interval for the estimated number or percent.

Table 7-2. Mean Soil and Mean Bare Soil Lead Concentrations (ppm) by Various Housing Characteristics							
Characteristic	*All Soil*			*Bare Soil*			*HUs in Sample (All/Bare)*
	Mean	*Lower 95% CI[a]*	*Upper 95% CI*	*Mean*	*Lower 95% CI*	*Upper 95% CI*	
All Occupied HUs	169	132	207	184	127	240	942/681
Region:							
Northeast	373	238	508	400	198	602	151/83
Midwest	190	100	280	217	97	338	227/181
South	83	57	109	67	44	91	375/259
West	124	58	191	184	32	337	189/158
Construction Year:							
1978-2005	25	16	33	26	13	39	390/267
1960-1977	72	45	99	70	44	96	248/191
1940-1959	194	131	257	205	123	288	162/122
Before 1940	604	447	760	691	421	961	142/101
Region by Construction Year:							
Northeast							
Built 1978-2005	55	0	115	97	0	246	34/14
Built 1960-1977	150	14	286	161	0	322	41/19
Built 1940-1959	251	93	410	285	44	525	26/17
Built before 1940	797	480	1,114	730	344	1,116	50/33
Midwest							
Built 1978-2005	30	15	46	26	14	37	97/72
Built 1960-1977	51	23	78	51	24	78	54/48
Built 1940-1959	232	75	388	239	58	419	35/29
Built before 1940	539	295	782	657	290	1023	41/32
South							
Built 1978-2005	17	12	22	16	13	20	182/121
Built 1960-1977	62	25	100	69	27	111	101/78
Built 1940-1959	119	75	163	118	71	164	67/50
Built before 1940	435	216	653	394	78	711	25/10
West							

Table 7-2. Mean Soil and Mean Bare Soil Lead Concentrations (ppm) by Various Housing Characteristics							
Characteristic	*All Soil*			*Bare Soil*			*HUs in Sample (All/Bare)*
	Mean	*Lower 95% CI*[a]	*Upper 95% CI*	*Mean*	*Lower 95% CI*	*Upper 95% CI*	
Built 1978-2005	19	12	26	20	11	29	77/60
Built 1960-1977	55	29	81	50	36	65	52/46
Built 1940-1959	218	74	362	235	26	443	34/26
Built before 1940	476	96	857	847	0	1,892	26/26
Urbanization							
MSA	192	142	243	211	133	288	709/510
Non-MSA	111	65	157	113	63	164	233/171
Children Under Age 6:							
All HU ages	172	101	242	185	94	277	176/133
HUs built 1978-2005	31	2	59	38	0	85	87/64
HUs built 1960-1977	111	42	180	119	30	207	39/30
HUs built 1940-1959	367	153	580	410	108	712	29/24
HUs built before 1940	533	195	871	530	281	779	21/15
No Children Under Age 6:							
All HU ages	169	132	205	183	123	243	766/548
HUs built 1978-2005	23	18	28	22	18	27	303/203
HUs built 1960-1977	66	38	94	62	37	87	209/161
HUs built 1940-1959	165	107	222	166	92	239	133/98
HUs built before 1940	614	455	773	716	405	1,026	121/86
Housing Unit Type:							
Single family	174	134	213	190	130	250	880/639
Multi-family	107	9	205	97	0	216	62/42
Tenure							
Owner-occupied	144	106	182	151	102	200	717/508
Renter-occupied	254	180	329	285	130	439	225/173
Household Income:							
Less than $30,000/year	203	137	269	205	88	322	317/245
$30,000/year or more	152	113	191	172	122	222	625/436
Children Under Age 6:							
All Income Categories	172	101	242	185	94	277	176/133
Less than $30,000/year	92	47	138	61	36	86	60/47
$30,000/year or more	210	110	310	252	118	386	116/86
No Children Under Age 6:							
All Income Categories	169	132	206	183	123	243	766/548
Less than $30,000/year	224	148	300	234	94	374	257/198
$30,000/year or more	141	101	180	155	109	201	509/350
Government Support:							
Government support	60	28	93	57	19	95	41/29
No government support	172	134	209	190	131	249	894/649
Refusal/Don't Know[b]							7/3
Poverty:							
In Poverty	181	94	268	234	5	464	131/103
Not in Poverty	167	125	210	175	120	231	811/578
Poverty by Urbanization:							
MSA							

Table 7-2. Mean Soil and Mean Bare Soil Lead Concentrations (ppm) by Various Housing Characteristics							
Characteristic	***All Soil***			***Bare Soil***			***HUs in Sample (All/Bare)***
	Mean	***Lower 95% CI[a]***	***Upper 95% CI***	***Mean***	***Lower 95% CI***	***Upper 95% CI***	
In poverty	225	98	351	313	0	668	92/69
Not in poverty	188	132	244	196	123	269	617/441
Non-MSA							
In poverty	98	47	148	96	46	147	39/34
Not in poverty	114	58	170	117	59	175	194/137
Race:							
White	156	117	195	173	115	232	745/545
African American	229	137	321	202	97	308	114/81
Other[c]	216	93	340	270	67	473	83/55
Ethnicity:							
Hispanic/Latino	174	75	274	199	52	346	118/84
Not Hispanic/Latino	169	130	207	182	124	240	824/597

No NSLAH values available, only AHHS values shown.

[a] CI = confidence interval for the mean.

[b] Refusals and "don't know" responses by survey respondents.

[c] "Other" includes Asian, American Indian or Alaskan Native, Native Hawaiian or other Pacific Islander, or more than one race.

Table 7-3. Distribution of Maximum Bare Soil Sample Lead Concentrations						
Bare Soil Lead	*Number of HUs[a] (000)*			*Percent[b] of HUs (%)*		
	Estimate	*Lower 95% CI[c]*	*Upper 95% CI*	*Estimate*	*Lower 95% CI*	*Upper 95% CI*
GTE[d] 20 ppm	44,071	39,330	48,811	41.6%	37.1%	46.1%
GTE 50 ppm	27,046	23,052	31,040	25.5%	21.7%	29.3%
GTE 200 ppm	14,441	11,525	17,357	13.6%	10.9%	16.4%
GTE 400 ppm	10,578	8,138	13,018	10.0%	7.7%	12.3%
GTE 1,200 ppm	3,435	2,003	4,866	3.2%	1.9%	4.6%
GTE 1,600 ppm	2,764	1,453	4,074	2.6%	1.4%	3.8%
GTE 2,000 ppm	2,280	1,123	3,437	2.2%	1.1%	3.3%
GTE 5,000 ppm	875	157	1,593	0.8%	0.1%	1.5%
No Bare Soil	19,704	14,787	24,621	18.6%	14.0%	23.2%
No Soil	15,540	11,656	19,423	14.7%	11.0%	18.3%
Missing[e]	2,668	1,312	4,024	2.5%	1.2%	3.8%

[a] "Housing units" include permanently occupied, noninstitutional housing units in which children are permitted to live.
[b] All percentages are calculated with total housing units (106,033) as the denominator.
[c] CI = confidence interval for the estimated number or percent.
[d] GTE equals "greater than or equal to."
[e] "Missing" means that soil was present, but that no lead value is available (either the sample was not collected, e.g. due to inaccessibility or respondent refusal, or the laboratory did not submit a value).

Table 7-4. Distribution of Maximum Bare Soil Sample Lead Concentration by Construction Year								
Bare Soil Lead Concentration	*Number of HUs[a] (000)*				*Percent[b] of HUs (%)*			
	Before 1940	*1940 - 1959*	*1960 - 1977*	*1978 - 2005*	*Before 1940*	*1940 - 1959*	*1960 - 1977*	*1978 - 2005*
GTE[c] 20 ppm	10,514	11,732	13,597	8,227	60.1%	64.8%	45.4%	20.3%
GTE 50 ppm	10,060	8,527	5,942	2,517	57.5%	47.1%	19.8%	6.2%
GTE 200 ppm	8,084	3,982	1,811	565	46.2%	22.0%	6.0%	1.4%
GTE 400 ppm	6,409	2,611	1,363	195	36.6%	14.4%	4.6%	0.5%
GTE 1,200 ppm	2,469	776	81	109	14.1%	4.3%	0.3%	0.3%
GTE 1,600 ppm	1,798	776	81	109	10.3%	4.3%	0.3%	0.3%
GTE 2,000 ppm	1,558	613	0	109	8.9%	3.4%	0%	0.3%
GTE 5,000 ppm	625	250	0	0	3.6%	1.4%	0%	0%
Missing[d]	563	355	1,095	655	3.2%	2.0%	3.7%	1.6%
No Bare Soil	4,251	2,877	4,176	8,400	24.3%	15.9%	13.9%	20.8%
No Soil	1,540	2,050	5,050	6,900	8.8%	11.3%	16.9%	17.1%

[a] "Housing units" include permanently occupied, noninstitutional housing units in which children are permitted to live.
[b] All percentages are calculated with total housing units of that age as the common denominator.
[c] GTE equals "greater than or equal to."
[d] Missing means that soil was present, but that no lead value is available (usually due to inaccessibility or respondent refusal).

Table 7-5. Distribution of Maximum Bare Soil Lead Concentrations in Children's Play Areas

Bare Play Area Soil Lead	*Number of HUs (000)*[a]			*Percent of HUs (%)*[b]			*HUs in Sample*
	Estimate	*Lower 95% CI*[c]	*Upper 95% CI*	*Estimate*	*Lower 95% CI*	*Upper 95% CI*	
GTE[d] 20 ppm	7,326	4,908	9,744	6.9%	4.6%	9.2%	76
GTE 50 ppm	3,895	2,362	5,427	3.7%	2.2%	5.1%	38
GTE 200 ppm	1,391	680	2,103	1.3%	.6%	2.0%	13
GTE 400 ppm	512	65	960	0.5%	0.1%	0.9%	5
GTE 1,200 ppm	0	0	0	0%	0%	0%	0
No Play Area	60,108	53,582	66,634	56.7%	50.7%	62.7%	652
No soil in play area	10,672	7,807	13,536	10.1%	7.4%	12.8%	109
No bare soil in play area	11,317	8,639	13,994	10.7%	8.1%	13.2%	128
Missing[e]	10,904	6,997	14,810	10.3%	6.6%	14.0%	103
Total	106,033			100%			1,131

[a] "Housing units" are permanently occupied, noninstitutional residential units in which children are permitted to live.
[b] All percentages are calculated with total housing units (106,033) as the denominator.
[c] CI = 95% confidence interval for the estimated number or percent.
[d] GTE equals "greater than or equal to."
[e] Missing means that soil was present, but that no lead value is available (usually due to inaccessibility or respondent refusal).

Table 7-6. Distribution of Maximum Bare Soil Lead Concentrations in Children's Play Areas, by Construction Year

Bare Soil Lead Concentration	*Number of HUs (000)*[a]				*Percent of HUs (%)*[b]			
	Before 1940	*1940 - 1959*	*1960 - 1977*	*1978 - 2005*	*Before 1940*	*1940 - 1959*	*1960 - 1977*	*1978 - 2005*
GTE[c] 20 ppm	2,362	2,484	1,293	1,187	13.5%	13.7%	4.3%	2.9%
GTE 50 ppm	2,129	920	613	233	12.2%	5.1%	2.1%	0.6%
GTE 200 ppm	742	442	207	0	4.2%	2.4%	0.7%	0%
GTE 400 ppm	315	100	97	0	1.8%	0.6%	0.3%	0%
GTE 1,200 ppm	0	0	0	0	0%	0%	0%	0%
No Play Area	9,499	10,156	17,266	23,186	54.3%	56.1%	57.6%	57.3%
No soil in play area	1,339	1,623	3,371	4,338	7.7%	9.0%	11.3%	10.7%
No bare soil in play area	2,353	1,178	3,126	4,659	13.4%	6.5%	10.4%	11.5%
Missing[d]	1,949	1,944	3,828	3,182	11.1%	10.7%	12.8%	7.9%
Total	17,503	18,117	29,956	40,458	100%	100%	100%	100%

[a] "Housing units" are permanently occupied, noninstitutional housing units in which children are permitted to live.
[b] All percentages are calculated with total housing units of that age as the common denominator.
[c] GTE equals "greater than or equal to."
[d] Missing means that soil was present, but that no lead value is available (usually due to inaccessibility or respondent refusal).

