American Healthy Homes Survey II Lead Findings

FINAL REPORT

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ABSTRACT

The American Healthy Homes Survey II (AHHS II), conducted from March 2018 through June 2019, measured levels of lead, lead-based paint (LBP) hazards, pesticides, formaldehyde and mold in homes nationwide. This report includes estimates of the prevalence and levels of lead in paint, 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. The report provides a comparison with the findings on the prevalence of lead-based paint and lead-based paint hazards from the first AHHS, conducted in 2005-2006, as well as selected comparisons to the National Survey of Lead and Allergens in Housing (NSLAH), conducted in 1998-1999.

Based on the survey results, it is estimated that 34.6 million homes (29.4%) have LBP somewhere in the building, of which 22.3 million (18.9% of all homes) have one or more significant lead-based paint hazards, using the definition of lead dust hazards applicable to AHHS.[1] Of homes with lead-based paint, 30.9 million (89%) 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 2.6 million homes with children less than 6 years of age have one or more LBP hazards; this includes 1.6 million low income households (< $35,000/yr). Low income households had a statistically significantly higher prevalence of LBP hazards (23.9%) than higher income households (15.8%). Households receiving Government housing assistance had a statistically significantly lower prevalence of LBP hazards (11.1%) compared to those not receiving support (19.9%). There were significant reductions in dust lead loadings on windowsills and in soil lead levels from the first AHHS to AHHS II.

When the new definition of dust lead hazards is employed, the number of homes with significant LBP hazards increases to 29.0 million (24.6% of homes), i.e., by almost 7 million homes compared to the old dust standard. The number of homes with children under age 6 with LBP hazards increases to 3.3 million, including 2.1 million low income households.

[1] A floor dust lead level equal to 40 μg/ft^2 or greater, or a windowsill dust lead level equal to 250 μg/ft^2 or greater. New, lower, thresholds for lead in dust were effective January 6, 2020, i.e., a floor dust lead level equal to 10 μg/ft^2 or greater, or a windowsill dust lead level equal to 100 μg/ft^2 or greater.

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EXECUTIVE SUMMARY

The second American Healthy Homes Survey (AHHS II) was conducted from March 2018 through June 2019 to update the first AHHS, conducted 13 years earlier in 2005-2006, and the National Survey of Lead and Allergens in Housing (NSLAH), which was conducted 7 years before that, in 1998-1999. AHHS II measured levels of lead and lead hazards, in homes nationwide, as did AHHS and NSLAH. AHHS II also collected data on other potentially harmful substances such as pesticides, mold, formaldehyde and lead in water, and on potential hazards in homes such as slips and falls, electrical hazards, high water temperatures, etc. The present report includes estimates of the levels of lead in paint, 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 AHHS II was designed to ensure a high degree of comparability to AHHS for lead, comparisons of AHHS II and AHHS lead estimates are provided in most cases. Selected comparisons to NSLAH are also included. Results from the analyses of pesticides, mold, formaldehyde and lead in water, and on potential home hazards, will be presented in other reports and papers.

AHHS II FINDINGS

Lead-Based Paint (LBP) in Housing

AHHS II estimates that 34.6 million homes (29.4% of 117.8 million total housing units) have LBP somewhere in the building, down from the AHHS estimate of 37.1 million (34.9% of 106.0 million total housing units in 2005) and the NSLAH estimate of 37.9 million (40% of 95.7 million total housing units in 1998), see Table ES-1[2] and Figure ES-1. The estimated decrease of 3.3 million homes with LBP from NSLAH to AHHS II is not statistically significant. On the other hand, the decrease in percent of homes from NSLAH to AHHS and from AHHS to AHHS II (and, *a fortiori*, from NSLAH to AHHS II) are statistically significant, primarily because of the large number of homes built since lead-based paint was banned for residential use in 1978. Of homes built before 1978, 30.9 million (51.6%) have LBP, compared to 34.4 million (52.4%) in AHHS and 35.9 million (54%) in NSLAH, a decrease of 5 million in 20 years (though not statistically significant).

The prevalence of LBP increases with the age of the housing, reaching 85.4% for homes built before 1940 (Figure ES-3). Because it is older, a statistically significantly higher percentage of the housing stock in the Northeast and Midwest has LBP compared to the South and West. Of 15.0 million homes with children under the age of 6, 4.3 million (28.5%) have LBP, about the same prevalence of LBP as in all homes (Figure ES-4). Single-family dwellings have significantly higher prevalence of LBP (31.3%) than multifamily dwellings (21.2%). Homes receiving Government support have significantly lower prevalence of LBP than those not receiving Government support. No significant differences in LBP prevalence were found by tenure, urbanization, income, poverty status, or ethnicity. In AHHS, African American and Other Race households had significantly more LBP than White households but in AHHS II they had less LBP, although the differences were not significant. The changes are due to a significant

[2] Statistically significant changes from NSLAH to AHHS or from AHHS to AHHS II are highlighted in this and all subsequent tables in the report.

decrease in LBP prevalence in African American and Other Race households in the 13 years between the two surveys, while LBP prevalence in White households was essentially unchanged.

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[3], or has dust lead levels above the Federal threshold for floors or windowsills[4], or has bare soil lead levels above Federal thresholds[5,6]. Under the old dust hazard standard of 40 μg/ft^2 for floors and 250 μg/ft^2 for windowsills, AHHS II estimates that 22.3 million homes (18.9%) have LBP hazards, down from 23.2 million homes (21.9%) in AHHS and 24.0 million (25%) in NSLAH, see Table ES-2 and Figure ES-2. Thus, the number of homes with significant LBP hazards is estimated to have decreased by 1.7 million in the twenty years between NSLAH and AHHS II, although the decrease is not statistically significant. The decrease from 25% in NSLAH to 18.9% in AHHS II is significant, but only because of the 22.1 million homes built since 1998. Under the new standard of 10 μg/ft^2 for floors and 100 μg/ft^2 for windowsills, 29.0 million (24.6%) have lead hazards, compared to 30.2 million (28.5%) in AHHS (estimates under the new dust standards are not available for NSLAH). The change in dust hazard standards therefore increases the number of homes with significant LBP hazards by 6.7 million, from 22.3 to 29.0 million.

As in NSLAH and AHHS, older homes have more LBP hazards (68.8% (old dust standard) and 78.0% (new standard) of homes built before 1940), as do homes in the Northeast and Midwest compared to the South and West (Figures ES-5 through ES-8). The differences between the Northeast and Midwest and the South are significant under both dust standards. Of an estimated 15.0 million households with children under the age of 6, 2.6 million (17.4%) have LBP hazards under the old dust standard and 3.3 million (22.1% under the new; of 5.4 million households earning less than $35,000 per year with children under age 6, 1.6 million (29.7%) have LBP

[3] 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 Code of Federal Regulations (CFR) Part 35), and is the same definition used in NSLAH and AHHS.

[4] At the time AHHS II was conducted, the thresholds were 40 μg/ft^2 for floors and 250 μg/ft^2 for windowsills. New, lower thresholds of 10 μg/ft^2 for floors and 100 μg/ft^2 for windowsills were effective January 6, 2020. Prevalence of LBP hazards is presented for both thresholds for AHHS and AHHS II; prevalence for the new thresholds is not available for NSLAH.

[5] 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.

[6] The hazard standards for lead in dust and soil used in this report were promulgated by the U.S. under sections 401 and 402 of the Toxic Substances Control Act (TSCA), which were created by the Residential Lead-Based Paint Hazard Reduction Act of 1992 (also referred to as Title X). Although Title X defines these hazards as "lead-based paint hazards", this should not be interpreted to mean that lead-based paint is the only source of lead in these media. For example, an important source of lead in the environment is from the past use of lead in gasoline, which peaked in the early 1970's (*The Rise and Fall of Leaded Gasoline.* J.O. Nriagu. Sci. Total Env. 92 1-28 *at* 16, 1990. https://doi.org/10.1016/0048-9697(90)90318-O). On the general point, EPA has noted that,

> "Lead-based paint hazards … are not limited to the hazards from paint, alone, because they include conditions that cause exposure to residential lead-contaminated dust and soil, regardless of the source of lead." (EPA. Lead; Identification of Dangerous Levels of Lead; Proposed Rule. 63 FR 30302 *at* 30303. June 3, 1998. https://www.federalregister.gov/d/98-14736.)

hazards under the old dust standard and 2.1 million (39.5%) under the new. Overall, homes with children do not differ from all homes in their likelihood of having LBP hazards, but those with lower incomes do have higher prevalence of LBP hazards. In general, lower income households were significantly more likely to have LBP hazards (23.9%[7]/30.8%[8]) than more affluent households (15.8%/20.6%), as were single-family households (21.4%/27.3%) compared to multifamily households (8.4%/13.1%), and households not receiving Government support (19.9%/25.2%) compared to those receiving Government support (11.1%/21.0%). No significant difference in incidence of LBP hazards was found by tenure, urbanization, race or ethnicity.

By type of LBP hazard, AHHS II found 18.2 million homes (15.4%) with significantly deteriorated LBP, 10.6 million (9.0%) with dust lead hazards under the old standard and 21.9 million (18.6%) under the new, and 2.4 million with soil lead hazards (2.0%), see Table ES-3. By comparison, AHHS found 15.3 million homes (14.5%) with significantly deteriorated LBP, 13.7 million with dust lead hazards (13.0%) under the old standard and 24.6 million under the new, and 3.8 million with soil lead hazards (3.6%). 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 (old standard) and 6.5 million (7%) with soil lead hazards. Thus, the modest drop in the total number of homes with LBP hazards (0.9[9]/1.2[10] million) from AHHS to AHHS II is composed of larger drops in homes with lead dust hazards (3.1/2.8 million) and soil lead hazards (1.5 million), offset by an increase in homes with significantly deteriorated LBP (2.9 million). This pattern is even stronger when comparing AHHS II to NSLAH (old dust standard only): 1.7 million decrease in homes with significant LBP hazards overall composed of a 4.9 million drop in dust hazards, a 4.1 million drop in soil hazards and a 4.6 million increase in significantly deteriorated LBP. This suggests that, while the overall number of homes with LBP hazards has decreased only modestly in 20 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 have declined in the past 20 years.

Table ES-4 shows the prevalence of significant LBP hazards in housing in AHHS II, AHHS and NSLAH (under both dust standards for AHHS and AHHS II), by income, presence of a child under age 6 and race. The only significant changes between AHHS and AHHS II noted are that the percent of African American households with significant LBP hazards is lower in AHHS II than in AHHS, as are the number and percent of higher income households with a child under 6 with significant LBP hazards.

Similarities and Differences between AHHS and AHHS II Lead Estimates

As previously discussed, the AHHS II results indicate modest progress in the 13 years since AHHS and indeed in the 20 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 all three

[7] Old dust standard.
[8] New dust standard.
[9] Old dust standard.
[10] New dust standard.

surveys. Certain demographic and socioeconomic variables also exhibit similar general patterns in all three surveys. With respect to the likelihood of having LBP and/or LBP hazards in all three surveys[11]:

- 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.

To some degree, all of these persistent patterns in the 20-year period covering the three surveys are correlated with income, although not always in the same direction. Lower income families are more likely to receive Government support of their housing and/or to live in multifamily housing, which is usually professionally managed. To the extent that they do, lower income families ae less likely to have LBP or LBP hazards in their homes. Absent Government support or multifamily housing, however, lower income homes are more likely to have LBP/LBP hazards than higher income homes, probably because they have less money available for repairs and maintenance.

An important change from NSLAH and AHHS was noted for African American homes. In NSLAH and AHHS, they were found to have more LBP/LBP hazards than White homes. That pattern was reversed in AHHS II: White homes had more LBP and LBP hazards than African American homes. The difference was statistically significant for LBP hazards under both dust standards. The change was due to a statistically significant drop in the percent of African American homes with LBP hazards from AHHS to AHHS II, while the percent for White households was essentially unchanged.