Table 7-7. Distribution of Maximum Bare Soil Lead Concentrations in the Rest of the Yard

Soil Lead Concentration	*Number of HUs[a] (000)*			*Percent of HUs[b] (%)*			*HUs in Sample*
	Estimate	*Lower 95% CI[c]*	*Upper 95% CI*	*Estimate*	*Lower 95% CI*	*Upper 95% CI*	
GTE[d] 20 ppm	42,212	37,627	46,797	39.8%	35.5%	44.2%	435
GTE 50 ppm	26,150	22,338	29,962	24.7%	21.0%	28.3%	263
GTE 200 ppm	14,045	11,164	16,926	13.3%	10.5%	16.0%	136
GTE 400 ppm	10,262	7,913	12,610	9.7%	7.5%	11.9%	99
GTE 1,200 ppm	3,435	2,003	4,866	3.2%	1.9%	4.6%	31
GTE 1,600 ppm	2,764	1,453	4,074	2.6%	1.4%	3.8%	24
GTE 2,000 ppm	2,280	1,123	3,437	2.2%	1.1%	3.3%	20
GTE 5,000 ppm	875	157	1,593	0.8%	0.1%	1.5%	8
No Soil/No Bare Soil[e]	41,588	35,496	47,679	39.2%	33.5%	45.0%	448
Missing[e]	2,725	1,375	4,076	2.6%	1.3%	3.8%	27
Total	106,033			100%			1,131

[a] "Housing units" are permanently occupied, noninstitutional residential units in which children are permitted to live.
[b] All percentages are calculated with total housing units (106,033) as the denominator.
[c] CI = confidence interval for the estimated number or percent.
[d] GTE equals "greater than or equal to."
[e] Missing means that soil was present, but that no lead value is available (usually due to inaccessibility or respondent refusal). "No soil" means that there was no soil in the rest of the yard to sample. "No bare soil" means there was no bare soil in the rest of the yard.

Table 7-8. Distribution of Maximum Bare Soil Lead Concentrations in the Rest of the Yard, by Construction Year

Bare Soil Lead Concentration	*Number of HUs[a] (000)*				*Percent[b] of HUs (%)*			
	Before 1940	*1940 - 1959*	*1960 - 1977*	*1978 - 2005*	*Before 1940*	*1940 - 1959*	*1960 - 1977*	*1978 - 2005*
GTE[d] 20 ppm	10,061	11,438	13,165	7,548	57.5%	63.1%	44.0%	18.7%
GTE 50 ppm	9,506	8,427	5,912	2,306	54.3%	46.5%	19.7%	5.7%
GTE 200 ppm	7,788	3,882	1,811	565	44.5%	21.4%	6.0%	1.4%
GTE 400 ppm	6,193	2,510	1,363	195	35.4%	13.9%	4.6%	0.5%
GTE 1,200 ppm	2,469	776	81	109	14.1%	4.3%	0.3%	0.3%
GTE 1,600 ppm	1,798	776	81	109	10.3%	4.3%	0.3%	0.3%
GTE 2,000 ppm	1,558	613	0	109	8.9%	3.4%	0%	0.3%
GTE 5,000 ppm	625	250	0	0	3.6%	1.4%	0%	0%
No Soil/No Bare Soil[e]	6,643	6,024	11,082	17,839	38.0%	33.3%	37.0%	44.1%
Missing[d]	563	355	1,095	713	3.2%	2.0%	3.7%	1.8%
Total	17,503	18,117	29,956	40,458	100%	100%	100%	100%

[a] "Housing units" are permanently occupied, noninstitutional housing units in which children are permitted to live.
[b] All percentages are calculated with total housing units of that age as the common denominator.
[c] GTE equals "greater than or equal to."
[d] Missing means that soil was present, but that no lead value is available (usually due to inaccessibility or respondent refusal).
[e] "No soil" means that there was no soil in the rest of the yard to sample. "No bare soil" means there was no bare soil to sample in the rest of the yard.

Table 7-9. Association Between Bare Soil Lead Concentration and Presence of Significantly Deteriorated Exterior LBP

Bare Soil Lead	*Housing Units without Any Exterior LBP*[a,b]			*Housing Units without Significantly Deteriorated Exterior LBP*[a,b]			*Housing Units with Significantly Deteriorated Exterior LBP*[a,b]		
	Percent	*Lower 95% CI*[c]	*Upper 95% CI*	*Percent*	*Lower 95% CI*	*Upper 95% CI*	*Percent*	*Lower 95% CI*	*Upper 95% CI*
GTE[d] 20 ppm	33.6%	29.0%	38.3%	38.6%	34.2%	43.0%	65.5%	56.6%	74.4%
GTE 50 ppm	14.7%	11.4%	17.9%	20.9%	17.2%	24.5%	62.5%	52.5%	72.4%
GTE 200 ppm	4.8%	2.8%	6.8%	9.5%	7.2%	11.9%	46.2%	35.6%	56.9%
GTE 400 ppm	3.3%	1.7%	4.9%	6.7%	4.8%	8.6%	36.0%	25.9%	46.2%
GTE 1,200 ppm	0.4%	0%	0.9%	1.7%	0.8%	2.6%	15.6%	8.7%	22.5%
GTE 1,600 ppm	0.3%	0%	0.6%	1.1%	0.4%	1.9%	14.3%	7.3%	21.4%
GTE 2,000 ppm	0.3%	0%	0.6%	1.0%	0.3%	1.7%	11.3%	4.9%	17.7%
GTE 5,000 ppm	0.1%	0%	0.3%	0.3%	0%	0.6%	5.4%	0%	10.9%
Missing[e]	2.4%	0.9%	3.9%	2.4%	1.0%	3.7%	3.8%	0.6%	7.0%
No Bare Soil	19.0%	14.0%	24.0%	18.6%	13.9%	23.2%	18.6%	10.8%	26.5%
No Soil	17.2%	12.8%	21.7%	16.0%	12.0%	19.9%	4.2%	0%	8.8%

[a] "Housing units" include permanently occupied, noninstitutional housing units in which children are permitted to live.

[b] The denominators for the percentages are 80,091,000 HUs without any exterior LBP, 90,702,000 HUs without significantly deteriorated exterior LBP, and 15,331,000 HUs with significantly deteriorated exterior LBP.

[c] CI = confidence interval for the estimated number or percent.

[d] GTE equals "greater than or equal to."

[e] Missing means that soil was present, but that no lead value is available (usually due to inaccessibility or respondent refusal).

Table 7-10. Association Between Bare Soil Lead Concentration and Presence of Significantly Deteriorated Exterior LBP, in Children's Play Areas

Bare Play Area Soil Lead	*Housing Units without Significantly Deteriorated Exterior LBP (%)*[a,b]			*Housing Units with Significantly Deteriorated Exterior LBP (%)*[a,b]		
	Estimate	*Lower 95% CI*[c]	*Upper 95% CI*	*Estimate*	*Lower 95% CI*	*Upper 95% CI*
GTE[d] 20 ppm	5.7%	3.6%	7.8%	16.4%	8.8%	24.1%
GTE 50 ppm	2.4%	1.2%	3.6%	13.7%	7.9%	19.5%
GTE 200 ppm	0.6%	0.1%	1.1%	7.4%	3.0%	11.8%
GTE 400 ppm	0.1%	0%	0.3%	3.5%	0.3%	6.7%
GTE 1,200 ppm	0%	0%	0%	0%	0%	0%
No Play Area	56.0%	49.9%	62.0%	62.6%	51.3%	73.8%
No soil in play area	10.8%	7.9%	13.7%	4.2%	0%	8.8%
No bare soil in play area	11.4%	8.6%	14.2%	5.0%	0.1%	9.9%
Missing[e]	10.1%	6.4%	13.7%	11.9%	4.7%	19.1%

[a] "Housing units" include permanently occupied, noninstitutional housing units in which children are permitted to live.
[b] Percentages are calculated with the number of HUs with and without significantly deteriorated LBP, 15,331,000 and 90,702,000, respectively, as the denominators.
[c] CI = confidence interval for the estimated number or percent.
[d] GTE equals "greater than or equal to."
[e] Missing means that soil was present, but that no lead value is available (usually due to inaccessibility or respondent refusal).

Table 7-11. Percent of HUs with Maximum Bare Soil and Play Area Bare Soil Lead Concentrations (ppm) Greater than or Equal to Various Thresholds by Housing Characteristic

Characteristic	*Bare Soil*		*Play Area Bare Soil*	
	GTE[b] 600	*GTE 1200*	*GTE 200*	*GTE 400*
All Housing Units [a]	6.6%	3.2%	1.3%	0.5%
Built 1978-2005	0.3%	0.3%	0%	0%
Built 1960-1977	2.4%	0.3%	0.7%	0.3%
Built 1940-1959	8.4%	4.3%	2.4%	0.6%
Built pre-1940	26.7%	14.1%	4.2%	1.8%
Income < $30K	5.4%	2.0%	1.4%	0.5%
Income ≥ $30K	7.2%	3.9%	1.3%	0.5%
Single Family	7.7%	3.7%	1.6%	0.6%
Multifamily	0.7%	0.7%	0%	0%
Government Support	0%	0%	0%	0%
No Government Support	7.0%	3.5%	1.4%	0.5%
White	6.5%	3.2%	1.1%	0.4%
African American	7.6%	2.7%	1.6%	1.6%
Other Race	6.5%	4.6%	2.6%	0%
Hispanic	4.3%	3.5%	2.0%	0%
Not Hispanic	6.9%	3.2%	1.2%	0.6%
LBP - INTERIOR only	8.2%	1.2%	2.1%	0%
LBP - EXTERIOR only	13.9%	8.9%	2.2%	0%
LBP - INT and EXT	26.2%	13.8%	5.8%	3.2%
LBP	17.5%	8.7%	3.8%	1.4%
No LBP	0.7%	0.3%	0%	0%
Deteriorated LBP - INTERIOR only	28.0%	8.6%	3.1%	0%
Deteriorated LBP - EXTERIOR only	16.9%	9.0%	2.3%	1.1%
Deteriorated LBP - INT and EXT	30.2%	16.8%	9.1%	3.8%
Deteriorated LBP	24.2%	12.0%	5.1%	2.0%
No Deteriorated LBP	2.3%	1.1%	0.4%	0.1%
Sig. Det. LBP - INTERIOR only	30.4%	8.7%	3.5%	0%
Sig. Det. LBP - EXTERIOR only	23.5%	14.0%	5.3%	2.3%
Sig. Det. LBP - INT and EXT	35.3%	19.9%	13.1%	6.7%
Significantly Deteriorated LBP	27.5%	14.0%	6.5%	2.7%
No Significantly Deteriorated LBP	3.1%	1.4%	0.4%	0.1%

[a] "Housing units" include permanently occupied, noninstitutional housing units in which children are permitted to live.
[b] GTE equals "greater than or equal to."

8.0 ARSENIC LEVELS IN HOUSING

8.1 Arsenic Levels in Interior Dust

All floor and windowsill dust wipe samples taken in the AHHS were analyzed for arsenic (As) levels in dust as well as for lead levels, with the same detection limit (5 $\mu g/ft^2$). Of 5,612 floor dust wipe samples in the 1,131 completed units, only 17 had detectable levels of As; of the 3,170 windowsill dust wipe samples, only 45 had detectable levels of As. Table 8-1 presents national estimates of the number of and percent of HUs with detectable levels of As in floor and windowsill dust.

Nationally, at the detection limit of 5 $\mu g/ft^2$, only 1.5% of HUs have detectable levels of As on floors, while 3.2% have detectable levels of As on windowsills. However, the percent with detectable As on windowsills is statistically significantly greater than the percent for floors. If blow-in from exterior soil is the major source of interior household As, one might expect windowsill levels of As to be higher than floor levels. Only 0.1% of HUs have detectable levels on both floors and windowsills, indicating little or no correlation between floor and windowsill levels of As in dust.

8.2 Arsenic Levels in Soil

All soil samples taken in the AHHS were analyzed for arsenic as well as lead. The initial analysis for As had the same detection limit (LOD) as the analysis for lead (20 ppm). This is a perfectly adequate LOD for lead analysis, since the regulatory limits for lead in soil are much higher than 20 ppm (1,200 ppm for bare soil or 400 ppm for bare soil in a children's play area). However, it turned out that As levels in soil were much lower than lead levels, with the result that only 120 of 3,734 (3.2%) soil samples in the 1,131 completed units had detectable levels of As on initial analysis. A second As soil analysis was therefore conducted using a modified method with an LOD of 1 ppm, as described in a separate report [15]. All but 6 soil samples had sufficient material remaining to conduct the second analysis. Of the 3,728 soil samples re-analyzed using the modified method, 3,197 (86%) now had detectable levels of arsenic. Table 8-2 shows mean arsenic levels in soil and bare soil by various characteristics of housing. In calculating the estimates in the table, all soil arsenic sample results in each HU were first averaged to develop a mean soil estimate for each HU with at least one soil arsenic sample. For samples below the detection limit, arsenic levels were calculated from raw analytical files provided by the laboratory.

The national mean As level in soil is 6.60 ppm, and slightly higher at 6.88 ppm for bare soil. Homes in the Northeast and Midwest have higher mean soil As levels than those in the South and West; mean As levels in the Northeast are statistically significantly higher than those in the South or West, while those in the Midwest are significantly higher than those in the South. Older homes have higher mean levels than newer homes; pre-1940 homes have statistically significantly higher mean soil As levels than post-1960 homes. These patterns are similar to those seen for mean soil lead levels, but the regional and age differences are not as pronounced for As as they are for lead. Unlike lead, mean soil As levels are not related to the other housing characteristics in the table, with the exception of income, poverty status and presence of children

under the age of 6. Households not in poverty have statistically significantly higher mean soil and mean bare soil As levels than those in poverty, as do those with incomes of $30,000 per year or more when compared to those with incomes less than $30,000 per year. The explanation may be that wealthier households are more likely to have wooden structures in the yard, such as decks, that may be constructed of treated wood. Households with no children under 6 have significantly higher mean soil As levels than those with children under 6.

Table 8-2 generally shows slightly higher mean As levels in bare soil as compared to all soil. Since the differences are modest, and the sample sizes for all soil are considerably larger than those for bare soil, we have used all soil samples in all subsequent tables in this chapter.

Table 8-3 shows the national distribution of maximum soil As levels. Table 8-4 breaks down the national distribution by housing age and region of the country. Nationally, 78.6% of homes have detectable soil As levels (1 ppm or greater). The percent with detectable soil As is highest in pre-1960 homes and homes in the Midwest. While there are no Federal regulatory limits for As in soil, it is interesting to compare the soil As levels in Tables 8-2 through 8-4 to various State regulatory levels (notification levels, action levels, clean-up levels, etc.) reported in [16] from a 1998 survey of 34 States. Of 19 States reporting residential action levels for soil As, 12 are at or below the national mean soil As level of 6.60 ppm. Only one of the 19 States (Montana) has an action level greater than 22 ppm. Cleanup levels in 17 States reporting are higher than action levels, but only 1 of the 17 (Colorado) exceeds 20 ppm. Since 11% of homes nationwide have soil As levels of 20 ppm or greater, the survey suggests that current State regulations, if widely implemented/enforced, could potentially trigger remedial action in millions of homes.

Table 8-5 shows the relationship between maximum soil As levels and presence of wooden structures (decks, porches, steps, handrails, play equipment, fences or wood chips). The percents are based on the estimated total number of units with or without wooden structures for which a soil sample could be taken. Homes with wooden structures have significantly higher soil As levels than homes without wooden structures. It should be noted that no sampling or assessment was conducted in AHHS to evaluate whether or not wooden structures were treated with chromated copper arsenate (CCA), a pesticide that could leach As into soil. In addition, soil sampling locations were selected to maximize detection of soil lead. Samples were not generally taken at the dripline of wooden structures (if present), where one might expect higher As levels.

In the resident questionnaire, Q33b asks residents with wooden structures in the yard whether any have been *"treated"… with a stain, paint or sealer product to improve its looks or "seal" it?* Table 8-6 shows the distribution of maximum soil As levels by response to Q33b (excludes 23 homes where respondent didn't know if the wooden structures were treated or not). Homes that have treated structures have higher soil As levels than those that do not. This conclusion is somewhat surprising, because most types of treatment mentioned in Q33b would, if anything, tend to seal the wood and reduce leaching of As into the soil, at least from the above-ground part.

Table 8-7 shows the distribution of maximum soil As in homes with treated wooden structures by type and age of treatment. The age and type of treatment of the deck was used to classify the unit; if no deck was present, the oldest structure was used. There are no significant differences by age or type of treatment.

Table 8-1. Number and Percent of HUs with Detectable Levels of Arsenic (5 µg/ft^2 or greater) in Interior Floor and Windowsill Dust

Location of Dust with Detectable As	*No. HUs [a] with Detectable As (000)*			*% HUs with Detectable As*			*HUs in Sample*
	Estimate	*Lower 95% CI[c]*	*Upper 95% CI*	*Estimate*	*Lower 95% CI*	*Upper 95% CI*	
Floor	1,585	499	2,671	1.5%	0.5%	2.5%	16
Windowsill	3,418	1,965	4,870	3.2%	1.9%	4.6%	37
Both Floor and Sill	116	0	285	0.1%	0%	0.3%	2
Either Floor or Sill	4,887	3,223	6,552	4.6%	3.1%	6.2%	51
No Detectable As[b]	101,146	99,067	103,225	95.4%	93.8%	97.0%	1,080
Total HUs	106,033			100%			1,131

[a] "Housing units" include permanently occupied, noninstitutional housing units in which children are permitted to live.
[b] Includes HUs where there is no Windowsill As sample (sill missing or sample not taken). All HUs have at least one Floor As sample result.
[c] CI = confidence interval for the estimated number or percent.

Table 8-2. Mean Soil and Bare Soil Arsenic Concentrations (ppm) by Various Housing Characteristics

Characteristic	*All Soil*			*Bare Soil*			*HUs [a] in Sample (All/Bare)*
	Mean	*Lower 95% CI[b]*	*Upper 95% CI*	*Mean*	*Lower 95% CI*	*Upper 95% CI*	
All Occupied HUs	6.60	5.87	7.33	6.88	5.97	7.79	942/680
Region:							
Northeast	8.73	7.30	10.17	7.91	6.40	9.41	151/83
Midwest	7.82	6.01	9.63	8.41	6.23	10.59	227/180
South	5.32	4.37	6.28	6.00	4.86	7.15	375/259
West	5.55	3.89	7.21	5.66	3.72	7.59	189/158
Construction Year:							
1978-2005	5.62	4.59	6.64	5.78	4.30	7.26	390/267
1960-1977	6.35	5.24	7.45	6.47	5.13	7.81	248/190
1940-1959	7.04	5.55	8.52	7.18	5.38	8.98	162/122
Before 1940	8.65	7.48	9.81	9.59	8.10	11.09	142/101
Region by Construction Year:							
Northeast							
HUs built 1978-2005	8.06	5.15	10.96	5.21	3.58	6.83	34/14
HUs built 1960-1977	9.45	5.95	12.95	7.28	4.19	10.38	41/19
HUs built 1940-1959	7.17	5.14	9.21	6.01	4.14	7.89	26/17
HUs built before 1940	9.45	7.90	11.01	10.45	8.18	12.71	50/33
Midwest							
HUs built 1978-2005	8.01	5.31	10.70	8.23	4.39	12.07	97/72
HUs built 1960-1977	6.95	4.56	9.34	7.16	4.43	9.89	54/47
HUs built 1940-1959	7.16	4.81	9.52	8.79	4.90	12.67	35/29
HUs built before 1940	9.01	7.01	11.02	9.75	7.71	11.80	41/32
South							
HUs built 1978-2005	4.19	3.22	5.16	4.80	3.31	6.29	182/121
HUs built 1960-1977	5.95	4.21	7.68	7.20	4.63	9.77	101/78
HUs built 1940-1959	6.63	3.01	10.26	6.54	2.86	10.21	67/50
HUs built before 1940	6.90	3.67	10.14	7.93	2.04	13.81	25/10

Table 8-2. Mean Soil and Bare Soil Arsenic Concentrations (ppm) by Various Housing Characteristics							
Characteristic	*All Soil*			*Bare Soil*			*HUs[a] in Sample (All/Bare)*
	Mean	*Lower 95% CI[b]*	*Upper 95% CI*	*Mean*	*Lower 95% CI*	*Upper 95% CI*	
West							
HUs built 1978-2005	4.82	1.90	7.73	5.26	1.46	9.06	77/60
HUs built 1960-1977	4.25	2.73	5.77	4.26	2.60	5.92	52/46
HUs built 1940-1959	7.38	5.48	9.27	6.71	4.04	9.38	34/26
HUs built before 1940	8.05	3.99	12.11	8.47	4.20	12.74	26/26
Urbanization							
MSA	6.50	5.64	7.35	6.92	5.83	8.01	709/510
Non-MSA	6.86	5.43	8.28	6.79	4.98	8.61	233/170
Children Under Age 6:							
All HU ages	5.42	4.31	6.53	5.55	4.23	6.87	176/133
HUs built 1978-2005	4.29	3.08	5.49	4.03	3.03	5.02	87/64
HUs built 1960-1977	4.91	2.20	7.61	5.58	2.12	9.04	39/30
HUs built 1940-1959	6.94	3.90	9.97	6.32	4.62	8.03	29/24
HUs built before 1940	8.44	5.23	11.64	9.97	5.36	14.59	21/15
No Children Under Age 6:							
All HU ages	6.83	6.03	7.63	7.16	6.13	8.19	766/547
HUs built 1978-2005	5.97	4.75	7.19	6.29	4.46	8.12	303/203
HUs built 1960-1977	6.57	5.40	7.74	6.61	5.20	8.03	209/160
HUs built 1940-1959	7.05	5.67	8.43	7.35	5.37	9.32	133/98
HUs built before 1940	8.68	7.41	9.95	9.54	7.92	11.16	121/86
Housing Unit Type:							
Single family	6.56	5.87	7.24	6.78	5.97	7.58	880/638
Multi-family	7.17	3.93	10.41	8.33	3.65	13.01	62/42
Tenure:							
Owner-occupied	6.64	5.88	7.39	6.91	6.04	7.77	717/507
Renter-occupied	6.47	4.71	8.22	6.80	4.51	9.09	225/173
Household Income:							
Less than $30,000/year	5.77	4.93	6.61	5.81	4.80	6.82	317/244
$30,000/year or more	7.02	6.14	7.90	7.48	6.33	8.63	625/436
Children Under Age 6:							
All Income Categories	5.42	4.31	6.53	5.55	4.23	6.87	176/133
Less than $30,000/year	4.54	3.29	5.80	4.40	3.08	5.73	60/47
$30,000/year or more	5.85	4.46	7.23	6.16	4.41	7.91	116/86
No Children Under Age 6:							
All Income Categories	6.83	6.03	7.63	7.16	6.13	8.19	766/547
Less than $30,000/year	6.00	5.11	6.90	6.10	4.99	7.21	257/197
$30,000/year or more	7.25	6.24	8.26	7.75	6.39	9.12	509/350
Government Support:							
Government support	4.96	3.31	6.62	4.53	2.61	6.45	41/29
No government support	6.69	5.94	7.44	7.00	6.07	7.94	894/648
Refusal/Don't Know[c]							7/3

Table 8-2. Mean Soil and Bare Soil Arsenic Concentrations (ppm) by Various Housing Characteristics							
Characteristic	***All Soil***			***Bare Soil***			***HUs[a] in Sample (All/Bare)***
	Mean	***Lower 95% CI[b]***	***Upper 95% CI***	***Mean***	***Lower 95% CI***	***Upper 95% CI***	
Poverty:							
In Poverty	4.95	4.09	5.80	5.07	4.03	6.11	131/103
Not in Poverty	6.85	6.05	7.65	7.18	6.18	8.18	811/577
Poverty by Urbanization:							
MSA							
In poverty	4.67	3.75	5.60	4.16	3.41	4.90	92/69
Not in poverty	6.75	5.80	7.69	7.31	6.10	8.52	617/441
Non-MSA							
In poverty	5.47	3.54	7.41	6.68	3.82	9.54	39/34
Not in poverty	7.12	5.58	8.65	6.82	4.96	8.68	194/136
Race:							
White	6.66	5.89	7.43	6.82	5.84	7.81	745/545
African American	7.01	4.84	9.18	8.41	5.71	11.11	114/80
Other[d]	5.47	3.96	6.97	5.29	3.21	7.36	83/55
Ethnicity:							
Hispanic/Latino	6.03	3.68	8.38	6.43	3.17	9.68	118/84
Not Hispanic/Latino	6.67	6.01	7.34	6.94	6.15	7.73	824/596

[a] "Housing units" include permanently occupied, noninstitutional housing units in which children are permitted to live.
[b] CI = confidence interval for the mean.
[c] Refusals and "don't know" responses by survey respondents.
[d] "Other" includes Asian, American Indian or Alaskan Native, Native Hawaiian or other Pacific Islander, or more than one race.