Other significant differences between AHHS and AHHS II are listed in Tables ES-5 and ES-6, showing differences between the two surveys' estimates for prevalence of LBP and LBP hazards, respectively, that are statistically significant at the 5% level ($p = 0.05$).

In every instance, there is a decrease from AHHS to AHHS II, indicating a general downward trend in number and percent of units with LBP or significant LBP hazards in the 13 years between AHHS and AHHS II. By contrast, when NSLAH and AHHS were similarly compared, some characteristics showed increases in LBP or LBP hazards in the 7 years between the surveys. Perhaps the longer interval between AHHS and AHHS II allows the true underlying trends to appear. It is also possible that some of the increases from NSLAH to AHHS were cases of spurious statistical significance, some of which are very likely to occur when a large number of significance tests are conducted.

It is important to remember that the greatly increased number of post-1977 housing units in AHHS II compared to AHHS inevitably contributes to a decreased percent of units with LBP or LBP hazards for all housing characteristics, because LBP or LBP hazards are very uncommon in

[11] 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 all three surveys, and the difference is statistically significant for both LBP and LBP hazards in AHHS II under the old dust standard. For example, a higher percentage of single family homes than multifamily homes had LBP and significant LBP hazards in NSLAH, AHHS and AHHS II. The difference was statistically significant for both LBP and LBP hazards in AHHS (actually under both dust standards).

post-1977 housing. Characteristics for which the percent decrease in LBP or significant LBP hazards remains significant for pre-1978 units are denoted by an asterisk in Tables ES-5 and ES-6. For LBP, these characteristics are Poverty, Renter-Occupied, African American and Other Race. For significant LBP hazards, they are African American (new dust standard) and Poverty (old dust standard). The decreases for these characteristics likely reflect the effect of lead hazard control programs at the Federal, State and local levels directed towards poor and minority communities.

Statistically significant decreases in the number of units with LBP hazards remain significant for pre-1978 units because there are slightly more post-1977 units with LBP hazards in AHHS II than AHHS. The significant decreases in the number and percent of units with interior LBP hazards only are puzzling because they are offset by increases in the number and percent of units with both interior and exterior LBP hazards. The cause may be increasing deterioration of exterior paint over time.

AHHS DESIGN AND OPERATIONS

The target population for NSLAH, AHHS and AHHS II 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 AHHS II, 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 117.5 million homes.

To maximize comparability with AHHS data, AHHS II was conducted in a subsample of the 100 Primary Sampling Units **(PSUs)** in which AHHS was conducted. The AHHS PSUs consisted of Metropolitan Statistical Areas (**MSAs**), a single county, or groups of contiguous counties. The 16 certainty[12] PSUs in AHHS were included in AHHS II, as well as a stratified random subsample of 62 of the 84 non-certainty PSUs, for a total subsample of 78 of the 100 AHHS PSUs. All but one of the 38 states in the AHHS sample were also represented in AHHS II, the exception being Colorado.

The AHHS II sample consisted of longitudinal and Address-Based (ABS) components. The longitudinal component comprised all 504 homes sampled in AHHS (in the 78 PSUs selected for AHHS II) that were built prior to 1978, when lead-based paint was banned for residential use. This was done to increase the representation of pre-1978 homes in the sample in order to improve estimates of LBP and LBP hazards. Without the inclusion of a sample of homes known to be built before 1978, it was estimated that approximately half the AHHS II sample would consist of homes built 1978 or later, compared to 42% in AHHS. The reduced representation of pre-78 homes, combined with the lower target sample size (800 homes compared to 1,131 in AHHS), would in that case greatly reduce the precision of estimates of LBP and LBP hazards.

The ABS sample was selected from segments, drawn from each PSU with probability proportional to the number of occupied housing units in the 2010 Census. A segment typically consisted of several city blocks, although it could be much larger in rural areas. The number of

[12] The largest PSUs, such as Los Angeles County or Brooklyn NY, were selected with certainty in AHHS.

segments in a PSU for the ABS sample was 6 in Los Angeles County, 5 in the next 11 largest PSUs and 4 in all others. Six homes were randomly selected in each segment for the ABS sample. Ultimately, a sample of 2,315 housing units was drawn from which 703 eligible homes were recruited and completed the survey. The principal reasons 70% of sampled homes did not complete the survey were ineligibility (7%), inability to contact a resident (23%) and refusal (33%).

Field operations began in late March 2018 and were completed in June 2019. 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 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 $1 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 encourage 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 in *SurveyToGo* software. The interviewer retrieved a water sample collected by the resident the day before the interview and collected the resident's vacuum cleaner bag. The interviewer also collected vacuum and wipe dust (fungal) samples for mold analysis. The vacuum samples were taken from the floor of the home; the wipe samples were taken from surfaces not commonly cleaned (such as the top of a bookcase) using an electrostatic cleaning cloth. The interviewer then conducted a walkthrough of the home to check for potential hazards such as missing or non-working smoke detectors, high hot water temperatures, slip/fall hazards, etc. Concurrently with the interviewer's activities, the Risk Assessor conducted lead testing in paint using a portable X-Ray Fluorescence (XRF) instrument, collected an air sample for formaldehyde, collected dust wipe floor samples for pesticides and lead, and took soil samples in the yard for lead. 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 uploaded from the XRF to the QuanTech server. The questionnaire data was automatically uploaded to the software vendor, where QuanTech staff had access to it once the tablet established a WiFi connection. When work in a PSU was completed, the Tablet PC and all paper forms were returned to QuanTech. The XRF instruments were returned to the manufacturer for servicing between PSUs. The manufacturer downloaded all data from the instruments to provide a second 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, formaldehyde samples and vacuum and wipe dust (fungal) samples were kept frozen in the interviewer's hotel room freezer or in portable freezers provided to the field team. Other samples were not frozen. At the end of activities in the PSU, dust and soil samples were shipped to QuanTech's offices for inventory, data entry and transmittal to an analysis laboratory. The pesticide and fungal samples were shipped frozen overnight to a laboratory designated by the Environmental Protection Agency (EPA). The water samples were also shipped to EPA. The formaldehyde samples were shipped frozen to the provider of the air sampling equipment for analysis.

Table ES-1. Comparison of Prevalence of Lead-Based Paint (LBP) by Selected Housing Unit (HU) Characteristics between NSLAH, AHHS and AHHS II

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
	117,751	34,598	29,914	39,283	29.4%	25.4%	33.4%	703
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
	20,993	9,273	6,601	11,945	44.2%	30.9%	57.4%	139
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
	26,699	9,514	6,715	12,313	35.6%	28.3%	43.0%	161
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
	43,640	9,561	7,379	11,743	21.9%	16.5%	27.4%	240
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
	26,420	6,250	4,764	7,736	23.7%	16.3%	31.1%	163
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
1978-2017	57,919	3,744	1,670	5,818	6.5%	3.0%	9.9%	224
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
	25,599	6,045	4,375	7,714	23.6%	18.3%	28.9%	225
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
	18,178	11,098	8,695	13,501	61.0%	51.7%	70.4%	154
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
	16,055	13,712	10,459	16,965	85.4%	77.4%	93.4%	100

[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. Comparison of Prevalence of Significant Lead-Based Paint (LBP) Hazards, by Selected Housing (HU) Characteristics between NSLAH, AHHS and AHHS II and Old (not bold)[a] and New (BOLD)[b] Dust Hazard Action Levels

Characteristic	*All HUs (000)*	*No. of HUs[c] with Significant LBP Hazards (000)*			*Percent[d] of HUs[e] with Significant LBP Hazards (%)*			HUs in Sample
		Estimate	*Lower 95% CI[e]*	*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
	106,033	**30,222**	**25,606**	**34,837**	**28.5%**	**24.7%**	**32.3%**	**1,131**
	117,751	22,308	17,670	26,946	18.9%	14.9%	23.0%	703
	117,751	**28,973**	**23,992**	**33,955**	**24.6%**	**20.0%**	**29.2%**	**703**
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
	20,190	**8,703**	**6,446**	**10,961**	**43.1%**	**32.2%**	**54.0%**	**196**
	20,993	5,904	3,218	8,590	28.1%	15.3%	40.9%	139
	20,993	**8,020**	**5,519**	**10,522**	**38.2%**	**25.2%**	**51.2%**	**139**
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
	23,994	**7,798**	**5,508**	**10,088**	**32.5%**	**25.5%**	**39.4%**	**245**
	26,699	6,760	4,594	8,927	25.3%	17.7%	33.0%	161
	26,699	**8,014**	**5,753**	**10,276**	**30.0%**	**21.5%**	**38.6%**	**161**
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
	38,996	**9,174**	**6,214**	**12,134**	**23.5%**	**16.9%**	**30.2%**	**440**
	43,640	5,747	3,070	8,423	13.2%	6.8%	19.5%	240
	43,640	**7,470**	**4,241**	**10,698**	**17.1%**	**9.4%**	**24.9%**	**240**
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
	22,853	**4,546**	**3,062**	**6,030**	**19.9%**	**13.8%**	**26.0%**	**250**
	26,420	3,897	2,336	5,458	14.8%	8.0%	21.5%	163
	26,420	**5,469**	**3,732**	**7,206**	**20.7%**	**12.6%**	**28.8%**	**163**
Construction Year:								
HUs built 1978-2005	29,774	1,042	169	1,915	3%	1%	6%	220
HUs built 1978-2005	40,458	1,083	453	1,713	2.7%	1.1%	4.3%	476
	40,458	**3,126**	**2,185**	**4,068**	**7.7%**	**5.6%**	**9.8%**	**476**
HUs built 1978-2017	57,919	1,645	142	3,147	2.8%	0.3%	5.4%	224
	57,919	**2,738**	**779**	**4,696**	**4.7%**	**1.4%**	**8.1%**	**224**
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
	29,956	**5,842**	**3,985**	**7,699**	**19.5%**	**13.7%**	**25.3%**	**306**
	25,599	2,513	1,472	3,554	9.8%	5.6%	14.1%	225
	25,599	**4,405**	**3,058**	**5,751**	**17.2%**	**11.8%**	**22.6%**	**225**
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
	18,117	**8,431**	**6,004**	**10,858**	**46.5%**	**38.0%**	**55.1%**	**187**
	18,178	7,098	5,183	9,014	39.0%	30.4%	47.7%	154
	18,178	**9,303**	**6,888**	**11,718**	**51.2%**	**40.1%**	**62.2%**	**154**
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
	17,503	**12,822**	**9,296**	**16,348**	**73.3%**	**65.5%**	**81.0%**	**162**
	16,055	11,052	7,712	14,392	68.8%	57.8%	79.8%	100
	16,055	**12,527**	**9,046**	**16,009**	**78.0%**	**68.7%**	**87.3%**	**100**

[a]Old dust hazard action level is at least 40 µg/ft^2 for floors and at least 250 µg/ft^2 for windowsills.
[b]New dust hazard action level is at least 10 µg/ft^2 for floors and at least 100 µg/ft^2 for windowsills.
[c] "HUs" include permanently occupied, noninstitutional housing units in which children are permitted to live.
[d] All percentages are calculated with total housing units (95,688) (106,033) (117,751) as the denominator. Percentages may not total 100% due to rounding.
[e] CI = confidence interval for the estimated number or percent

Table ES-3. Comparison of Prevalence of Significant Lead-Based Paint (LBP) Hazards in Housing Units by Type of Hazard between NSLAH, AHHS and AHHS II and Old (not bold)[a] and New (BOLD)[b] Dust Hazard Action Levels

HUD Lead Safe Housing Rule: Significant LBP Hazards						
Type of Hazard	*Number of HUs[c] (000)*			*Percent of HUs[d] (%)*		
	Estimate	*Lower 95% CI[e]*	*Upper 95% CI*	*Estimate*	*Lower 95% CI*	*Upper 95% CI*
Significantly Deteriorated Lead Based Paint						
All HUs	13,634	10,928	16,341	14%	11%	17%
	15,331	12,784	17,879	14.5%	12.1%	16.8%
	18,191	13,428	22,953	15.4%	11.4%	19.5%
Interior Lead Dust						
All HUs	15,468	12,982	17,954	16%	14%	19%
	13,740	11,776	15,704	13.0%	11.2%	14.8%
	24,642	**20,513**	**28,771**	**23.2%**	**19.7%**	**26.8%**
	10,644	7,704	13,584	9.0%	6.4%	11.6%
	21,862	**17,814**	**25,911**	**18.6%**	**14.7%**	**22.4%**
Soil Lead Hazard						
All HUs	6,460	3,122	9,799	7%	3%	10%
	3,848	2,235	5,461	3.6%	2.1%	5.2%
	2,350	743	3,956	2.0%	0.6%	3.4%
Any LBP Hazard						
All HUs	24,026	21,306	26,746	25%	22%	28%
	23,186	20,532	25,840	21.9%	19.4%	24.3%
	30,222	**25,606**	**34,837**	**28.5%**	**24.7%**	**32.3%**
	22,308	17,670	26,946	18.9%	14.9%	23.0%
	28,973	**23,992**	**33,955**	**24.6%**	**20.0%**	**29.2%**

[a]Old dust hazard action level is at least 40 µg/ft^2 for floors and at least 250 µg/ft^2 for windowsills.
[b]New dust hazard action level is at least 10 µg/ft^2 for floors and at least 100 µg/ft^2 for windowsills.
[c]"Housing units": permanently occupied, noninstitutional housing units in which children are permitted to live.
[d]Estimated percentages are calculated with total HUs (95,688) (106,033) (117,751), as the denominator.
[e]CI = confidence interval for the estimated number or percent.