Table 8-3. Distribution of Maximum Soil Arsenic Levels							
Soil Arsenic Concentration	***Number of HUs[a] (000)***			***Percent[b] of HUs (%)***			***HUs in Sample***
	Estimate	***Lower 95% CI[c]***	***Upper 95% CI***	***Estimate***	***Lower 95% CI***	***Upper 95% CI***	
GTE[d] 1 ppm	83,296	79,038	87,553	78.6%	74.7%	82.4%	885
GTE 5 ppm	54,876	49,469	60,284	51.8%	46.7%	56.8%	579
GTE 10 ppm	27,024	23,286	30,762	25.5%	22.0%	29.0%	286
GTE 20 ppm	11,639	9,332	13,947	11.0%	8.8%	13.1%	122
GTE 40 ppm	5,149	3,379	6,919	4.9%	3.2%	6.5%	51
GTE 100 ppm	736	171	1,302	0.7%	0.2%	1.2%	7
No soil	15,540	11,656	19,423	14.7%	11.0%	18.3%	163
Missing Soil Sample	2,668	1,312	4,024	2.5%	1.2%	3.8%	26
TOTAL HUs	106,033			100%			1,131

[a] "Housing units" include permanently occupied, noninstitutional housing units in which children are permitted to live.
[b] All percentages are calculated with "TOTAL HUs" (106,033) as denominator.
[c] CI = confidence interval for the estimated number or percent.
[d] GTE equals "greater than or equal to."

Table 8-4. Distribution of Maximum Soil Arsenic Levels by Region and Age					
Maximum Soil Arsenic Level in the Housing Unit	***Percent of HUs [a] by Year of Construction***				
	1978-1998	***1960-1977***	***1940-1959***	***Before 1940***	***ALL***
GTE[b] 1 ppm	75.3%	74.2%	85.2%	86.8%	78.6%
GTE 5 ppm	44.0%	48.0%	55.7%	72.0%	51.8%
GTE 10 ppm	20.7%	21.1%	27.8%	41.8%	25.5%
GTE 20 ppm	8.4%	8.1%	13.1%	19.7%	11.0%
GTE 40 ppm	3.5%	4.3%	6.1%	7.6%	4.9%
GTE 100 ppm	0.2%	1.2%	1.6%	0%	0.7%
No soil	17.1%	16.9%	11.3%	8.8%	14.7%
Missing Soil Sample	1.6%	3.7%	2.0%	3.2%	2.5%
Maximum Soil Arsenic Level in the Housing Unit	***Percent of HUs by Region***				
	Northeast	***Midwest***	***South***	***West***	***ALL***
GTE 1 ppm	77.0%	91.5%	77.6%	68.1%	78.6%
GTE 5 ppm	67.9%	65.1%	44.5%	36.0%	51.8%
GTE 10 ppm	34.8%	29.4%	23.2%	17.2%	25.5%
GTE 20 ppm	13.9%	13.9%	9.7%	7.5%	11.0%
GTE 40 ppm	6.8%	6.3%	3.2%	4.5%	4.9%
GTE 100 ppm	0.5%	0.9%	0.8%	0.5%	0.7%
No soil	17.0%	5.1%	12.8%	25.9%	14.7%
Missing Soil Sample	5.6%	3.2%	1.1%	1.4%	2.5%

[a] "Housing units" include permanently occupied, noninstitutional housing units in which children are permitted to live.
[b] GTE equals "greater than or equal to."

Table 8-5. Distribution of Maximum Soil Arsenic Levels by Presence or Absence of Wooden Structures in the Yard (Statistically Significant Differences Highlighted)								
Soil As	***HUs[a] with Wooden Structures in Yard (591)***				***HUs[a] with No Wooden Structures in Yard (334)***			
	Percent (Sample Size)		***Lower 95% CI[c]***	***Upper 95% CI***	***Percent (Sample Size)***		***Lower 95% CI***	***Upper 95% CI***
GTE [b] 1 ppm	96.8%	(568)	*95.3%*	*98.3%*	92.1%	(304)	*88.7%*	*95.5%*
GTE 5 ppm	70.1%	(412)	*65.1%*	*75.1%*	49.1%	(156)	*41.1%*	*57.1%*
GTE 10 ppm	37.4%	(218)	*33.1%*	*41.6%*	20.5%	(67)	*15.1%*	*25.8%*
GTE 20 ppm	16.3%	(96)	*13.0%*	*19.7%*	8.4%	(26)	*4.7%*	*12.1%*
GTE 40 ppm	7.4%	(40)	*5.0%*	*9.8%*	3.4%	(11)	*1.0%*	*5.9%*
GTE 100 ppm	0.8%	(4)	*0%*	*1.5%*	1.0%	(3)	*0%*	*2.2%*

[a] "HU's" include permanently occupied, noninstitutional housing units in which children are permitted to live.
[b] GTE equals "greater than or equal to."
[c] CI = confidence interval for the estimated number or percent.

Table 8-6. Distribution of Maximum Soil Arsenic Levels by Whether Any of the Wooden Structures in the Yard are Treated (Statistically Significant Differences Highlighted)

Soil As	*HUs[a] with Some Treated Wooden Structures in Yard (257)*			*HUs[a] with Wooden Structures in Yard but not treated (311)*		
	Percent (Sample Size)	*Lower 95% CI[c]*	*Upper 95% CI*	*Percent (Sample Size)*	*Lower 95% CI*	*Upper 95% CI*
GTE[b] 1 ppm	97.2% (248)	*95.7%*	*98.8%*	96.6% (298)	*94.5%*	*98.7%*
GTE 5 ppm	74.2% (191)	*66.7%*	*81.7%*	67.8% (207)	*62.4%*	*73.1%*
GTE 10 ppm	44.5% (111)	*37.6%*	*51.3%*	31.5% (98)	*26.6%*	*36.4%*
GTE 20 ppm	20.8% (55)	*15.3%*	*26.3%*	12.7% (38)	*8.9%*	*16.4%*
GTE 40 ppm	8.7% (21)	*4.9%*	*12.5%*	6.1% (17)	*3.5%*	*8.6%*
GTE 100 ppm	0.9% (2)	*0%*	*2.3%*	0.7% (2)	*0%*	*1.6%*

[a] "Housing units" include permanently occupied, noninstitutional housing units in which children are permitted to live.
[b] GTE equals "greater than or equal to."
[c] CI = confidence interval for the estimated percent.

Table 8-7. Distribution of Maximum Soil Arsenic Levels by Age and Type of Treatment of Wooden Structures in the Yard

Characteristics of Wooden Structure Treatment (Sample Size)	*GTE[a] 10 ppm*			*GTE 20 ppm*		
	Percent	*Lower 95% CI[b]*	*Upper 95% CI*	*Percent*	*Lower 95% CI*	*Upper 95% CI*
Treatment ≥ 3 years old (36)	56.0%	*39.8%*	*72.1%*	19.7%	*6.1%*	*33.3%*
Treatment < 3 years old (72)	42.2%	*28.6%*	*55.9%*	23.8%	*14.2%*	*33.4%*
Painted (51)	39.3%	*24.4%*	*54.1%*	14.7%	*4.0%*	*25.3%*
Stained (69)	48.7%	*37.7%*	*59.7%*	24.7%	*14.3%*	*35.0%*

[a] GTE equals "greater than or equal to."
[b] CI = confidence interval for the estimated percent.

REFERENCES

[1] *National Survey of Lead and Allergens in Housing, Volume I, Revision 7.1: Analysis of Lead Hazards*. Prepared by Westat, Inc., for U.S. Department of Housing and Urban Development, Office of Healthy Homes and Lead Hazard Control (October 31, 2002).

[2] *American Healthy Homes Survey Final Report: Allergen and Endotoxin Findings.* Prepared by QuanTech, Inc., for U.S. Department of Housing and Urban Development, Office of Healthy Homes and Lead Hazard Control (August 18, 2009).

[3] *Statistical Sampling of PSUs for the American Healthy Homes Survey.* Prepared by Westat, Inc., for U.S. Department of Housing and Urban Development, Office of Healthy Homes and Lead Hazard Control (May 21, 2004).

[4] *American Healthy Homes Survey: Design and Methodology*. Prepared by QuanTech, Inc., for U.S. Department of Housing and Urban Development, Office of Healthy Homes and Lead Hazard Control (September 4, 2007).

[5] *Annual Update of the HHS Poverty Guidelines.* Federal Register, Vol. 70, No. 33, February 15, 2005, pp. 8373-8375.

[6] *American Housing Survey for the United States: 2005.* U.S. Department of Housing and Urban Development and U.S. Department of Commerce (August 2006).

[7] *WESVAR 4.2 User's Guide.* Westat, Inc., Rockville MD (2002).

[8] *A Study of Procedures to Identify and Trim Extreme Sampling Weights.* F. Potter, Research Triangle Institute (1990).

[9] *Survey of Procedures to Control Extreme Sampling Weights.* F. Potter, Research Triangle Institute. Proceedings of the Section on Survey Research Methods, American Statistical Association (1988).

[10] *National Survey of Lead and Allergens in Housing, Volume II, Revision 6.0: Design and Methodology*. Prepared by Westat, Inc., for U.S. Department of Housing and Urban Development, Office of Healthy Homes and Lead Hazard Control (March 29, 2001).

[11] *Introduction to Variance Estimation.* K. M. Wolter. New York, Springer (1985).

[12] *Leisure Homes, Second Homes & Age Restricted Housing.* Massachusetts Office of Consumer Affairs and Business Regulation at www.mass.gov/dpl/boards/re/contedu/2001/0.55.htm (2001).

[13] *Ceramic Tile Lead Hazards and Miscellaneous Other Lead Risks in Residential Remodeling and Construction.* Judson Bryant. Ceramic Tile Institute of America at www.ctioa.org/reports/fr79.html (2000).

[14] *Nondetects and Data Analysis: Statistics for Censored Environmental Data.* Dennis R. Helsel. Wiley Interscience (2005).

[15] *American Healthy Homes Survey: Arsenic in Soil Re-Analysis Investigation.* Prepared by QuanTech, Inc., for U.S. Department of Housing and Urban Development, Office of Healthy Homes and Lead Hazard Control (April 2009).

[16] *Study of State Soil Arsenic Regulations*. Association for the Environmental Health of Soils. Amherst MA (1998).

[17] *Validation of a Twenty-Year Forecast of U.S. Childhood Lead Poisoning: Updated Prospects for 2010.* D.E. Jacobs and R. Nevin. Environ Res 102(3) 352-364, Nov 2006.

[18] *Comparison of Selected Results from the AHHS and NSLAH.* Memorandum from David Marker to David Cox (June 30, 2009).

APPENDIX: WEIGHTING, NONRESPONSE ADJUSTMENT AND STATISTICAL ANALYSIS

A.1 Weighting of the AHHS Sample

Each housing unit released for AHHS recruitment has a known probability of selection, computed as

P = Pr(PSU)*Pr(Segment|PSU)*(#Units Released in Segment)/(#Units in Segment).

In this formula, Pr(PSU) is the probability of selecting the PSU containing the unit, at the first stage of sampling. This is proportional to PSU population within strata, except for 16 larger certainty selections, where Pr(PSU) = 1. The second term, Pr(Segment|PSU), is the probability of selecting the segment (or "chunk", i.e., subsegment of a large segment) containing the unit, at the second stage of sampling. This is proportional to the number of housing units in the segment. The third term in the equation equals either 4/(#Units in Segment) or 5/(#Units in Segment), depending on whether 4 or 5 units were released for recruitment in the segment. In a very small number of cases, the number of units released was not 4 or 5. This occurred where the interviewer either failed to attempt recruiting on all released units, or mistakenly recruited both reserve units in the segment.

The reciprocal of the unit selection probability is called the base weight for the unit. The base weight equals the total number of housing units in the U.S. represented in the survey by that unit. The distribution of base weights for the AHHS sample is shown in Table A-1.

Table A-1. Distribution of Base Weights in AHHS Sample

Parameter	***Value***
N	2,261
Total	102,763,979
Minimum	5,334
25th Percentile	31,768
Median	45,256
Mean	45,451
75th Percentile	56,092
95th Percentile	76,662
Maximum	132,503

The 102,763,979 total of the base weights is the estimate from the sample of the total number of eligible housing units in the U.S. at the time the survey was conducted. This compares to a total of 108,871,000 occupied, non-seasonal, housing units reported in the 2005 American Housing Survey. The difference between the two totals is due to a number of factors. The most important is that not all occupied, non-seasonal housing units are eligible for AHHS. Also, errors in the segment listing process and new construction occurring between the listing and the actual survey can cause the base weight total to slightly underestimate the number of AHHS-eligible units. The base weights range from a minimum of 5,334 to a maximum of 132,503 (a factor of

approximately 25). Although this variation in weights is not unusual, it means that all estimates from the survey data must be properly weighted to avoid biases.

A.2 Nonresponse Adjustment

Estimates from the survey data can be based only on the 1,131 completed units. Since this is only 50.7% of the 2,261 units released for recruiting, the weights of the completed units must be adjusted to account for ineligible units, nonrespondents and units of unknown eligibility. This process is called nonresponse adjustment. Because response rates can differ for different types of housing units, the nonresponse adjustment varies for different subgroups of the sample. Factors that may potentially affect response rates include race, ethnicity, socioeconomic status, region and housing age. To assess the impact of these factors on response rates, it is first necessary to classify each unit in the sample according to each factor. The following classification scheme was used for purposes of nonresponse adjustment:

RACE: In completed units, the race of the first person listed on the resident questionnaire ([4], Q.38 - generally the individual who responded to the questionnaire) was assigned to the unit. If this was not available, the "impression of race" from the recruitment questionnaire ([4], Q.E3) was used if available. Only 6 of the 1,131 completed units had race assigned based on impression of race. For units with no information on race, the unit was assigned the percentage distribution of races in the 2000 Census Block Group containing the unit. For example, if the Census Block Group was 65% White, 30% African American and 5% Asian, then 0.65 units were assigned to White, 0.3 units to African American and 0.05 units to Asian. This fractional assignment of units avoids biases caused by the more usual procedure of assigning the majority race in the Census Block Group to the unit. For example, very few Census Block Groups are majority Asian. Thus, majority assignment by Census Block Group will almost never result in classifying a unit as Asian, even though 3.6% of the U.S. population is Asian (Census 2000).

ETHNICITY: Ethnicity (Hispanic/Non-Hispanic) was assigned to units using the same procedure as for race. Only 2 of 1,131 completed units had ethnicity assigned based on "impression of ethnicity".

SOCIOECONOMIC STATUS: Where possible, each unit was classified as "In Poverty" or "Not In Poverty" based on the 2005 HHS Poverty Guidelines [5], which are a function of household income and number of occupants. This requires data from Q.38, Q.50 and/or Q.51 of the resident questionnaire[20]. Where such data was not available, the unit was assigned a fraction "In Poverty" and a fraction "Not In Poverty" based on the 2000 Census Block Group containing the unit.

REGION: The Census Region where the unit is located (Northeast, Midwest, South or West).

[20] The HHS Poverty Guidelines are similar to the Census Bureau's Poverty Thresholds, except that they include separate figures for AL and HI, and account only for the number of persons in the family unit (the Census Bureau also considers the number of related children in the family). The AHHS did not collect information on the family relationships within the household. Also, household income was collected only in broad income categories [4], so that HHS or Census Bureau poverty levels could only be approximated. For all PSUs except Honolulu HI, a one-person household was considered to be in poverty if household income was < $10,000; 2-3 persons, < $15,000; 4-5 persons, < $20,000; 6-8 persons, <$30,000; and, 9 or more persons, < $40,000.

AGE: Units were classified into 4 age categories, based on year built: 1978-2005, 1960-1977, 1940-1959 and 1939 or earlier. These age categories were chosen for consistency with NSLAH and relevance to lead-based paint (LBP was banned for residential use in 1978). Units were assigned to age categories based first on construction year as reported in Q.2 of the resident questionnaire. If this was not available, construction year as reported in S.12 of the recruitment questionnaire was used if available. Failing both of these, a fractional assignment to age categories was made based on the age distribution for the 2000 Census Block Group containing the unit, as for race, ethnicity and socioeconomic status.

Eligibility and response rates were calculated for subpopulations defined by these 5 factors using the formulas

Eligibility Rate (ER) = #Eligibles/(#Eligibles + # Ineligibles)

Response Rate = #Respondents/(#Eligibles + ER*(#Unknown Eligibility))

Table A-2 shows the results of these calculations.

Table A-2. Eligibility and Response Rates for AHHS Subpopulations

Subpopulation	*Eligibility Rate*	*Response Rate*
African American	86.1%	64.6%
Not African American	86.8%	57.8%
Hispanic	91.6%	65.9%
Not Hispanic	86.0%	57.6%
In Poverty	86.1%	63.8%
Not In Poverty	86.8%	57.8%
Northeast	88.9%	52.7%
Midwest	85.9%	58.5%
South	86.2%	61.1%
West	86.4%	59.6%
Built 1978-2005	89.4%	63.7%
Built 1960-1977	84.3%	55.7%
Built 1940-1959	85.2%	55.7%
Built 1939 Or Earlier	85.9%	55.0%

As seen in NSLAH, Hispanic and African American households have above-average response rates, as do poor households. However, the differences are less dramatic than those seen in NSLAH and are not statistically significant. The newest housing units (built 1978 and later) had higher response rates than pre-1978 units, again similar to NSLAH. The Northeast had lower response rates than the other regions, which all had similar response rates. This is a different pattern than NSLAH, where the West had the highest response rate and the Midwest the lowest, although the differences between regions in NSLAH were slight.

Adjustment of the AHHS base weights for nonresponse was performed in two stages. The first adjustment was for unknown eligibility, and was performed in 4 adjustment cells formed by classifying housing units as either in poverty or not in poverty, and either African American or

Hispanic, or not. As before, fractional assignment of units was used where Race and/or Ethnicity had to be imputed from Census data. The first nonresponse adjustment factor was calculated, for each cell, as

NR1 = (Sum of Base Weights)/(Sum of Base Weights for Units of Known Eligibility Status).

Table A-3 shows the values of NR1.

Table A-3. Nonresponse Adjustment Factors for Unknown Eligibility	
NONRESPONSE ADJUSTMENT CELL	***ADJUSTMENT FACTOR***
In poverty, African American or Hispanic	1.235
In poverty, not African American or Hispanic	1.271
Not in poverty, African American or Hispanic	1.241
Not in poverty, not African American or Hispanic	1.312

The second adjustment was for nonresponse among eligible housing units. This adjustment was performed in 16 cells formed by Age Category and Region. For each cell, the second nonresponse adjustment factor was calculated as

NR2 = (Sum of Base Weights * NR1 for Units of Known Eligibility Status)/(Sum of Base Weights * NR1 for Respondents).

The adjustment factors for nonresponse among eligible units are in Table A-4.

The overall nonresponse adjustment factor for respondents is the product NR1*NR2, and ranges from a minimum of 1.50 to a maximum of 2.06.

A.3 Poststratification

"Poststratification" is a process by which survey weights are adjusted to ensure that estimates from the survey match known totals for certain subgroups of the overall population from which the survey sample is drawn. In the case of AHHS, the 2005 American Housing Survey (AHS) [6] provides authoritative national estimates of the number of housing units in the U.S., and for a large number of subgroups. The variables chosen to define subgroups for poststratification purposes were Region, Housing Age Category, and Child Under Age 6 Resides in the Housing Unit (Yes/No). The AHS provides the total number of occupied, non-seasonal, housing units for all 16 combinations of Region and Housing Age and for presence/absence of a child under 6. However, it does not cover the three-way combinations involving the presence of a child under age 6 combined with the region and age variables. The approach adopted was therefore to use a process called "raking" [7] to poststratify to the 32 combinations of all three variables. Raking is a procedure used to poststratify to combined totals for several variables when only the individual totals for each variable are known. In the present case, the totals for all 16 combinations of region

Table A-4. Adjustment Factors for Nonresponse Among Eligible Units		
Nonresponse Adjustment Cell		***Adjustment Factor***
Housing Age	***Region***	
1978-2005	Northeast	1.549
1960-1977	Northeast	1.429
1940-1959	Northeast	1.477
1939 or earlier	Northeast	1.367
1978-2005	Midwest	1.245
1960-1977	Midwest	1.367
1940-1959	Midwest	1.421
1939 or earlier	Midwest	1.569
1978-2005	South	1.262
1960-1977	South	1.317
1940-1959	South	1.218
1939 or earlier	South	1.471
1978-2005	West	1.220
1960-1977	West	1.286
1940-1959	West	1.364
1939 or earlier	West	1.410

and age are known, as are the totals for Child Under 6 (Yes/No), but the totals for the 3-variable combinations are not known.

Two technical issues needed to be addressed in the poststratification process. First, the 2005 AHS housing age categories do not exactly match those for AHHS. Specifically, AHS reports numbers of housing units for 1975-1979 and 1980-1984, but does not include 1978 as a break point between categories. Therefore, poststratification of the AHHS weights was carried out using the age categories 1980-2005, 1960-1979, 1940-1959 and 1939 and earlier.

The second technical issue is that the class of "occupied, non-seasonal housing units" counted in AHS does not exactly match the definition of AHHS eligibility. The primary difference between the two is that AHS includes senior-only housing, while AHHS excludes all housing in which children cannot live. The solution to this problem was to include in the poststratification all units found ineligible because children cannot live there, as well as the two complete segments not listed because they consisted entirely of senior housing. In the poststratification, weights of the ineligible units were adjusted using NR1, the nonresponse adjustment factor for unknown eligibility. The two senior segments were assigned the segment weight (reciprocal of segment selection probability). After poststratification, the ineligible units and senior segments were ignored in subsequent calculations, i.e., only the poststratified, adjusted weights of the respondents were used.

A.4 Trimming

As stated in [8,9], "Extreme variation in the sampling weights can result in excessively large sampling variances….a few extreme weights can offset the precision gained from an otherwise well-designed and executed survey." The term "trimming" describes procedures used to identify unusually large weights and to specify a maximum value T at which weights are truncated, i.e., all weights larger than T are reduced to the value T and the total excess above T is distributed proportionally among the weights less than T. The process is iterated until no further change in the weights occurs. Trimming should be used cautiously, because it can potentially cause an unacceptable increase in the bias of estimates. The basic idea is that, when trimming is properly applied, any increase in bias is more than offset by a reduction in the variance of estimates.

In NSLAH [10], weights were trimmed to the value T = 300,000. This resulted in trimming fewer than 25 weights out of 831 respondents (approximately 3%). Accounting for the larger AHHS sample size, the corresponding trimming limit for AHHS would be approximately 300,000*831/1131 = 220,000, assuming similar relative variation in the weights of the two surveys. The minimum of the nonresponse-adjusted, poststratified AHHS weights is 21,505, and the maximum is 243,596. Only 6 weights out of 1,131 exceed the potential trimming limit of 220,000, suggesting that little if any trimming is needed. Moreover, when the NAEP trimming procedure [8,9], which compares each weight to a multiple of the root-mean-square of all the weights, is applied to the AHHS weights, a trimming limit of 312,976, larger than the maximum weight, is calculated. For these reasons, it was decided not to trim the AHHS weights.

A.5 Statistical Analysis

Weighted statistical analysis for the AHHS was conducted using WESVAR Version 4.2 [7]. For purposes of variance estimation and calculation of confidence intervals for estimates, the JK(n) version of the Jackknife method [11] was used within WESVAR. The AHHS first-stage sample consists of 16 large certainty PSUs and 84 noncertainty PSUs drawn as single samples from 84 strata based on per capita income, percentage Hispanic and percentage non-Hispanic African American. The 84 noncertainty PSUs were randomly selected with probability proportional to Census 2000 population.

The 16 certainty PSUs were each split into two "variance units" by randomly selecting half of the segments (or 3 out of 5, etc.) for each variance unit. Each certainty PSU was then a separate variance stratum with 2 variance units. Because only a single selection was made from each noncertainty stratum, it was necessary to group adjacent PSUs in the sample to form variance strata. Noncertainty PSUs were grouped in adjacent pairs within Census Division and MSA classification (MSA or non-MSA PSU). In cases where a Census Division combined with MSA classification contained an odd number of PSUs, it was necessary to combine 3 PSUs to form one of the variance strata. The 84 noncertainty PSUs were grouped in this way into 39 variance strata, 33 with 2 variance units (PSUs) and 6 with 3 variance units. This resulted in a total of 116 variance units in 55 variance strata.