Table ES-4. Prevalence of Significant Lead-Based Paint (LBP) Hazards in Housing Units by Income, Presence of Children Under Age 6 and Race in NSLAH, AHHS and AHHS II for Old[a] (not bold) **and New[b] (BOLD) Dust Hazard Standards.**

HU Characteristic	*All HUs (000)*	*Number of HUs (000)*			*Percentage of HUs*			*HUs in Sample*
		Estimate	*Lower 95% CI[f]*	*Upper 95% CI*	*Estimate*	*Lower 95% CI*	*Upper 95% CI*	
Household Income:								
Less than $30,000/year	33,830	12,007	9,336	14,679	35%	28%	43%	309
Less than $30,000/year	37,059	10,635	8,827	12,443	28.7%	24.2%	33.2%	401
	37,059	**12,799**	**10,252**	**15,346**	**34.5%**	**28.8%**	**40.2%**	**401**
Less than $35,000/year	45,994	11,004	7,715	14,294	23.9%	17.1%	30.8%	308
	45,994	**14,175**	**10,163**	**18,187**	**30.8%**	**22.5%**	**39.1%**	**308**
$30,000/year or more	56,111	10,464	8,250	12,678	19%	15%	23%	482
$30,000/year or more	68,975	12,551	10,027	15,075	18.2%	14.7%	21.7%	730
	68,975	**17,422**	**13,983**	**20,862**	**25.3%**	**20.8%**	**29.7%**	**730**
$35,000/year or more	71,757	11,304	8,138	14,470	15.8%	11.6%	19.9%	395
	71,757	**14,798**	**11,534**	**18,063**	**20.6%**	**16.0%**	**25.2%**	**395**
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
	16,833	**4,409**	**2,711**	**6,107**	**26.2%**	**16.9%**	**35.4%**	**207**
	14,979	2,610	1,257	3,962	17.4%	9.2%	25.7%	108
	14,979	**3,317**	**1,800**	**4,835**	**22.1%**	**13.4%**	**30.9%**	**108**
Less than $30,000/year	4,791	1,201	600	1,801	25%	13%	38%	61
Less than $30,000/year	5,781	1,138	510	1,765	19.7%	8.8%	30.6%	74
	5,781	**1,565**	**820**	**2,310**	**27.1%**	**14.6%**	**39.5%**	**74**
Less than $35,000/year	5,365	1,592	404	2,780	29.7%	12.5%	46.8%	47
	5,365	**2,119**	**784**	**3,453**	**39.5%**	**22.0%**	**57.0%**	**47**
$30,000/year or more	11,236	2,860	1,763	3,957	25%	16%	35%	117
$30,000/year or more	11,052	2,447	1,330	3,564	22.1%	12.6%	31.7%	133
	11,052	**2,844**	**1,487**	**4,201**	**25.7%**	**15.1%**	**36.4%**	**133**
$35,000/year or more	9,614	1,018	238	1,798	10.6%	3.0%	18.1%	61
	9,614	**1,199**	**458**	**1,940**	**12.5%**	**5.3%**	**19.7%**	**61**
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
	82,739	**21,355**	**17,402**	**25,309**	**25.8%**	**21.7%**	**29.9%**	**868**
	89,252	18,238	14,341	22,136	20.4%	15.8%	25.0%	502
	89,252	**22,819**	**18,521**	**27,116**	**25.6%**	**20.3%**	**30.8%**	**502**
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
	13,161	**5,528**	**3,843**	**7,213**	**42.0%**	**32.4%**	**51.6%**	**151**
	17,179	2,318	485	4,151	13.5%	4.0%	22.9%	126
	17,179	**3,714**	**1,561**	**5,868**	**21.6%**	**11.2%**	**32.1%**	**126**
Other[g]	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
	10,134	**3,339**	**2,326**	**4,351**	**32.9%**	**25.2%**	**40.7%**	**112**
	11,321	1,752	427	3,077	15.5%	4.6%	26.3%	75
	11,321	**2,440**	**957**	**3,923**	**21.6%**	**8.9%**	**34.2%**	**75**

[a] Old dust hazard action level is at least 40 µg/ft^2 for floors and at least 250 µg/ft^2 for windowsills.
[b] New dust hazard action level is at least 10 µg/ft^2 for floors and at least 100 µg/ft^2 for windowsills.
[c] Significant LBP hazard as defined in text and HUD Lead Safe Housing Rule.
[d] Estimated percentages are calculated with the "All HUs" column in each row used as the denominator.
[e] "Housing units" include permanently occupied, noninstitutional housing units in which children are permitted to live.
[f] CI = confidence interval for the estimated number or percent.
[g] "Other" includes Asian, American Indian/Alaskan Native, Native Hawaiian/other Pacific Islander, and more than one race.

Table ES-5. Statistically Significant Differences in Estimates of LBP Prevalence (p=0.05) between AHHS and AHHS II		
Estimate (Housing Units with LBP)	**AHHS**	**AHHS II**
Percent of Housing Units (Nationwide)	34.9%	29.4%
Percent of Housing Units with Government Support	26.0%	12.2%
Percent of Single-Family Homes	37.4%	31.3%
Percent of Homes in Poverty*	39.8%	22.3%
Percent of Renter-Occupied Units*	38.7%	28.1%
Percent of African American Households*	45.3%	25.2%
Percent of Households of Mixed or Other Race*	49.3%	24.8%
Percent of Housing Units with Exterior LBP only	9.2%	6.6%
Percent of Non-MSA Households	33.2%	21.9%
*Difference in percent remains statistically significant for pre-1978 units.		

Table ES-6. Statistically Significant Differences in Estimates of Prevalence of Significant LBP Hazards (p=0.05) between AHHS and AHHS II		
Estimate (Housing Units with LBP Hazards)	**AHHS**	**AHHS II**
Percent of Rented Units (old dust standard)	25.2%	16.8%
Percent of Higher Income Units with Children Under Age 6 (new dust standard)*	25.7%	12.5%
Percent of African American Units (old dust standard)	28.3%	13.5%
Percent of African American Units (new dust standard)*	42.0%	21.6%
Percent of Units in Poverty (old dust standard)*	30.2%	15.9%
Percent of Units in Poverty (new dust standard)	36.1%	23.6%
Number of Higher Income Units with Children Under Age 6 (000) (old dust standard)	2,447	1,018
Number of Higher Income Units with Children Under Age 6 (000) (new dust standard)	2,844	1,199
Percent of Units with Dust Lead Hazards (old dust standard)	13.0%	9.0%
Percent of Units in Poverty with Dust Lead Hazards (old dust standard)	18.6%	8.4%
Percent of Units with Interior LBP Hazards only (old dust standard)	9.1%	5.8%
Number of Units (000) with Interior LBP Hazards only (old dust standard)	9,661	6,794
Percent of Units with Interior LBP Hazards only (new dust standard)	15.7%	11.4%
*Difference in percent remains statistically significant for pre-1978 units.		

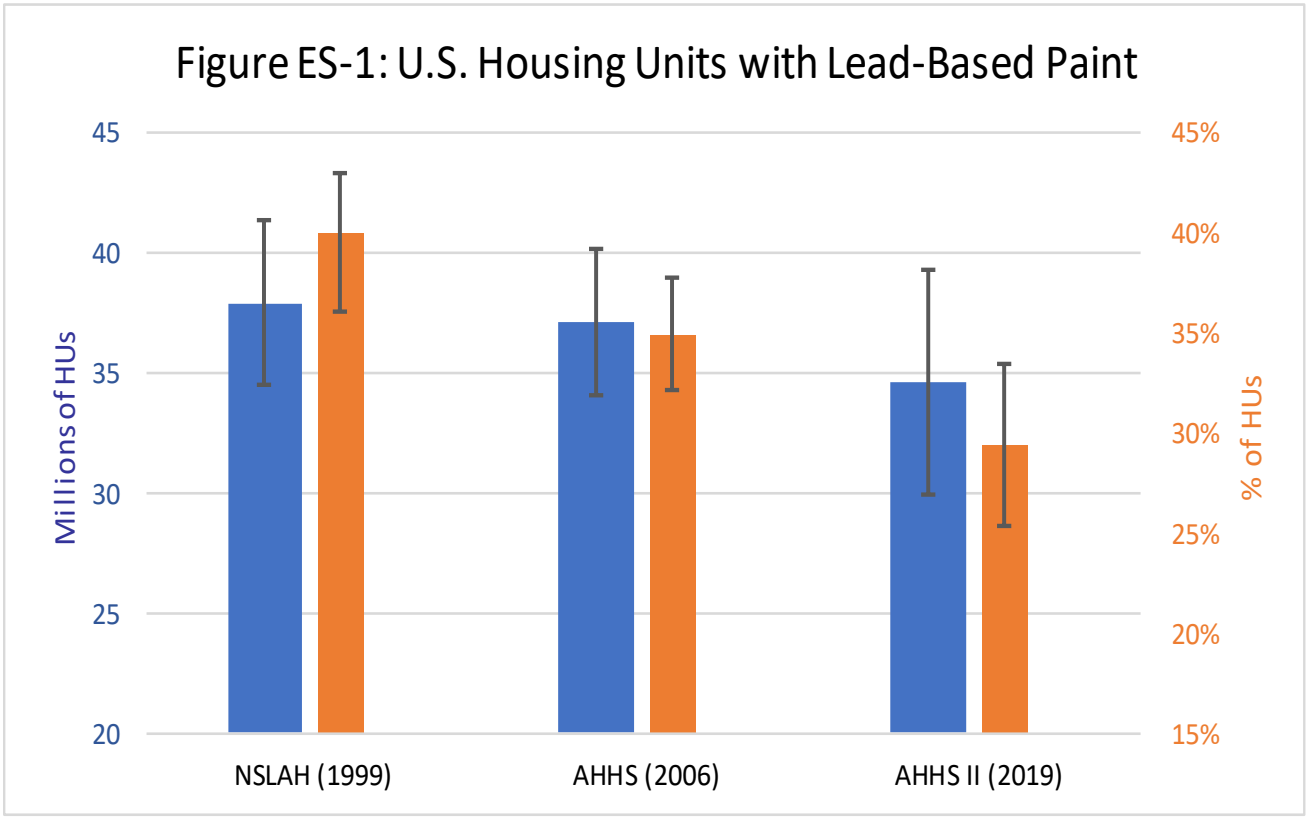


Figure ES-1: U.S. Housing Units with Lead-Based Paint
Millions of HUs
% of HUs
45
40
35
30
25
20
45%
40%
35%
30%
25%
20%
15%
NSLAH (1999)
AHHS (2006)
AHHS II (2019)