The variance estimation in WESVAR therefore used a total of 116 replicates, resulting in 116-55 = 61 degrees of freedom for estimating standard errors of national estimates. Nonresponse

adjustment and poststratification/raking were performed within WESVAR. This ensured that the replicate weights are also adjusted for nonresponse and poststratified.

APPENDIX B: COMPARISON OF SOIL LEAD HAZARD PREVALENCE IN NSLAH AND AHHS

As discussed in Chapter 7, there are significant differences in soil sampling strategy between NSLAH and AHHS which affect the estimated prevalence of soil hazards in the two surveys and make comparisons difficult. The major differences are:

1. In AHHS, soil samples were collected at a unit only if there was an area of soil associated with the unit, such as a yard, a planter or even flower pots. In NSLAH, soil samples were collected if there was soil anywhere on the property associated with the building containing the housing unit, even if there was no direct connection between the unit and the soil sampled. For example, if a large apartment building had a planter outside the front entrance, and a 7th floor unit in the building was selected for sampling, the soil in the planter would have been sampled in NSLAH but not in AHHS.
2. In AHHS, only units where there was play equipment, such as swing sets, sand boxes, jungle jims, etc., were considered to have a play area, where soil was sampled. In NSLAH, however, <u>any</u> area where children might play was considered a play area and was sampled.

As a result of the first difference in sampling strategy, many multifamily units were not sampled for soil in AHHS when they would have been sampled in NSLAH. The estimated number of units classified as having no soil to sample was 15,540,000 in AHHS (14.7%), compared to 2,242,000 (2.3%) in NSLAH. As a result of the second difference, play area soil samples were taken in a much smaller percentage of units in AHHS than in NSLAH. The estimated number of units in AHHS classified as having no play area was 60,108,000 (56.7%), comparable to the number of units with no children under age 18. In AHHS, only 12,638,000 units (12.9%) were classified as having no play area. The net result of these sampling differences is to substantially reduce the number of units sampled for soil, both in play areas and in the rest of the yard, in AHHS as compared to NSLAH. This inevitably also decreases the number and percent of units found to have soil hazards. In NSLAH, an estimated 6,460,000 units (6.8%) had soil lead hazards, compared to only 3,848,000 (3.6%) in AHHS[21].

The estimated number of units with soil lead hazards in AHHS can be adjusted to approximate the number that would have been found if the AHHS soil sampling strategy had been the same as in NSLAH. First consider play areas. If AHHS had followed NSLAH's definition of play area, an additional 43.8% (56.7% - 12.9%) of units would have had play area samples taken. This amounts to an additional 46,442,000 units. Table 7-1 shows that an estimated 413,000 units in AHHS had soil lead hazards in a play area only, out of 45,925,000 units with play areas. Thus, 0.9% of units with play areas had soil lead hazards in the play area only. Applying this percentage to the additional 46,442,000 units with play areas under the NSLAH definition yields an additional 418,000 units with soil lead hazards in a play area only. Next consider units classified in AHHS as having no soil to sample. If the NSLAH definition of available soil had been used in AHHS, an

[21] The differences, while relatively large (the estimated number of units with soil lead hazards decreased by 40% from NSLAH to AHHS), are not statistically significant because of the low incidence of soil hazards in both surveys.

additional 12.4% of units (14.7% - 2.3%) would have been sampled for soil. This amounts to an additional 13,148,000 units eligible for soil sampling. Table 7-1 shows an estimated 3,435,000 AHHS units with soil lead hazards, not exclusively in a play area, out of an estimated 90,493,000 eligible for soil sampling (3.8%). Applying this percentage to the additional 13,148,000 units gives an additional 500,000 units with soil lead hazards not exclusively in a play area.

The two adjustments combined add an additional 913,000 units to the 3,848,000 found to have soil lead hazards in AHHS, bringing the total to 4,761,000 (4.5%). This still shows a substantial drop from the 6.8% of units with soil lead hazards in NSLAH. The estimated number of units with soil lead hazards still drops from 6,460,000 in NSLAH to 4,761,000 in AHHS, i.e., by 26%. This is less than the 40% drop estimated before the differences in sampling strategy are accounted for, but is still a large decline.

Finally, it should be noted that the adjustments carried out in this appendix are approximate only. They depend on two major assumptions:

1. The additional 46,442,000 units with play areas in AHHS under the NSLAH definition would have the same 0.9% incidence of soil lead hazards in the play area only as the 45,925,000 units with play areas under the more restrictive definition actually used in AHHS.
2. The additional 13,148,000 units with soil available for AHHS sampling under the NSLAH definition would exhibit the same 3.8% incidence of soil lead hazards (not exclusively in play areas) as the 90,493,000 units with soil under the AHHS definition.

While these assumptions are reasonable, and constitute the only viable method of adjusting for the differences between NSLAH and AHHS, there is no way to verify their validity. First, the "play areas" in the additional 45,925,000 AHHS units under the NSLAH definition are not specifically designed as play areas and might therefore have a higher incidence of soil lead hazards than areas with actual play equipment. Second, the soil in the 13,148,000 additional AHHS units with soil available for sampling under the NSLAH definition is not associated with a particular unit and might therefore be less likely to fall in the drip line or other areas tending to have higher soil lead. Thus, the incidence of soil lead hazards in these additional units might be lower than in the other 90,493,000 units with soil under the AHHS definition.

APPENDIX C: ADDITIONAL TABLES FOR AHHS: PREVALENCE OF VARIOUS LEAD HAZARDS BY SELECTED HOUSING UNIT CHARACTERISTICS

Table C-1. Prevalence of Significantly Deteriorated Lead Based Paint (LBP) in AHHS by Selected Housing Unit (HU) Characteristics								
Characteristic	***All HUs (000)***	***No. of HUs with Significantly Deteriorated LBP (000)***			***Percent of HUs with Significantly Deteriorated LBP (%)***			**HUs in Sample**
		Estimate	***Lower 95% CI***	***Upper 95% CI***	***Estimate***	***Lower 95% CI***	***Upper 95% CI***	
Total Occupied HUs	106033	15331	11780	18881	14.5%	11.6%	17.9%	150
Region:								
Northeast	20191	6144	4024	8265	30.4%	21.1%	41.7%	58
Midwest	23994	3882	1754	6009	16.2%	9.9%	25.2%	32
South	38996	3127	1648	4606	8.0%	5.0%	12.6%	33
West	22853	2178	994	3361	9.5%	5.6%	15.6%	27
Construction Year:								
1978-Pres	40460	109	0	261	0.3%	0.1%	1.1%	2
1960-1977	29955	1822	864	2781	6.1%	3.6%	10.2%	19
1940-1959	18117	4547	2686	6408	25.1%	17.6%	34.5%	46
Pre 1940	17502	8852	6157	11547	50.6%	42.4%	58.7%	83
Region by Construction Year:								
Northeast								
1978-Pres	3832	0	0	0	0.0%	0.0%	0.0%	0
1960-1977	5288	787	147	1428	14.9%	6.6%	30.3%	8
1940-1959	4156	1325	285	2364	31.9%	15.9%	53.7%	13
Pre 1940	6915	4032	2055	6010	58.3%	44.5%	71.0%	37
Midwest								
1978-Pres	8320	0	0	0	0.0%	0.0%	0.0%	0
1960-1977	5843	262	0	563	4.5%	1.4%	13.3%	3
1940-1959	4436	1094	45	2144	24.7%	10.0%	49.1%	9
Pre 1940	5394	2526	1075	3977	46.8%	32.1%	62.2%	20
South								
1978-Pres	18626	0	0	0	0.0%	0.0%	0.0%	0
1960-1977	11723	656	52	1259	5.6%	2.1%	13.8%	7
1940-1959	5575	1300	319	2281	23.3%	12.8%	38.6%	16
Pre 1940	3071	1171	400	1942	38.1%	23.1%	55.8%	10
West								
1978-Pres	9683	109	0	261	1.1%	0.3%	4.6%	2
1960-1977	7100	118	0	348	1.7%	0.2%	11.8%	1
1940-1959	3949	828	263	1393	21.0%	10.0%	38.9%	8
Pre 1940	2121	1123	315	1930	52.9%	39.9%	65.6%	16
Urbanization								
MSA	80101	11883	8595	15171	14.8%	11.4%	19.1%	120
Non-MSA	25932	3448	2108	4788	13.3%	9.2%	18.8%	30
Child under 6 by Construction Year:								
1978-Pres	7995	0	0	0	0.0%	0.0%	0.0%	0
1960-1977	4001	460	27	892	11.5%	4.4%	27.0%	6
1940-1959	2641	1103	297	1909	41.8%	22.1%	64.5%	14
Pre 1940	2196	1164	305	2023	53.0%	30.1%	74.7%	13
No Child under 6 by Construction Year:								

Table C-1. Prevalence of Significantly Deteriorated Lead Based Paint (LBP) in AHHS by Selected Housing Unit (HU) Characteristics								
Characteristic	***All HUs (000)***	***No. of HUs with Significantly Deteriorated LBP (000)***			***Percent of HUs with Significantly Deteriorated LBP (%)***			**HUs in Sample**
		Estimate	***Lower 95% CI***	***Upper 95% CI***	***Estimate***	***Lower 95% CI***	***Upper 95% CI***	
1978-Pres	32465	109	0	261	0.3%	0.1%	1.4%	2
1960-1977	25953	1362	458	2267	5.2%	2.7%	10.1%	13
1940-1959	15476	3444	1959	4930	22.3%	15.1%	31.5%	32
Pre 1940	15306	7688	5297	10078	50.2%	42.5%	57.9%	70
Housing Unit Type and Tenure:								
Single Family	89156	14523	11150	17896	16.3%	13.1%	20.1%	142
Multi-Family	16878	808	121	1495	4.8%	2.1%	10.8%	8
Owner	73627	9448	6564	12332	12.8%	9.6%	17.0%	92
Renter	32407	5883	4264	7502	18.2%	13.7%	23.7%	58
Household Income:								
Income<$30k	37059	6155	4601	7710	16.6%	12.9%	21.1%	59
Income>=$30k	68975	9175	6485	11865	13.3%	10.0%	17.5%	91
Child under 6 by Household Income:								
Child under 6/Income<$30k	5781	709	54	1364	12.3%	4.5%	29.3%	9
Child under 6/Income>=$30k	11052	2018	929	3107	18.3%	10.4%	30.1%	24
No Child under 6 by Household Income:								
No Child under 6/Income<$30k	31278	5446	3992	6900	17.4%	13.4%	22.4%	50
No Child under 6/Income>=$30k	57923	7157	4607	9708	12.4%	8.8%	17.1%	67
Government Support:								
Government Support	5871	388	7	768	6.6%	2.2%	18.0%	4
No Government Support	99522	14798	11334	18263	14.9%	11.9%	18.4%	145
Poverty:								
In Poverty	14592	2803	1790	3816	19.2%	13.3%	26.9%	29
Not In Poverty	91441	12527	9263	15792	13.7%	10.8%	17.3%	121
Poverty by Urbanization:								
MSA								
In Poverty	10469	1950	1132	2767	18.6%	12.3%	27.2%	22
Not In Poverty	69632	9933	6982	12884	14.3%	10.8%	18.6%	98
Non-MSA								
In Poverty	4124	853	256	1451	20.7%	9.5%	39.3%	7
Not In Poverty	21809	2594	1199	3990	11.9%	7.3%	18.8%	23
Race:								
Other Race	10134	1832	1066	2598	18.1%	11.7%	26.8%	19
Black	13160	2516	1403	3629	19.1%	13.1%	27.0%	24
White	82739	10983	7952	14013	13.3%	10.2%	17.0%	107
Ethnicity:								
Hispanic	13175	1642	993	2292	12.5%	7.9%	19.1%	18
Non-Hispanic	92858	13688	10260	17117	14.7%	11.7%	18.4%	132

Table C-2. Prevalence of Dust Lead Hazards in AHHS by Selected Housing Unit (HU) Characteristics								
Characteristic	*All HUs (000)*	*No. of HUs with Dust Lead Hazards (000)*			*Percent of HUs with Dust Lead Hazards (%)*			**HUs in Sample**
		Estimate	*Lower 95% CI*	*Upper 95% CI*	*Estimate*	*Lower 95% CI*	*Upper 95% CI*	
Total Occupied HUs	106033	13739	10903	16575	13.0%	10.6%	15.7%	132
Region:								
Northeast	20191	3921	2499	5343	19.4%	13.2%	27.7%	36
Midwest	23994	4509	2873	6145	18.8%	13.6%	25.3%	39
South	38996	4198	2571	5824	10.8%	7.4%	15.3%	46
West	22853	1112	275	1949	4.9%	2.2%	10.5%	11
Construction Year:								
1978-Pres	40460	865	276	1454	2.1%	1.1%	4.2%	11
1960-1977	29955	1970	999	2942	6.6%	4.0%	10.7%	20
1940-1959	18117	4148	2587	5710	22.9%	16.6%	30.8%	41
Pre 1940	17502	6756	4488	9024	38.6%	31.5%	46.2%	60
Region by Construction Year:								
Northeast								
1978-Pres	3832	0	0	0	0.0%	0.0%	0.0%	0
1960-1977	5288	440	56	825	8.3%	3.7%	17.6%	4
1940-1959	4156	688	0	1438	16.6%	5.8%	39.0%	7
Pre 1940	6915	2793	1311	4275	40.4%	32.2%	49.2%	25
Midwest								
1978-Pres	8320	97	0	234	1.2%	0.3%	4.4%	2
1960-1977	5843	284	0	608	4.9%	1.5%	14.8%	3
1940-1959	4436	1605	665	2546	36.2%	21.0%	54.8%	13
Pre 1940	5394	2522	1194	3850	46.8%	32.9%	61.2%	21
South								
1978-Pres	18626	664	128	1200	3.6%	1.6%	8.0%	8
1960-1977	11723	736	65	1406	6.3%	2.4%	15.7%	8
1940-1959	5575	1516	604	2428	27.2%	17.5%	39.6%	18
Pre 1940	3071	1282	216	2347	41.7%	22.8%	63.4%	12
West								
1978-Pres	9683	103	0	306	1.1%	0.2%	6.7%	1
1960-1977	7100	511	19	1002	7.2%	2.8%	17.1%	5
1940-1959	3949	339	0	739	8.6%	2.5%	25.6%	3
Pre 1940	2121	159	0	380	7.5%	2.0%	24.8%	2
Urbanization								
MSA	80101	10471	8103	12839	13.1%	10.4%	16.2%	106
Non-MSA	25932	3269	1708	4829	12.6%	8.1%	19.2%	26
Child under 6 by Construction Year:								
1978-Pres	7995	61	0	180	0.8%	0.1%	5.5%	1
1960-1977	4001	455	47	864	11.4%	4.9%	24.1%	5
1940-1959	2641	774	255	1293	29.3%	16.4%	46.8%	10
Pre 1940	2196	854	216	1493	38.9%	22.7%	58.0%	9

Table C-2. Prevalence of Dust Lead Hazards in AHHS by Selected Housing Unit (HU) Characteristics								
Characteristic	*All HUs (000)*	*No. of HUs with Dust Lead Hazards (000)*			*Percent of HUs with Dust Lead Hazards (%)*			**HUs in Sample**
		Estimate	*Lower 95% CI*	*Upper 95% CI*	*Estimate*	*Lower 95% CI*	*Upper 95% CI*	
No Child under 6 by Construction Year:								
1978-Pres	32465	804	227	1381	2.5%	1.2%	5.0%	10
1960-1977	25953	1515	612	2418	5.8%	3.2%	10.5%	15
1940-1959	15476	3375	1986	4763	21.8%	15.0%	30.6%	31
Pre 1940	15306	5901	3826	7976	38.6%	31.2%	46.5%	51
Housing Unit Type and Tenure:								
Single Family	89156	13219	10522	15916	14.8%	12.2%	17.9%	128
Multi-Family	16878	520	0	1076	3.1%	1.0%	9.1%	4
Owner	73627	9259	6866	11651	12.6%	9.8%	16.0%	89
Renter	32407	4480	2865	6096	13.8%	9.5%	19.6%	43
Household Income:								
Income<$30k	37059	6974	5186	8762	18.8%	14.8%	23.7%	68
Income>=$30k	68975	6765	4486	9045	9.8%	7.0%	13.5%	64
Child under 6 by Household Income:								
Child under 6/Income<$30k	5781	759	310	1209	13.1%	7.4%	22.2%	10
Child under 6/Income>=$30k	11052	1385	639	2131	12.5%	7.5%	20.3%	15
No Child under 6 by Household Income:								
No Child under 6/Income<$30k	31278	6214	4415	8014	19.9%	15.1%	25.7%	58
No Child under 6/Income>=$30k	57923	5381	3303	7459	9.3%	6.4%	13.3%	49
Government Support:								
Government Support	5871	527	63	991	9.0%	3.4%	21.8%	6
No Government Support	99522	13212	10435	15990	13.3%	10.8%	16.2%	126
Poverty:								
In Poverty	14592	2706	1575	3837	18.5%	12.7%	26.2%	29
Not In Poverty	91441	11033	8293	13773	12.1%	9.5%	15.2%	103
Poverty by Urbanization:								
MSA								
In Poverty	10469	2283	1235	3330	21.8%	14.8%	30.9%	25
Not In Poverty	69632	8188	5881	10496	11.8%	8.9%	15.4%	81
Non-MSA								
In Poverty	4124	424	0	849	10.3%	3.7%	25.6%	4
Not In Poverty	21809	2845	1368	4322	13.0%	8.0%	20.5%	22
Race:								
Other Race	10134	1313	635	1990	13.0%	7.5%	21.4%	13
Black	13160	2335	1458	3213	17.7%	12.2%	25.0%	25
White	82739	10091	7639	12544	12.2%	9.7%	15.3%	94
Ethnicity:								
Hispanic	13175	1108	433	1784	8.4%	4.6%	14.9%	13
Non-Hispanic	92858	12631	9911	15351	13.6%	11.1%	16.5%	119

Table C-3. Prevalence of Floor Dust Lead Hazards in AHHS by Selected Housing Unit (HU) Characteristics								
Characteristic	*All HUs (000)*	*No. of HUs with Floor Dust Lead Hazards (000)*			*Percent of HUs with Floor Dust Lead Hazards (%)*			**HUs in Sample**
		Estimate	*Lower 95% CI*	*Upper 95% CI*	*Estimate*	*Lower 95% CI*	*Upper 95% CI*	
Total Occupied HUs	106033	5237	3621	6853	4.9%	3.6%	6.7%	49
Region:								
Northeast	20191	1589	771	2406	7.9%	4.5%	13.5%	14
Midwest	23994	1908	1059	2758	8.0%	5.0%	12.5%	17
South	38996	1347	345	2348	3.5%	1.7%	7.0%	14
West	22853	393	0	860	1.7%	0.5%	5.3%	4
Construction Year:								
1978-Pres	40460	212	0	467	0.5%	0.2%	1.7%	3
1960-1977	29955	597	58	1137	2.0%	0.8%	5.1%	5
1940-1959	18117	1549	781	2316	8.5%	5.4%	13.3%	15
Pre 1940	17502	2879	1607	4152	16.5%	11.3%	23.4%	26
Region by Construction Year:								
Northeast								
1978-Pres	3832	0	0	0	0.0%	0.0%	0.0%	0
1960-1977	5288	113	0	334	2.1%	0.3%	15.6%	1
1940-1959	4156	213	0	509	5.1%	1.4%	17.4%	2
Pre 1940	6915	1263	555	1970	18.3%	12.7%	25.6%	11
Midwest								
1978-Pres	8320	41	0	121	0.5%	0.1%	3.5%	1
1960-1977	5843	207	0	494	3.5%	0.8%	13.8%	2
1940-1959	4436	678	144	1212	15.3%	7.0%	30.2%	5
Pre 1940	5394	982	372	1593	18.2%	9.4%	32.3%	9
South								
1978-Pres	18626	68	0	200	0.4%	0.0%	2.6%	1
1960-1977	11723	178	0	526	1.5%	0.2%	11.2%	1
1940-1959	5575	550	134	966	9.9%	5.0%	18.6%	7
Pre 1940	3071	551	0	1399	17.9%	4.6%	50.0%	5
West								
1978-Pres	9683	103	0	306	1.1%	0.2%	6.7%	1
1960-1977	7100	100	0	297	1.4%	0.2%	10.2%	1
1940-1959	3949	107	0	316	2.7%	0.4%	16.4%	1
Pre 1940	2121	83	0	245	3.9%	0.5%	24.5%	1
Urbanization								
MSA	80101	3368	2282	4454	4.2%	3.0%	5.8%	35
Non-MSA	25932	1869	672	3066	7.2%	3.8%	13.3%	14
Child under 6 by Construction Year:								
1978-Pres	7995	0	0	0	0.0%	0.0%	0.0%	0
1960-1977	4001	97	0	288	2.4%	0.3%	15.8%	1
1940-1959	2641	137	0	330	5.2%	1.1%	20.6%	2
Pre 1940	2196	404	2	806	18.4%	7.4%	38.9%	4
No Child under 6 by Construction Year:								

Table C-3. Prevalence of Floor Dust Lead Hazards in AHHS by Selected Housing Unit (HU) Characteristics								
Characteristic	*All HUs (000)*	*No. of HUs with Floor Dust Lead Hazards (000)*			*Percent of HUs with Floor Dust Lead Hazards (%)*			**HUs in Sample**
		Estimate	*Lower 95% CI*	*Upper 95% CI*	*Estimate*	*Lower 95% CI*	*Upper 95% CI*	
1978-Pres	32465	212	0	467	0.7%	0.2%	2.1%	3
1960-1977	25953	500	0	1005	1.9%	0.7%	5.5%	4
1940-1959	15476	1411	668	2154	9.1%	5.6%	14.6%	13
Pre 1940	15306	2475	1280	3671	16.2%	10.5%	24.1%	22
Housing Unit Type and Tenure:								
Single Family	89156	5237	3621	6853	5.9%	4.3%	8.0%	49
Multi-Family	16878	0	0	0	0.0%	0.0%	0.0%	0
Owner	73627	4084	2520	5648	5.5%	3.8%	8.1%	38
Renter	32407	1153	506	1800	3.6%	2.1%	6.1%	11
Household Income:								
Income<$30k	37059	2305	1432	3178	6.2%	4.3%	8.9%	21
Income>=$30k	68975	2932	1634	4231	4.3%	2.7%	6.7%	28
Child under 6 by Household Income:								
Child under 6/Income<$30k	5781	175	0	419	3.0%	0.7%	11.4%	2
Child under 6/Income>=$30k	11052	463	45	882	4.2%	1.6%	10.3%	5
No Child under 6 by Household Income:								
No Child under 6/Income<$30k	31278	2130	1191	3068	6.8%	4.4%	10.4%	19
No Child under 6/Income>=$30k	57923	2469	1250	3688	4.3%	2.6%	7.0%	23
Government Support:								
Government Support	5871	0	0	0	0.0%	0.0%	0.0%	0
No Government Support	99522	5237	3621	6853	5.3%	3.9%	7.1%	49
Poverty:								
In Poverty	14592	923	415	1432	6.3%	3.8%	10.4%	10
Not In Poverty	91441	4314	2713	5914	4.7%	3.2%	6.8%	39
Poverty by Urbanization:								
MSA								
In Poverty	10469	720	297	1142	6.9%	3.9%	11.9%	8
Not In Poverty	69632	2649	1600	3698	3.8%	2.5%	5.6%	27
Non-MSA								
In Poverty	4124	204	0	487	4.9%	1.4%	15.7%	2
Not In Poverty	21809	1665	456	2874	7.6%	3.6%	15.3%	12
Race:								
Other Race	10134	384	6	762	3.8%	1.3%	10.6%	4
Black	13160	944	399	1488	7.2%	4.1%	12.3%	9
White	82739	3909	2457	5361	4.7%	3.2%	6.9%	36
Ethnicity:								
Hispanic	13175	348	2	694	2.6%	1.0%	7.0%	4
Non-Hispanic	92858	4889	3339	6439	5.3%	3.8%	7.2%	45