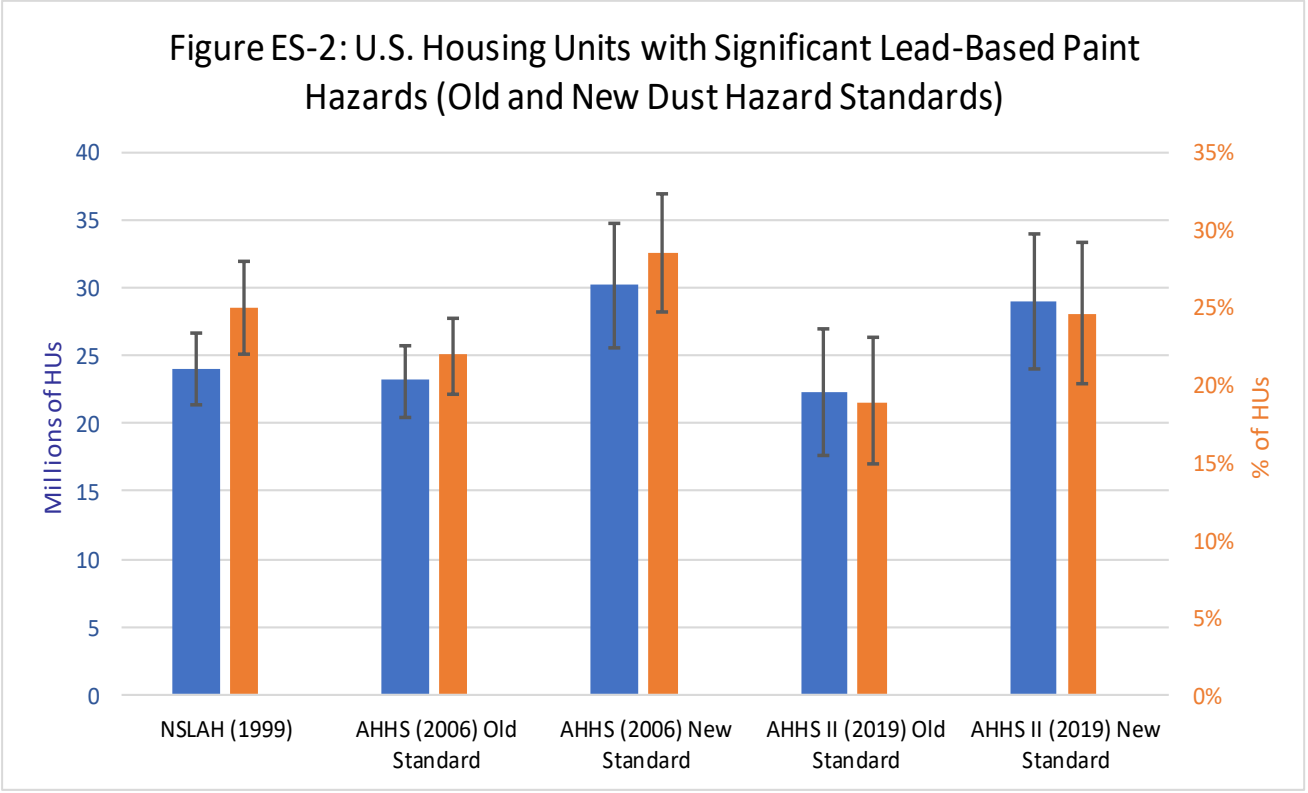


Figure ES-2: U.S. Housing Units with Significant Lead-Based Paint Hazards (Old and New Dust Hazard Standards)
Millions of HUs
% of HUs
40
35
30
25
20
15
10
5
0
35%
30%
25%
20%
15%
10%
5%
0%
NSLAH (1999)
AHHS (2006) Old Standard
AHHS (2006) New Standard
AHHS II (2019) Old Standard
AHHS II (2019) New Standard

Figure ES-3: Prevalence of Lead-Based Paint by Housing Unit Characteristics

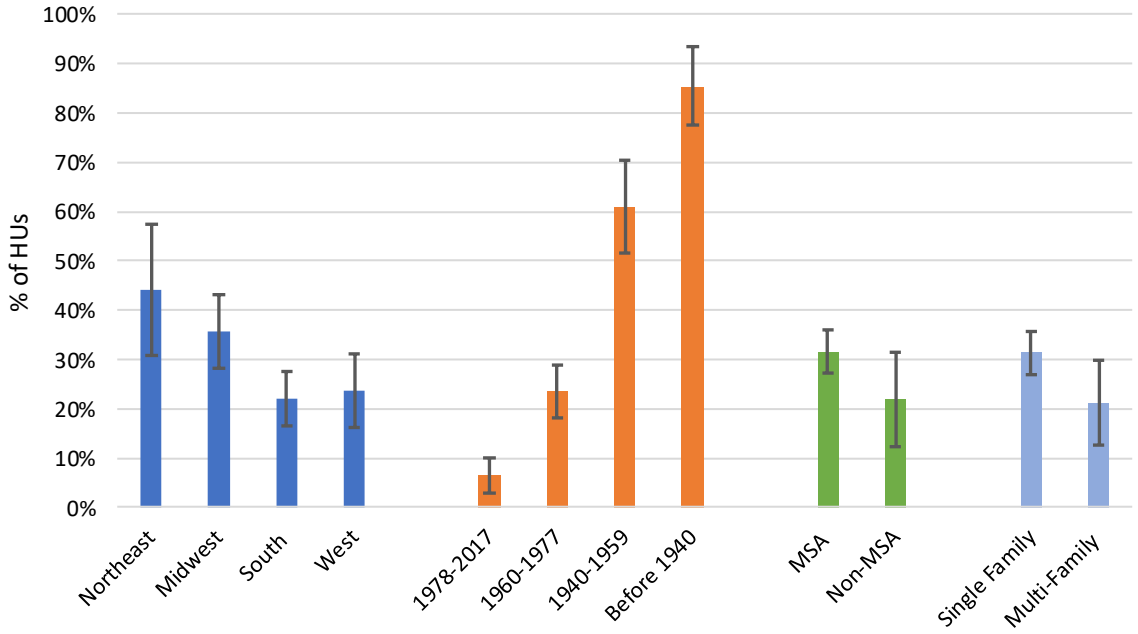


Figure ES-4: Prevalence of Lead-Based Paint by Occupant Characteristics

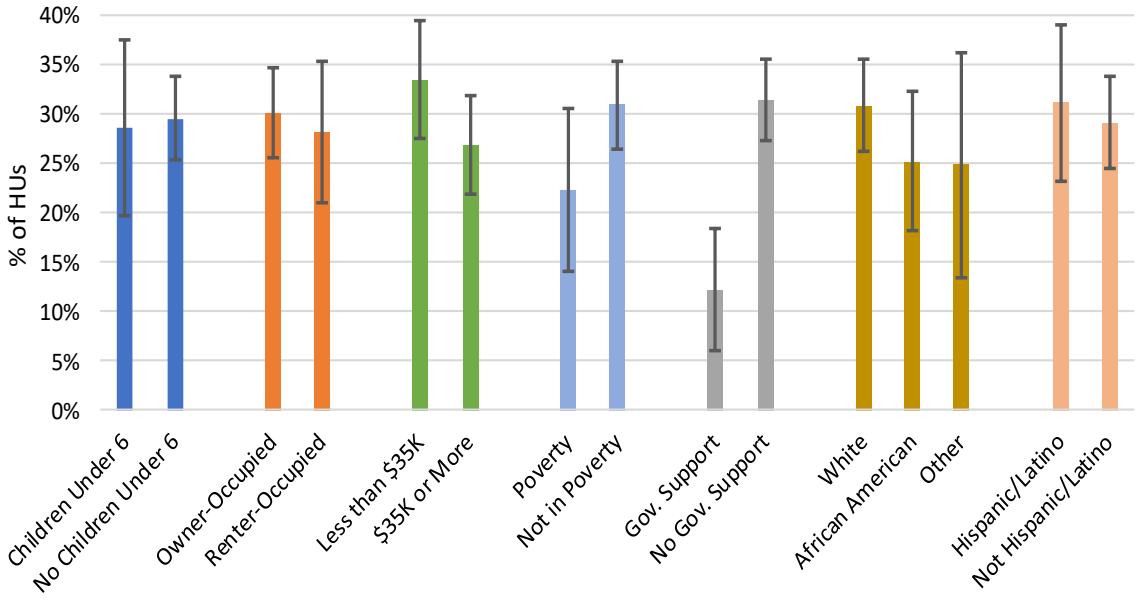


Figure ES-5: Prevalence of Significant Lead-Based Paint Hazards by Housing Unit Characteristics (Old Dust Standard)

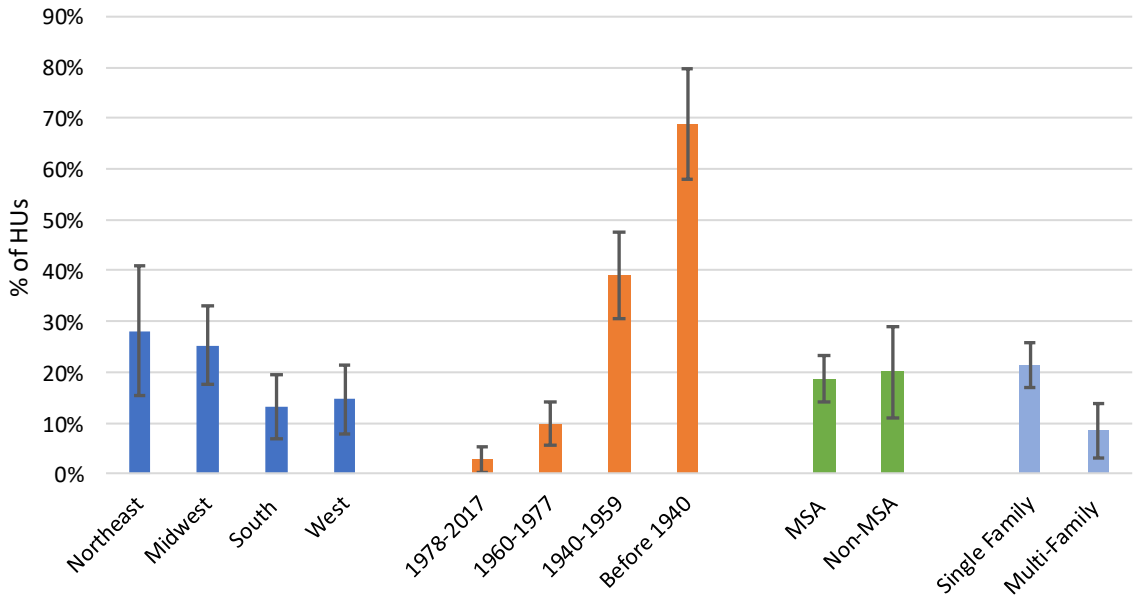


Figure ES-6: Prevalance of Significant Lead-Based Paint Hazards by Occupant Characteristics (Old Dust Standard)