Table C-4. Prevalence of Windowsill Dust Lead Hazards in AHHS by Selected Housing Unit (HU) Characteristics								
Characteristic	***All HUs (000)***	***No. of HUs with Windowsill Dust Lead Hazards (000)***			***Percent of HUs with Windowsill Dust Lead Hazards (%)***			**HUs in Sample**
		Estimate	***Lower 95% CI***	***Upper 95% CI***	***Estimate***	***Lower 95% CI***	***Upper 95% CI***	
Total Occupied HUs	106033	11089	8610	13568	10.5%	8.4%	13.0%	106
Region:								
Northeast	20191	3365	2224	4506	16.7%	12.0%	22.7%	31
Midwest	23994	3387	1772	5003	14.1%	8.9%	21.6%	28
South	38996	3535	2244	4827	9.1%	6.4%	12.7%	39
West	22853	801	50	1553	3.5%	1.3%	9.4%	8
Construction Year:								
1978-Pres	40460	653	122	1184	1.6%	0.7%	3.7%	8
1960-1977	29955	1663	726	2601	5.6%	3.1%	9.7%	17
1940-1959	18117	3317	1997	4637	18.3%	12.8%	25.5%	32
Pre 1940	17502	5455	3514	7396	31.2%	24.4%	38.9%	49
Region by Construction Year:								
Northeast								
1978-Pres	3832	0	0	0	0.0%	0.0%	0.0%	0
1960-1977	5288	440	56	825	8.3%	3.7%	17.6%	4
1940-1959	4156	580	0	1179	13.9%	5.0%	33.2%	6
Pre 1940	6915	2345	1184	3506	33.9%	28.0%	40.4%	21
Midwest								
1978-Pres	8320	57	0	167	0.7%	0.1%	4.4%	1
1960-1977	5843	77	0	228	1.3%	0.2%	9.1%	1
1940-1959	4436	1294	465	2123	29.2%	15.5%	48.0%	10
Pre 1940	5394	1959	593	3326	36.3%	20.7%	55.5%	16
South								
1978-Pres	18626	597	77	1116	3.2%	1.3%	7.6%	7
1960-1977	11723	736	65	1406	6.3%	2.4%	15.7%	8
1940-1959	5575	1212	450	1973	21.7%	13.7%	32.7%	14
Pre 1940	3071	991	282	1701	32.3%	17.3%	52.0%	10
West								
1978-Pres	9683	0	0	0	0.0%	0.0%	0.0%	0
1960-1977	7100	410	0	919	5.8%	1.7%	17.7%	4
1940-1959	3949	232	0	573	5.9%	1.2%	24.1%	2
Pre 1940	2121	159	0	380	7.5%	2.0%	24.8%	2
Urbanization								
MSA	80101	8975	6684	11267	11.2%	8.7%	14.4%	89
Non-MSA	25932	2114	1169	3060	8.2%	5.4%	12.1%	17
Child under 6 by Construction Year:								
1978-Pres	7995	61	0	180	0.8%	0.1%	5.5%	1
1960-1977	4001	358	0	720	8.9%	3.5%	21.2%	4
1940-1959	2641	636	157	1116	24.1%	12.9%	40.5%	8
Pre 1940	2196	740	220	1261	33.7%	19.3%	52.0%	8
No Child under 6 by Construction Year:								

Table C-4. Prevalence of Windowsill Dust Lead Hazards in AHHS by Selected Housing Unit (HU) Characteristics								
Characteristic	***All HUs (000)***	***No. of HUs with Windowsill Dust Lead Hazards (000)***			***Percent of HUs with Windowsill Dust Lead Hazards (%)***			**HUs in Sample**
		Estimate	***Lower 95% CI***	***Upper 95% CI***	***Estimate***	***Lower 95% CI***	***Upper 95% CI***	
1978-Pres	32465	592	75	1110	1.8%	0.7%	4.4%	7
1960-1977	25953	1305	451	2160	5.0%	2.6%	9.6%	13
1940-1959	15476	2681	1471	3892	17.3%	11.2%	25.8%	24
Pre 1940	15306	4715	2883	6547	30.8%	23.7%	39.0%	41
Housing Unit Type and Tenure:								
Single Family	89156	10569	8290	12848	11.9%	9.7%	14.5%	102
Multi-Family	16878	520	0	1076	3.1%	1.0%	9.1%	4
Owner	73627	7204	5293	9116	9.8%	7.5%	12.6%	69
Renter	32407	3885	2292	5478	12.0%	7.8%	18.0%	37
Household Income:								
Income<$30k	37059	5891	4180	7602	15.9%	12.0%	20.8%	57
Income>=$30k	68975	5198	3165	7232	7.5%	5.2%	10.9%	49
Child under 6 by Household Income:								
Child under 6/Income<$30k	5781	584	141	1028	10.1%	4.7%	20.6%	8
Child under 6/Income>=$30k	11052	1211	574	1849	11.0%	6.7%	17.4%	13
No Child under 6 by Household Income:								
No Child under 6/Income<$30k	31278	5307	3621	6993	17.0%	12.4%	22.8%	49
No Child under 6/Income>=$30k	57923	3987	2097	5877	6.9%	4.3%	10.7%	36
Government Support:								
Government Support	5871	527	63	991	9.0%	3.4%	21.8%	6
No Government Support	99522	10562	8137	12988	10.6%	8.5%	13.2%	100
Poverty:								
In Poverty	14592	2142	1102	3182	14.7%	9.2%	22.6%	23
Not In Poverty	91441	8947	6561	11334	9.8%	7.5%	12.6%	83
Poverty by Urbanization:								
MSA								
In Poverty	10469	1922	932	2913	18.4%	11.6%	27.8%	21
Not In Poverty	69632	7053	4795	9311	10.1%	7.4%	13.8%	68
Non-MSA								
In Poverty	4124	220	0	538	5.3%	1.0%	23.2%	2
Not In Poverty	21809	1894	1123	2665	8.7%	6.1%	12.2%	15
Race:								
Other Race	10134	1121	454	1788	11.1%	6.0%	19.6%	11
Black	13160	2200	1377	3022	16.7%	11.5%	23.6%	23
White	82739	7769	5649	9889	9.4%	7.2%	12.1%	72
Ethnicity:								
Hispanic	13175	1018	366	1669	7.7%	4.1%	14.1%	12
Non-Hispanic	92858	10071	7672	12470	10.8%	8.7%	13.5%	94

Table C-5. Prevalence of Soil Lead Hazards in AHHS by Selected Housing Unit (HU) Characteristics								
Characteristic	*All HUs (000)*	*No. of HUs with Soil Lead Hazards (000)*			*Percent of HUs with Soil Lead Hazards (%)*			HUs in Sample
		Estimate	*Lower 95% CI*	*Upper 95% CI*	*Estimate*	*Lower 95% CI*	*Upper 95% CI*	
Total Occupied HUs	106033	3848	2190	5505	3.6%	2.3%	5.6%	35
Region:								
Northeast	20191	1463	268	2657	7.2%	3.1%	15.8%	13
Midwest	23994	1775	811	2739	7.4%	4.1%	12.9%	15
South	38996	240	0	583	0.6%	0.1%	2.6%	3
West	22853	370	0	894	1.6%	0.4%	6.7%	4
Construction Year:								
1978-Pres	40460	109	0	322	0.3%	0.0%	1.9%	1
1960-1977	29955	178	0	426	0.6%	0.1%	2.5%	2
1940-1959	18117	877	196	1557	4.8%	2.3%	10.0%	8
Pre 1940	17502	2685	1405	3964	15.3%	9.8%	23.2%	24
Region by Construction Year:								
Northeast								
1978-Pres	3832	109	0	322	2.8%	0.4%	16.7%	1
1960-1977	5288	0	0	0	0.0%	0.0%	0.0%	0
1940-1959	4156	188	0	556	4.5%	0.7%	23.6%	2
Pre 1940	6915	1166	79	2253	16.9%	7.3%	34.4%	10
Midwest								
1978-Pres	8320	0	0	0	0.0%	0.0%	0.0%	0
1960-1977	5843	97	0	288	1.7%	0.2%	12.3%	1
1940-1959	4436	471	0	945	10.6%	3.9%	25.6%	4
Pre 1940	5394	1206	609	1803	22.4%	12.6%	36.6%	10
South								
1978-Pres	18626	0	0	0	0.0%	0.0%	0.0%	0
1960-1977	11723	81	0	239	0.7%	0.1%	5.0%	1
1940-1959	5575	68	0	201	1.2%	0.2%	7.3%	1
Pre 1940	3071	92	0	271	3.0%	0.4%	20.2%	1
West								
1978-Pres	9683	0	0	0	0.0%	0.0%	0.0%	0
1960-1977	7100	0	0	0	0.0%	0.0%	0.0%	0
1940-1959	3949	149	0	442	3.8%	0.5%	23.9%	1
Pre 1940	2121	221	0	482	10.4%	3.7%	26.0%	3
Urbanization								
MSA	80101	3149	1687	4611	3.9%	2.5%	6.2%	29
Non-MSA	25932	699	0	1478	2.7%	0.8%	8.5%	6
Child under 6 by Construction Year:								
1978-Pres	7995	109	0	322	1.4%	0.2%	9.2%	1
1960-1977	4001	178	0	426	4.4%	1.1%	16.5%	2
1940-1959	2641	261	0	560	9.9%	3.3%	26.1%	3
Pre 1940	2196	494	0	1036	22.5%	8.4%	47.9%	5
No Child under 6 by Construction Year:								

Table C-5. Prevalence of Soil Lead Hazards in AHHS by Selected Housing Unit (HU) Characteristics								
Characteristic	***All HUs (000)***	***No. of HUs with Soil Lead Hazards (000)***			***Percent of HUs with Soil Lead Hazards (%)***			**HUs in Sample**
		Estimate	***Lower 95% CI***	***Upper 95% CI***	***Estimate***	***Lower 95% CI***	***Upper 95% CI***	
1978-Pres	32465	0	0	0	0.0%	0.0%	0.0%	0
1960-1977	25953	0	0	0	0.0%	0.0%	0.0%	0
1940-1959	15476	615	62	1168	4.0%	1.6%	9.4%	5
Pre 1940	15306	2191	1191	3191	14.3%	9.1%	21.9%	19
Housing Unit Type and Tenure:								
Single Family	89156	3726	2086	5366	4.2%	2.7%	6.5%	34
Multi-Family	16878	121	0	359	0.7%	0.1%	5.2%	1
Owner	73627	2553	1191	3916	3.5%	2.0%	5.9%	22
Renter	32407	1294	667	1922	4.0%	2.4%	6.5%	13
Household Income:								
Income<$30k	37059	927	231	1624	2.5%	1.1%	5.4%	9
Income>=$30k	68975	2920	1666	4174	4.2%	2.7%	6.5%	26
Child under 6 by Household Income:								
Child under 6/Income<$30k	5781	97	0	288	1.7%	0.2%	11.1%	1
Child under 6/Income>=$30k	11052	945	268	1621	8.5%	4.1%	16.8%	10
No Child under 6 by Household Income:								
No Child under 6/Income<$30k	31278	830	161	1500	2.7%	1.2%	6.0%	8
No Child under 6/Income>=$30k	57923	1976	1069	2882	3.4%	2.1%	5.4%	16
Government Support:								
Government Support	5871	0	0	0	0.0%	0.0%	0.0%	0
No Government Support	99522	3848	2190	5505	3.9%	2.5%	6.0%	35
Poverty:								
In Poverty	14592	352	3	701	2.4%	0.9%	6.5%	4
Not In Poverty	91441	3496	1922	5069	3.8%	2.4%	6.0%	31
Poverty by Urbanization:								
MSA								
In Poverty	10469	255	0	547	2.4%	0.8%	7.6%	3
Not In Poverty	69632	2894	1461	4327	4.2%	2.5%	6.8%	26
Non-MSA								
In Poverty	4124	97	0	288	2.4%	0.3%	15.6%	1
Not In Poverty	21809	602	0	1252	2.8%	0.8%	8.7%	5
Race:								
Other Race	10134	463	0	1038	4.6%	1.3%	14.9%	4
Black	13160	566	57	1074	4.3%	1.7%	10.2%	5
White	82739	2820	1439	4200	3.4%	2.1%	5.6%	26
Ethnicity:								
Hispanic	13175	463	0	1038	3.5%	0.9%	12.4%	4
Non-Hispanic	92858	3385	1834	4936	3.6%	2.3%	5.8%	31