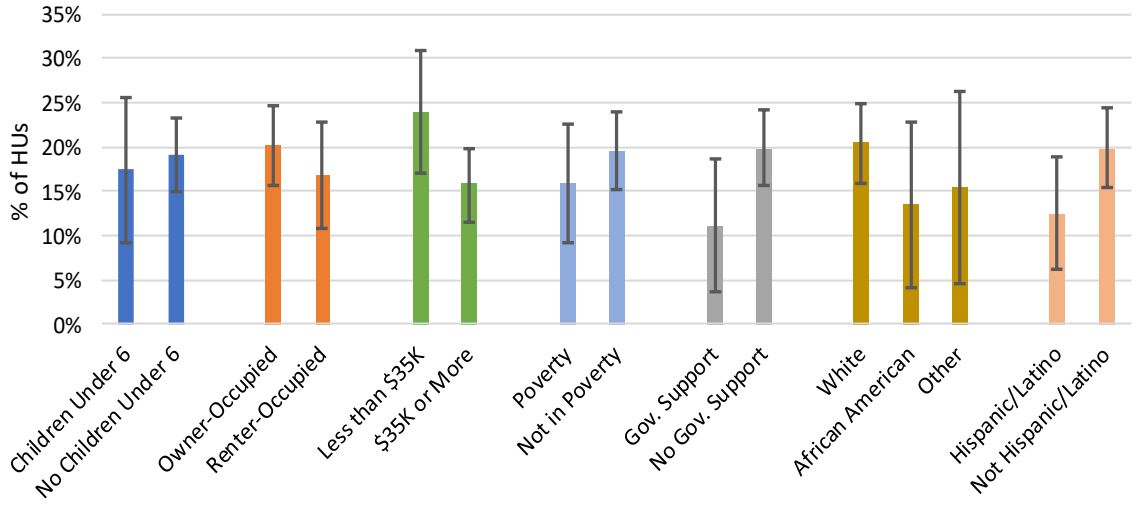


Figure ES-7: Prevalence of Significant Lead-Based Paint Hazards by Housing Unit Characteristics (New Dust Standard)

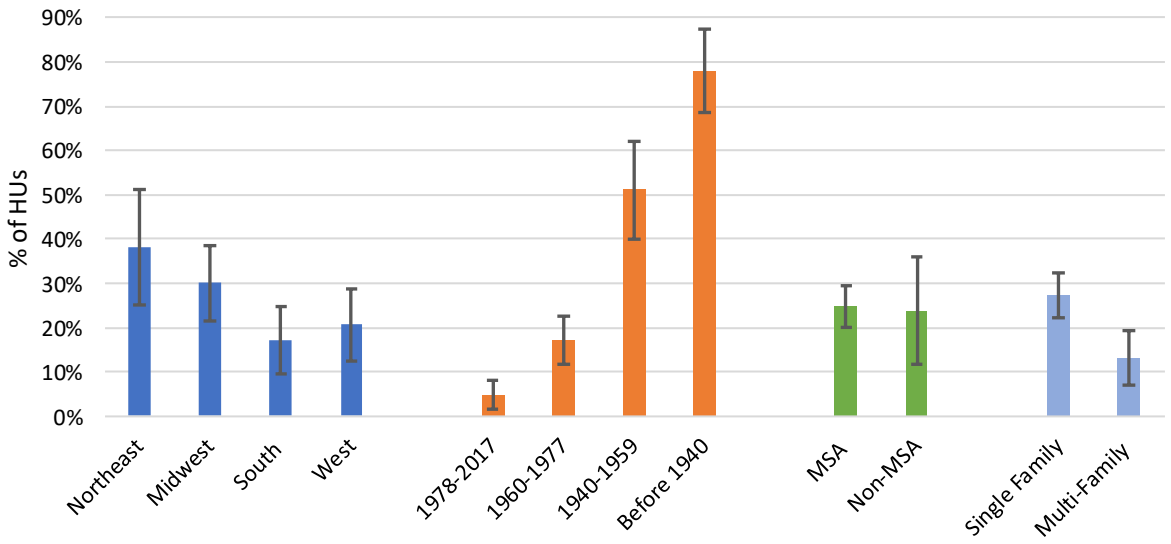
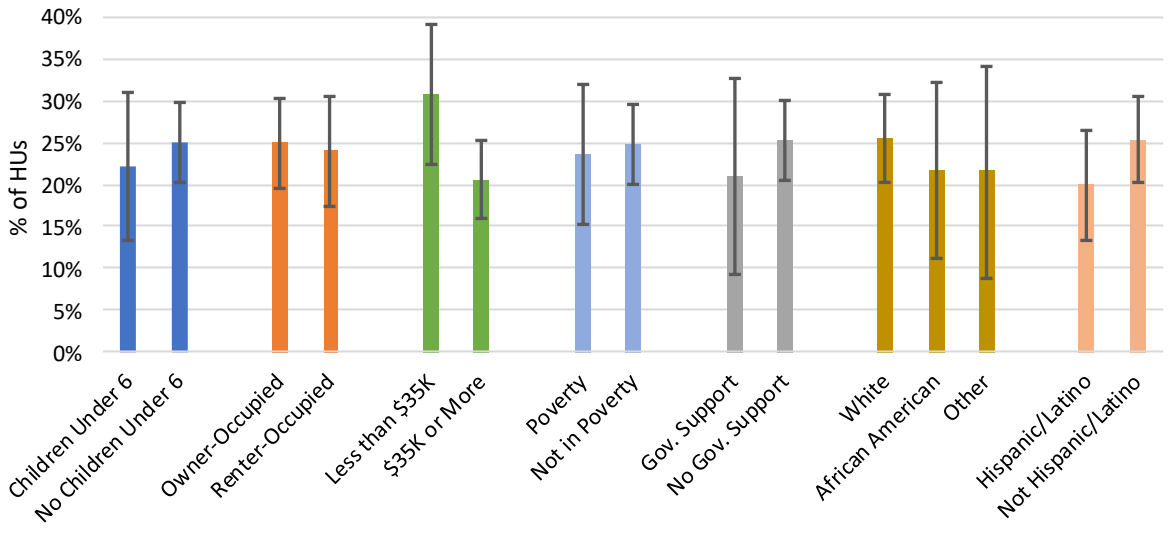


Figure ES-8: Prevalence of Significant Lead-Based Paint Hazards by Occupant Characteristics (New Dust Standard)



INTRODUCTION AND REPORT ORGANIZATION

The American Healthy Homes Survey II (AHHS II) is an update to the first American Healthy Homes Survey (AHHS) [1], conducted in 2005-2006, and the National Survey of Lead and Allergens in Housing (NSLAH) [2] 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 AHHS II 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 AHHS and NSLAH. Unlike AHHS and NSLAH, AHHS II did not include analysis of settled dust samples for residential allergens; instead, these samples were analyzed for a limited set of mold species by EPA. Like AHHS, AHHS II included the sampling of homes for pesticide residues. Finally, AHHS II collected air samples for analysis for formaldehyde and water samples for analysis for lead. These samples provide the first national estimates of formaldehyde levels in the air in homes and lead levels in drinking water. AHHS II also collected data on potential hazards in homes such as slips and falls, electrical hazards, high water temperatures, etc.

The design of the AHHS II 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. In particular, AHHS II included a longitudinal component in which all homes built prior to 1978 that were tested in AHHS were included in the AHHS II sample in order to enhance the ability to detect changes in LBP and LBP hazards between the two surveys.

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)**. **Statistically significant changes from NSLAH to AHHS or from AHHS to AHHS II are highlighted in all tables.**

Threshold values for lead in various media used during this study and referenced throughout the document (new, lower, thresholds for lead in dust were effective January 6, 2020) are:

Substrate	***Threshold***	***Reference***
Paint (by XRF)	1.0 mg/cm^2	24 CFR Part 35.1320
Dust (old thresholds) Floor Windowsill	 40 µg/ft^2 250 µg/ft^2	24 CFR Part 35.1320
Dust (January 6, 2020) Floor Windowsill	 10 µg/ft^2 100 µg/ft^2	24 CFR Part 35.1320
Bare Soil Non-play areas Play areas	 1,200 ppm 400 ppm	24 CFR Part 35.1320

1.0 SURVEY DESIGN AND OPERATIONS

1.1 Objectives of Sampling in the American Healthy Homes Survey II

The primary objective of sampling in AHHS II 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 Federal Government has a goal of eliminating childhood lead poisoning as a significant public health problem. Comparing the AHHS II estimates (2018-2019) to similar estimates from AHHS (2005-2006) provides an indication of progress in the previous 13 years 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.

1.2 AHHS II Sample Design

Like AHHS, AHHS II 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 AHHS II, 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.

To maximize comparability with AHHS data, AHHS II was conducted in a subsample of 78 of the 100 Primary Sampling Units (PSUs) in which AHHS was conducted. The AHHS PSUs consisted 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. The 16 certainty[13] PSUs in AHHS were included in AHHS II, as well as a stratified random subsample of 62 of the 84 non-certainty PSUs, for a total subsample of 78 of the 100 AHHS PSUs. All but one of the 38 states in the AHHS sample were also represented in AHHS II, the exception being Colorado.

The AHHS II sample consisted of longitudinal and Address-Based (ABS) components. The longitudinal component comprised all 504 homes sampled in AHHS (in the 78 PSUs selected for AHHS II) that were built prior to 1978, when lead-based paint was banned for residential use. This was done to increase the representation of pre-1978 homes in the sample in order to improve estimates of LBP and LBP hazards. Without the inclusion of a sample of homes known to be built before 1978, it was estimated that approximately half the AHHS II sample would consist of homes built 1978 or later, compared to 42% in AHHS. The reduced representation of pre-78 homes, combined with the lower target sample size (800 homes compared to 1,131 in AHHS), would in that case greatly reduce the precision of estimates of LBP and LBP hazards.

[13] The largest PSUs, such as Los Angeles County or Brooklyn NY, were selected with certainty in AHHS.

A second reason for including a longitudinal component was to potentially provide a more precise estimate of changes in the prevalence of LBP and LBP hazards in the 13 years between AHHS and AHHS II by comparing the same homes in the two surveys.

To select the ABS sample, the survey design contractor, Westat, divided the 78 selected PSUs into "segments" based on Census 2010 data. 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. Westat sampled 6 segments in Los Angeles County (the largest PSU by population), 5 in the 11 remaining largest certainty PSUs, and 4 from the 4 smallest certainty PSUs and all noncertainty PSUs, for a total of 325 ABS segments.

To select segments, Westat first stratified segments (within each PSU) according to percent pre-1980 housing and then sampled segments with probability proportional to occupied HUs within those strata according to the 2010 Census. In Los Angeles County, three approximately equal-sized strata were created and two segments per stratum were sampled. In the 11 largest certainty PSUs, two unequal-sized strata (one containing segments at or below the 60th percentile of percent pre-1980 housing) were created and then three segments from the larger stratum and two from the smaller stratum were selected. In the 4 smallest certainty PSUs and all noncertainty PSUs, two approximately equal-size strata (at or below the median percent pre-1980 housing, and above the median) were created and two segments from each stratum sampled. The advantage of this approach is that it controlled for age of housing stock, thereby improving the representativeness of the sample.

In the third stage of sampling, 6 addresses were generally[14] selected in each segment by simple random sampling from the addresses in the segment on the USPS Computerized Delivery Sequence File (CDSF) as of January 2018. This resulted in an ABS sample of 1,970 addresses, and a total sample of 2,474, including the 504 longitudinal units.

The AHHS II was reviewed for human subject involvement by Chesapeake Institutional Review Board (IRB),[15] and approved October 23, 2017. The AHHS II information collection was approved by the Office of Management and Budget (OMB), in accordance with the Paperwork Reduction Act, on December 31, 2017 (OMB No. 2539-0026).

1.3 Field Work

The target minimum sample size for the AHHS was 800 housing units nationwide. While the response rate for AHHS was 58.6%, response rates for all surveys have been decreasing since 2006. For planning purposes, we assumed a 50% response rate, with a 16% loss from the ABS sample due to ineligibility. The longitudinal sample of 504 units, plus 4 units from each of the 325 ABS segments, was therefore expected to result in 504*0.5 + 325*4*0.5*0.84 = 798 completed units. This left a reserve of two units per ABS segment that could be released for recruitment if the initial response rate fell below the 50% target. Operationally, the survey was conducted in 13 rounds of sampling between March 2018 and June 2019. The number of PSUs

[14] 7 addresses were selected in 5 of the 325 segments.
[15] Chesapeake IRB is now part of Advarra.

in each round varied from 4 to 7 depending on the availability of field staff, but the typical round had 6 or 7 PSUs.

The release of units for recruiting was complicated by the variable number of longitudinal units in each PSU, which ranged from 0 (Collier County FL) to 13 (Enid OK), 14 (Philadelphia PA) and 15 (Los Angeles CA). Since the number of segments per PSU also varied, this meant that, if exactly 4 units were released per ABS segment, there could be a significant difference in the recruiting and sampling effort in different PSUs in a round, an undesirable occurrence from an operational perspective. The approach adopted initially was to balance the anticipated effort in different PSUs in a round by varying the number of ABS units released per segment in order to make the number of units to be recruited as equal as possible in the different PSUs. For example, in Round 1 (March-April 2018), 7 PSUs were selected, with the number of longitudinal units per PSU varying from 2 to 9. Five of the 7 PSUs had 4 segments and two had 5. By varying the number of ABS units released per segment from 4 to 6, we kept the total number of units released per PSU within the narrow range of 25-28.

After the completion of Round 5, at which point 34 PSUs had been completed, it was clear that the response rate was falling far below that of AHHS. Of 958 units released for recruitment in Rounds 1-5, 265 were completed, a raw response rate of only 28%. This was far lower than the planned rate of 798/(4*325+504) = 44%. Although the raw response rate had increased from 27% in Round 1 to 34% in Round 5 as interviewers gained experience, it seemed highly unlikely that it would increase enough to meet the target of 800 completed units. It was therefore decided to release all the ABS units for recruiting from Round 6 on. The disparity in recruiting effort was managed by increasing the pay of interviewers who had unusually large numbers of units to recruit. In the case of Los Angeles County, however, the total number of units to be recruited was 51, far too many to be recruited and sampled in the typical 17-day period in a PSU, especially considering the notorious traffic in the LA area. We therefore divided Los Angeles into southern and northern areas, each with 3 segments, to be visited in different rounds.

The scheduling of PSUs in each round was determined by staff availability and, importantly, by expected weather. Where possible, we avoided scheduling PSUs in colder areas of the country in the months from December through March. This minimized travel difficulties and problems sampling soil and taking outdoor measurements of lead in paint in inclement weather.

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 was provided with a listing of the addresses of all units to be recruited in the PSU. We sent the entire sample to a service which matched addresses to resident names and telephone numbers where possible. We also provided the interviewer with the name and telephone number of the prior respondent for all longitudinal units. The interviewer traveled to the PSU first and spent approximately 5 days locating and visiting the housing units released for recruitment in the PSU. All housing units released for recruitment were mailed an advance letter approximately one week before the interviewer traveled to the PSU. The advance letter explained the purpose of AHHS and contained a $1 bill as a token incentive to attract the interest of the recipient and increase the likelihood the letter would be read. The longitudinal and ABS units received slightly different advance letters. The letter sent to longitudinal units noted that the unit was part of AHHS,

although the current resident might not have lived there then. 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 [3] was completed, on which the eligibility and recruitment status of the housing unit were 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 II-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. The respondent was provided with a labeled bottle with instructions for collecting a sample of the household's water for analysis for lead and other metals by EPA. 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. Attempts to reach respondents were also made by telephone using the names and numbers provided on the listing.[16]

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 Samsung Galaxy tablet in which the questionnaire was programmed in *SurveyToGo*, a Computer-Assisted Personal Interviewing (CAPI) system for Android tablets. When the interviewer returned to their hotel and connected to WiFi, the completed interviews were uploaded to the *SurveyToGo* database where they were accessible to QuanTech's headquarters staff. The interviewer also retrieved the water sample from the respondent, collected a dust sample using a special vacuum, and recorded observations on potential safety hazards in the home. 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 on floors and windowsills in up to 5 rooms in the house, for collecting soil samples at various locations in the yard, including children's play areas if present, and for collecting an air sample for formaldehyde using a pump that ran throughout the data collection visit. The Viken Pb200i XRF instrument recorded all lead readings electronically and was programmed to also record the component type tested for each reading. XRF data was transmitted electronically each evening from the instrument to QuanTech headquarters over WiFi. Although some technicians encountered difficulty with data transmission, all data from the instruments were also downloaded by Viken staff when the instruments were returned to Viken after each PSU. The storage capacity of a single Viken instrument was sufficient to store all the survey data, and the technicians were unable to delete data either intentionally or inadvertently. There was no loss of XRF data in the survey. 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 (GPI Laboratories, Inc., Grand Rapids MI) for analysis. Vacuum dust, water and pesticide samples were sent directly to EPA from the field. Formaldehyde air samples were sent directly to SGS Galson, the provider of the sampling pumps, for analysis.

[16] Although many names and numbers provided by the matching service were not valid, and many for prior respondents were out of date, the names and telephone numbers did contribute to successful recruiting in some cases.

2.0 RESPONSE RATES FOR AHHS II

All 504 longitudinal units were released for recruitment. As discussed in Chapter 1, the number of ABS units released for recruitment varied depending on the sampling round in which the PSU was completed, with all ABS units released from Round 6 on. In addition, four of the 325 ABS segments were not released for recruitment at all, for reasons of practicality. In the Essex-Middlesex-Worcester Counties MA PSU, two of the 5 ABS segments were so far west in the PSU that their inclusion would have resulted in a survey area of approximately 2,500 square miles, with a distance between some segments of more than 90 miles. Given the distances and traffic in the Boston area, it was decided to omit these two segments. In the Santa Fe-Los Alamos Counties NM PSU, one segment consisted of homes located down dirt roads a mile or more from the paved road. Some could not be located on Google Maps with any certainty, and it was also felt that there could be a safety issue for the interviewer in approaching such isolated dwellings. Finally, in the Little Rock AR PSU, one segment was entirely within Little Rock Air Force Base – military housing is inaccessible and also ineligible for AHHS II.

Recruitment was ultimately attempted at a total of 1,834 of the 1,970 ABS units, plus all 504 longitudinal units, for a total of 2,338 units, of which 703 were completed, 88% of the target of 800. As discussed below, the reason for the shortfall was a dramatic decrease in response rates from AHHS to AHHS II. Table 2-1 below shows the disposition of the 2,338 units within broad categories.

Table 2-1. Disposition of 2,338 Housing Units Recruited for AHHS II

Units	*Disposition*	*Definition*
703	Complete	Completed resident questionnaire and sample collection
1	Partially Complete	Missing LBP data - XRF malfunction.
22	Unable to Schedule	Completed recruiting, resident willing but unable to schedule because of time constraints (e.g., resident going out of town)
618	Hard Refusal	Resident explicitly refused survey
153	Soft Refusal	Resident did not explicitly refuse but appeared to evade survey
170	Ineligible	Vacant, vacation home, group housing (e.g., college dorm), etc.
417	No contact	Interviewer never spoke to anyone at the unit
72	Insufficient Contact	Interviewer spoke to someone at the unit not qualified to answer the recruitment questionnaire (e.g., child, language barrier, etc.)
11	Could Not Find	Interviewer could not locate unit, but no reason to doubt it exists
23	Does Not Exist	Unit determined not to exist by field observation (e.g., empty lot, no such unit in apartment building, etc.)
26	Could Not Access	Unable to access unit, e.g., gated community, doorman, etc.
88	Cancellation	Respondent agreed to participate but then cancelled appointment or did not show
34	Other	Missing or blank recruitment questionnaire; unsafe situation

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 II Sample				
Disposition	***Eligible***	***Ineligible***	***Unknown***	***Total***
Complete	703	0	0	**703**
Partially Complete	1	0	0	**1**
Unable to Schedule	15	0	7	**22**
Hard Refusal	82	0	536	**618**
Soft Refusal	37	0	116	**153**
Ineligible	0	170	0	**170**
No contact	0	0	417	**417**
Insufficient Contact	3	1	68	**72**
Could Not Find	0	0	11	**11**
Could Not Access	0	0	26	**26**
Cancellation	88	0	0	**88**
Other	0	0	34	**34**
Total	**929**	**171**	**1,215**	**2,315**

The 23 addresses where it was determined that no unit existed are excluded. Eight units were determined to be vacant (ineligible) based on advance letters returned undeliverable and marked vacant by the letter carrier.

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

Table 2-3. AHHS II Response Categories		
Response Category	***Number of Housing Units***	***Percent***
Respondent	703	30.4%
Nonrespondent	226	9.8%
Ineligible	171	7.4%
Unknown Eligibility	1,215	52.5%
Total	**2,315**	**100%**

The completion rate (percent of the sample for which data collection was completed) for AHHS II is therefore 30.4%, much lower than both the target of 44% and the 50.9% completion rate for AHHS. The eligibility rate is the percentage of units of known eligibility status that are eligible, i.e., 929/(929+171) = 84.5%. This is slightly below the eligibility rate of 86.7% in AHHS but comparable to the expected eligibility rate of 84% for the ABS sample.

The response rate is defined as the percentage of eligible units that are respondents. It cannot be exactly calculated because of the 1,215 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., 84.5%, the response rate can be calculated approximately as

703/[(2,315 - 1,215 - 171) + 0.845*1,215] = 35.9%.

This is much lower than the response rate of 58.6% for AHHS. To examine the reasons for this, it is useful to calculate response rates for the longitudinal and ABS samples separately. Tables 2-4 to 2-6 break downs Table 2-1 to 2-3, respectively, by longitudinal and ABS samples.

Table 2-4. Disposition of 2,338 Housing Units Recruited for AHHS II by Type of Sample

Units		***Disposition***	***Definition***
Long'nal	ABS		
213	490	Complete	Completed resident questionnaire and sample collection
0	1	Partially Complete	Missing LBP data - XRF malfunction.
3	19	Unable to Schedule	Completed recruiting, resident willing but unable to schedule because of time constraints (e.g., resident going out of town)
115	503	Hard Refusal	Resident explicitly refused survey
24	129	Soft Refusal	Resident did not explicitly refuse but appeared to evade survey
33	137	Ineligible	Vacant, vacation home, group housing (e.g., college dorm), etc.
56	361	No contact	Interviewer never spoke to anyone at the unit
9	63	Insufficient Contact	Interviewer spoke to someone at the unit not qualified to answer the recruitment questionnaire (e.g., child, language barrier, etc.)
7	4	Could Not Find	Interviewer could not locate unit, but no reason to doubt it exists
13	10	Does Not Exist	Unit determined not to exist by field observation (e.g., empty lot, no such unit in apartment building, etc.)
2	24	Could Not Access	Unable to access unit, e.g., gated community, doorman, etc.
21	67	Cancellation	Respondent agreed to participate but then cancelled appointment or did not show
8	26	Other	Missing or blank recruitment questionnaire; unsafe situation

Table 2-5. Disposition Categories by Eligibility Status for AHHS II by Sample Type

Disposition	***Eligible***		***Ineligible***		***Unknown***		***Total***	
	Long'nal	ABS	Long'nal	ABS	Long'nal	ABS	Long'nal	ABS
Complete	213	490	0	0	0	0	213	490
Partially Complete	0	1	0	0	0	0	0	1
Unable to Schedule	2	13	0	0	1	6	3	19
Hard Refusal	14	68	0	0	101	435	115	503
Soft Refusal	3	34	0	0	21	95	24	129
Ineligible	0	0	33	137	0	0	33	137
No contact	0	0	0	0	56	361	56	361
Insufficient Contact	0	3	0	1	9	59	9	63
Could Not Find	0	0	0	0	7	4	7	4
Could Not Access	0	0	0	0	2	24	2	24
Cancellation	21	67	0	0	0	0	21	67

Other	0	0	0	0	8	26	8	26
Total	**253**	**686**	**33**	**138**	**205**	**1,010**	**491**	**1,824**

Table 2-6. AHHS II Response Categories by Sample Type

Response Category	***Number of Housing Units***		***Percent***	
	Longitudinal	ABS	Longitudinal	ABS
Respondent	213	490	43.4%	26.9%
Nonrespondent	40	186	8.1%	10.2%
Ineligible	33	138	6.7%	7.6%
Unknown Eligibility	205	1,010	41.8%	55.4%
Total	**491**	**1,824**	**100%**	**100%**

The completion rate for the longitudinal sample is much higher than for the ABS sample – 43.4% vs 26.9%. The eligibility rate for the longitudinal sample is 253/(253+33) = 88.5%, compared to 676/(676+138) = 83.0% for the ABS sample (close to the expected eligibility rate of 84%). It isn't surprising that the longitudinal sample has higher eligibility. Some of the ABS mailing addresses were undeliverable -176 of 1,834 (9.6%). Because the longitudinal units were all eligible in AHHS, the only likely sources of ineligibility in AHHS II were vacancy or demolition. While vacancy is the largest source of ineligibility, other sources, such as age-restriction, second home, etc., do occur and were much less likely in the longitudinal than in the ABS sample.

The lower eligibility of the ABS sample is a partial explanation of the lower completion rate. However, when the completion rate is adjusted for ineligibility, the response rate for the longitudinal sample is

$$213/(213+40+0.885*205) = 49.0\%,$$

while for the ABS sample, the response rate is

$$490/(490+186+0.83*1010) = 32.4\%.$$

Thus, there is still a substantial difference in response rates between the two sample types when adjusted for ineligibility.

From Table 2-4, the major differences in disposition of the sample between ABS and longitudinal units are in refusals (hard and soft combined) and no-contacts; 34% of ABS units refused, compared to 28% of longitudinals, and 20% of ABS units could not be contacted, almost twice the 11% of longitudinals. There are several possible explanations for these differences. First, some of the longitudinal units were occupied by the AHHS respondent, making it more likely they would be receptive to the survey this time. Second, even for units not occupied by the same family, the fact that the home was in AHHS (as pointed out in the Advance Letter) may have helped response. Third, the longitudinal sample, having been eligible and cooperating in AHHS, was inherently likely to provide a better yield than the ABS sample. For example, since the response rate is higher for less wealthy households (because of the $130 incentive in both surveys), the longitudinal sample was likely to be less wealthy on average than the ABS sample.

Fourth, the longitudinal sample was older on average than the ABS sample. Residents of newer homes are more likely to refuse when the survey is explained to them because they believe they don't have lead-based paint.

The large drop in response rate from AHHS to AHHS II is harder to explain. The ineligibility-adjusted response rate in AHHS was 58.6%, compared to 35.9% in AHHS II, with 49.0% in the longitudinal sample and 32.4% in the ABS sample. The possibility that the AHHS II field interviewers were less experienced and/or less diligent in recruiting than those in AHHS can be ruled out. Two of the most productive AHHS interviewers returned for AHHS II. In AHHS, they averaged 13.3 completed units per PSU but only 9.1 in AHHS II. In AHHS, the overall average among all interviewers was 11.1 completed units per PSU, so that the two returning interviewers were 20% above average productivity. In AHHS II, the overall average was 8.9 completed units per PSU, so the two returners were only about average, indicating that AHHS II interviewers were likely not inferior to those in AHHS.

Some of the drop in response rate follows the continuing trend of lower response rates in all types of surveys due to the sheer number of surveys that are fielded and the fear of scams such as sales pitches masquerading as surveys. Anecdotal reports from interviewers indicate that people seemed very unwilling to even listen to an explanation of the survey. The three African American interviewers encountered some racist responses. Decreased confidence in the Federal government and mistrust of Federal programs[17] also likely contributed to the decline in response rates. An important factor specific to this survey was the incentive offered for completing the survey. AHHS and AHHS II are very intrusive since they require a 2-4 hour presence in the respondent's home. The incentive in AHHS was $130. QuanTech proposed increasing it to $160 in AHHS II to account for inflation since AHHS, but OMB rejected the increase during the Paperwork Reduction Act review. The result was that the incentive was unfortunately reduced by about 20% in real terms when maintaining the AHHS response rate would have required an increase in real terms. Experiments with variable incentives in NSLAH [4] showed that increased incentives improve the response rate.

3.0 CHARACTERISTICS OF THE AHHS SAMPLE

Table 3-1 (shown at the end of this section) characterizes the AHHS II 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 2017 American Housing Survey (AHS) and, where available, to the 2019 Current Population Survey (CPS). For comparison purposes, the same estimates are shown for the original AHHS sample but using the 2005 AHS and the 2006 CPS as benchmarks. All estimates are weighted.

[17] According to Gallup https://news.gallup.com/poll/1600/congress-public.aspx, public approval of Congress averaged 40% during AHHS but only 20% during AHHS II.

Respondents did not provide complete data for some of the 703 completed housing units in AHHS II. Respondent-provided data was missing[18] for housing age (63 units), household income (32 units) and race (11 units).

Housing age was asked of respondents in two questions in the interview. The first asked when the home was built. If the respondent did not know, a follow-up question asked which of 6 ranges of years best matched when the home was built. A total of 89 respondents could not answer either question. Of these, 26 were longitudinal for which the age from AHHS was used,[19] leaving 63 ABS cases with no age data. The 63 addresses were researched using real estate websites such as zillow.com, trulia.com and realtor.com, which provided the year built for 54. For the remaining 9 cases where the websites could not find the unit or had no data on age, we conducted in-depth research to identify neighborhood age, age of other buildings in the same complex, etc., to assign a likely age or age range. This process resulted in an assigned age or age range for all 703 completed units. For units with an age range only, we then assigned the midpoint of the range as the age.[20] This is consistent with the assignment of ages in AHHS.[21]

Respondents were asked two questions about their 2016 total household income. The first asked whether it was less than $35,000 or greater than or equal to $35,000. The second question asked for more detailed income information in 10 categories from less than $5,000 to $120,000 or above. A total of 32 respondents either refused or did not know the answer to either income question. Income was imputed for these 32 cases as the modal (most common) income category (mapped to our 10 income categories) from the 2017 American Community Survey (ACS) [22] for the Census Block Group containing the unit.

Respondents were asked which race or races they considered themself to belong to. A total of 58 refused the race question (or did not know). During recruitment, the interviewers were asked to record their impression of the race of the person recruited. This was used for 47 of the 58 cases where race information was not provided in the interview, leaving 11 cases with no race information. The modal race for the Census Block Group containing the unit from the 2018 ACS was imputed for these cases.

The poverty variable (household in poverty or not) was quite complicated to assign. Whether a household is considered to be poor is a function of household income and size. The Health and Human Services (HHS) poverty guidelines for 2016[23] are shown in Table 3-1. There were no households in AHHS II with more than 8 persons.

[18] Respondent refused or did not know.
[19] AHHS age was used for all longitudinal units.
[20] For the oldest age range, 1939 or before, we assigned 1919 as the age.
[21] In AHHS, websites such as zillow.com were not available and imputation based on Census data was used instead.
[22] The 2017 ACS asked about 2016 income.
[23] https://aspe.hhs.gov/computations-2016-poverty-guidelines, accessed June 25, 2020. The poverty levels for Hawaii are higher. They were applied in PSU 904 (Honolulu). The HHS poverty guidelines are a simplified version of the Census Bureau's poverty thresholds, which depend on the number and age of adults and the number of children under 18 in the household and are the same for all 50 states and the District of Columbia. AHHS II did not collect the data on age and family composition needed to apply the poverty thresholds.

Table 3-1. 2016 Federal Poverty Level Guidelines

Persons in Household	2016 Federal Poverty Level
1	$11,880
2	$16,020
3	$20,160
4	$24,300
5	$28,440
6	$32,580
7	$36,730
8	$40,890

The household income categories in AHHS II are different from the poverty income categories, so that in many cases it is unclear whether a household is in poverty or not. The AHHS II income categories are shown in Table 3-2.

Table 3-2. AHHS II Household Income Categories

Income Category	Lower Bound	Upper Bound
1	$0	$4,999
2	$5,000	$9,999
3	$10,000	$14,999
4	$15,000	$19,999
5	$20,000	$34,999
6	$35,000	$49,999
7	$50,000	$69,999
8	$70,000	$89,999
9	$90,000	$119,999
10	$120,000	N/A

For example, a one-person household with income in AHHS II categories 1 or 2 is classified as in poverty, while if its income is in category 4 or higher, it is not in poverty. If its income is in category 3, it may or may not be in poverty. In such cases, we assigned a probability of poverty to the household. In this example, the probability of poverty is 1,880/4,999 = 0.3768. We then used a random number generator to classify this unit as poor with probability 0.3768. Some units only had reported income as less than $35,000 or $35,000 or more. A similar random assignment procedure was use for these cases. Of the 672 units for which income data was reported by the respondent, 94 (14%) required the random assignment procedure to be used. For the 32 units without respondent-reported income data, we assigned poverty status based on the "impression of poverty" reported by the interviewer during the recruitment process, wherever possible. We did this rather than using imputed income because "impression of poverty" is an observation on the actual unit, whose income and poverty status might vary considerably from the mode for its Census Block Group. This left 11 units where poverty status was still undetermined. We used imputed income and the random assignment procedure for these units.

The total number of housing units eligible for AHHS II is estimated as 117.7 million, as compared to 106.0 million eligible for AHHS 13 years ago. The AHHS II total is the same as the

2017 American Housing Survey (AHS) estimate of total occupied, nonseasonal, none-age-restricted housing units because the AHHS II sample was poststratified to AHS data by Census Region, housing age and presence/absence of a child under age 6.[24] The AHHS total differed slightly from the 2005 AHS because of instability in the estimate of the number of age-restricted units [1]. The increase in eligible housing units from AHHS to AHHS II is estimated as 11.7 million in the 13 intervening years. This is not much greater than the 10.3 million estimated increase in the 7 years from NSLAH to AHHS, undoubtedly due to the severe contraction in new home construction in the wake of the 2008 financial crisis.

The distributions of eligible units by Census Region and construction year closely match the AHS 2017 distributions, as indeed they should because the weights were poststratified to the corresponding AHS totals. The regional distribution also agrees very well with the 2019 CPS. Agreement with the AHS is somewhat better for Census Region than for age category. This is because AHS age categories do not exactly match those of AHHS II. The AHS percentages for the 1978-2005 and 1960-1977 age categories are estimates only, obtained by assuming that 20% of the 1970-1979 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 II and AHS/CPS distributions for presence of children under age 6, housing unit type and tenure. AHHS II has a considerably lower percentage of MSA units (77.1%) than AHS (84.4%) or CPS (86.2%). This is due to changes in the designation of MSAs in 2013 and 2018 which brought some non-MSA AHHS PSUs within the boundaries of MSAs. For example, PSU 516 (Sussex County DE) was a non-MSA PSU in AHHS but was included in the Salisbury MD MSA in 2013 based on 2010 Census data. We used the same designation of MSA in AHHS II as in AHHS for purposes of data comparability between the two surveys.

AHHS II has 39.1% of households with income less than $35,000, compared to 30.9% for AHS 2017 and only 27.9% for CPS 2019. Probably the most important contributor to the higher AHHS II estimate of households with income below $35,000 is that the $130 incentive for completing the survey is more effective in lower income households. This is indicated by the fact that 44% of the 703 completed units had income below $35,000, even higher than the weighted estimate of 39.1%. This means that nonresponse adjustments[13] compensated partially but not completely for the higher response among low income households. The remaining difference from the AHS and CPS estimates may be due to a combination of other factors. First, AHHS asked a simple, general question about “Total Household Income”. By contrast, the Census Bureau, which conducts AHS and CPS, asks in detail about all sources of money income for all household members, including Social Security, pensions, disability, Workers Compensation, alimony, child support, etc. To the extent that AHHS II respondents may interpret income as just salary or hourly pay or may omit or overlook income of some household members such as teenagers with summer jobs, there may be a tendency to under-report income compared to AHS or CPS. Second, the longitudinal sample consists of homes that completed the AHHS. They are likely to be lower income on average because of the effect of the incentive, even though most did not have the same residents as in AHHS. Third, there is a tendency for people to under-report

[24] See the Appendix for a discussion of weighting, nonresponse adjustment and poststratification.

income in household surveys,[25] which may be exacerbated in AHHS II by the very general nature of the question compared to the detailed questions about all income sources in the Census Bureau surveys.

AHHS II also shows a higher percentage of households in poverty than AHS or CPS, consistent with the higher percentage with incomes below $35,000. There was an increase in the estimated percent receiving Government support of housing over AHHS (9.2% vs 5.5%). This is consistent with the substantial increase in the percentage of households renting from 30.6% in AHHS to 36.1% in AHHS II, an increase of over 10M households. This is likely another effect of the 2008 financial crisis and the resulting Great Recession, during which almost 10M homes were lost to foreclosure.[26]

With regard to race, AHHS II has a slightly higher percentage of African American and Other Race households, and a correspondingly lower percentage of White households, than AHS or CPS. This is consistent with the higher percentage of households in poverty and with incomes below $35,000 in AHHS II vs AHS and CPS, since African American households have lower incomes than White households and are twice as likely to be poor. It should also be borne in mind that there are differences between AHS, CPS and AHHS in assigning race to a household. We assigned to the housing unit the race or ethnicity of the individual completing the resident questionnaire. 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 could also be partly responsible for differences between the three surveys. Finally, AHHS II, AHS and CPS agree closely on the percentage of Hispanic households.

Despite the apparent slight over-representation of lower income households in AHHS II, there is good agreement between the AHHS II and AHS distributions of most variables of interest to HUD, indicating that the AHHS II respondents, with appropriate nonresponse adjustment and poststratification, provide a representative national sample for a variety of important population characteristics.

[25] https://www.census.gov/topics/income-poverty/income/about.html, accessed June 26, 2020.
[26] https://www.marketplace.org/2018/12/17/what-we-learned-housing/, accessed June 26, 2020.

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

Housing Unit Characteristic	*AHHS I (AHHS II) Estimates*		*Housing Units in Sample*	*AHS (2005) (2017)*	*Current Population Survey (2006) (2019)*
	Estimate (000)	*Estimate (%)[a]*			
Total Housing Units[b]	106,033 117,751	100% 100%	1,131 703	108,871 117,751	
Region:					
Northeast	20,190 20,993	19.0% 17.8%	196 139	18.7% 17.9%	18.3% 17.2%
Midwest	23,994 26,699	22.6% 22.7%	245 161	22.9% 22.3%	22.8% 21.5%
South	38,996 43,640	36.8% 37.1%	440 240	36.5% 37.5%	36.7% 38.7%
West	22,853 26,420	21.6% 22.4%	250 163	21.9% 22.2%	22.1% 22.6%
Construction Year:					
1978-2005 1978-2017	40,458 57,919	38.2% 49.2%	476 224	39.1% 48.3%	
1960-1977	29,956 25,599	28.3% 21.7%	306 225	27.9% 22.2%	
1940-1959	18,117 18,178	17.1% 15.4%	187 154	16.9% 15.5%	
Before 1940	17,503 16,055	16.5% 13.6%	162 100	16.2% 13.9%	
Region by Construction Year:					
Northeast	20,190 20,993	19.0% 17.8%	196 139	18.7% 17.9%	
1978-2005 1978-2017	3,831 6,123	3.6% 5.2%	35 37	4.1% 5.2%	
1960-1977	5,288 4,346	5.0% 3.7%	57 28	4.4% 2.6%	
1940-1959	4,156 4,180	3.9% 3.6%	42 31	3.8% 3.5%	
Before 1940	6,915 6,344	6.5% 5.4%	62 43	6.4% 5.6%	
Midwest	23,994 26,699	22.6% 22.7%	245 161	22.9% 22.3%	
1978-2005 1978-2017	8,319 11,826	7.9% 10.0%	107 51	7.6% 9.3%	
1960-1977	5,849 5,213	5.5% 4.4%	58 50	6.2% 5.0%	
1940-1959	4,436 4,693	4.2% 4.0%	36 28	4.2% 3.9%	
Before 1940	5,395 4,966	5.1% 4.2%	44 32	5.0% 4.1%	

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

Housing Unit Characteristic	*AHHS I (AHHS II) Estimates*		*Housing Units in Sample*	*AHS (2005) (2017)*	*Current Population Survey (2006) (2019)*
	Estimate (000)	*Estimate (%)[a]*			
South	38,996 43,640	36.8% 37.1%	440 240	36.5% 37.5%	
1978-2005 1978-2017	18,625 25,647	17.6% 21.8%	221 94	17.8% 22.5%	
1960-1977	11,724 10,237	11.1% 8.7%	122 81	10.7% 8.3%	
1940-1959	5,575 5,374	5.3% 4.6%	71 54	5.2% 4.5%	
Before 1940	3,072 2,381	2.9% 2.0%	26 11	2.8% 2.0%	
West	22,853 26,420	21.6% 22.4%	250 163	21.9% 22.2%	
1978-2005 1978-2017	9,682 14,323	9.1% 12.2%	113 42	9.6% 11.7%	
1960-1977	7,101 5,803	6.7% 4.9%	69 66	6.7% 5.4%	
1940-1959	3,949 3,931	3.7% 3.3%	38 41	3.7% 3.3%	
Before 1940	2,121 2,363	2.0% 2.0%	30 14	2.0% 2.0%	
Urbanization:					
MSA	80,101 90,723	75.5% 77.1%	889 555	77.7% 84.4%	83.4% 86.2%
Non-MSA	25,933 27,028	24.5% 23.0%	242 148	22.3% 15.6%	16.6% 13.8%
One or More Children Under Age 6:					
	16,833 14,979	15.9% 12.7%	207 108	15.9% 12.7%	
Housing Unit Type:					
Single family	89,156 95,590	84.1% 81.2%	950 571	84.0% 83.1%	
Multi-family	16,877 22,161	15.9% 18.8%	181 132	16.0% 17.0%	
Tenure:					
Owner-occupied	73,627 75,302	69.4% 64.0%	772 419	68.8% 64.6%	68.3% 64.5%
Renter-occupied	32,407 42,449	30.6% 36.1%	359 284	31.2% 35.4%	30.3% 35.5%
Imputed			2 0		

Table 3-3. Characteristics of the National Survey Population, with Comparisons to American Housing Survey (AHS) and Current Population Survey (CPS) Estimates (AHHS II in RED)					
Housing Unit Characteristic	***AHHS I (AHHS II) Estimates***		***Housing Units in Sample***	***AHS (2005) (2017)***	***Current Population Survey (2006) (2019)***
	Estimate (000)	***Estimate (%)[a]***			
Household Income:					
Less than $30,000/year Less than $35,000/year	37,059 45,994	35.0% 39.1%	401 308	37.2% 30.9%	31.0% 27.9%
Equal to or more than $30,000/year Equal to or more than $35,000/year	68,975 71,757	65.0% 61.0%	730 395	62.8% 69.1%	69.0% 72.1%
Imputed			70 32		
Government Support:					
Government support	5,870 10,781	5.5% 9.2%	65 70		
No Government support	99,522 106,023	93.9% 90.0%	1059 626		
Refusal/Don't Know	641 948	0.6% 0.8%	7 7		
Poverty:					
In poverty	14,593 20,340	13.8% 17.3%	166 157	13.9% 13.6%	9.8% - 11.8%+[27] 12.1%
Not in poverty	91,441 97,411	86.2% 82.7%	965 546	86.1% 86.4%	88.2% - 90.2% 87.9%
Imputed			98 5		
Race:					
White	82,739 89,252	78.0% 75.8%	868 502	82.2% 78.4%	81.6% 78.2%
African American	13,161 17,179	12.4% 14.6%	151 126	12.4% 13.6%	12.4% 13.4%
Other[d]	10,134 11,321	9.6% 9.6%	112 75	5.4% 8.0%	5.8% 8.5%
Imputed			2 11		

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

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

Housing Unit Characteristic	*AHHS I (AHHS II) Estimates*		*Housing Units in Sample*	*AHS (2005) (2017)*	*Current Population Survey (2006) (2019)*
	Estimate (000)	*Estimate (%)[a]*			
Ethnicity:					
Hispanic/Latino	13,175 15,538	12.4% 13.2%	158 120	10.7% 13.7%	10.4% 13.8%
Not Hispanic/Latino	92,858 102,213	87.6% 86.8%	973 583	89.3% 86.3%	89.6% 86.2%
Imputed			2 0		

[a] All percentages are calculated with total housing units (106,033) (117,751) as the denominator. Percentages may not total 100% due to rounding.
[b] "Housing units" include permanently occupied, noninstitutional housing units in which children are permitted to live.
[c] Refusals and "don't know" responses by survey respondents.
[d] "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”, "unit", “household” or “home” interchangeably to mean “occupied, non-seasonal non-institutional housing unit in which children are permitted to live”, i.e., an AHHS II-eligible housing unit. Table 4-1 shows the prevalence of lead-based paint, for various housing characteristics, and compares AHHS II and AHHS estimates. Statistically significant changes (either increases or decreases) from AHHS to AHHS II are highlighted in this and all subsequent tables in the report. Stated p-values are for two-sided comparisons unless otherwise noted. Table B-1 in Appendix B contains similar breakdowns to Table 4-1 but aggregated over all pre-1978 housing.

The survey estimates that 34,598,000 housing units in the United States contain some lead-based paint (LBP), 29.4% of all housing units, a decrease of 5.5% from the 34.9% figure in AHHS. The 5.5% decrease is statistically significant ($p = 0.013$ one-sided[28]), mainly because of the increase in the total number of housing units in the 13 years between the surveys. The estimated number of units with LBP decreased by 2,460,000 from 37,058,000 in AHHS. Although this is a substantial decrease (6.6%), it is not statistically significant. The estimated number of pre-1978 homes with LBP decreased by 3,527,000 from 34,282,000 in AHHS to 30,855,000 in AHHS II, a decrease of 10.3%. While the 3,527,000 decrease is not statistically significant, it is substantially larger than the 2,460,000 decrease in all homes with LBP. This is because the number of homes built 1978 or later with LBP increased from an estimated 2,675,000 to 3,744,000 between the two surveys. Although LBP was banned for residential use in 1978, some homes built after the ban can have LBP for a number of reasons. First, ceramic tiles, especially those imported, commonly have lead in the glaze[29] which can be detected by an XRF. Lead in tile glaze at or above 1.0 mg/cm^2 meets the definition of LBP and is counted in both surveys, see [1] and the discussion of Table 4-2 below. Second, homes built in the early years after the ban were sometimes painted with leftover LBP, because of hoarding by painters and homeowners,[30] although one would expect the influence of this factor to decrease over time. Third, LBP is still used (sometimes with high lead levels) on ships, cars, steel structures, bridges, roadway markings and in other applications,[31] so that some homeowners may still be able to obtain LBP. Finally, some units may be classified as having LBP because of measurement error on the part of the XRF. A unit is classified as LBP if any reading taken is 1.0 mg/cm^2 or greater. Since an average of almost 50 readings was taken in each unit, false positive classifications can occur.

The percentage decrease in pre-1978 homes with LBP (10.3%) is larger than the decrease in all pre-1978 homes (8.8%), but both are consistent with rates of housing demolition. Estimates of demolition range from 0.6% to 0.96% per year [6], which equates to 7.5% to 11.8% in the 13 years between AHHS and AHHS II.

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[28] A one-sided test is appropriate because the number of pre-1978 homes with LBP cannot easily increase over time, so that the percent with LBP is expected to decrease.

[29] https://eia-usa.org/images/downloads/Newsletters/may15newsletter.pdf (accessed July 1, 2020).

[30] LBP was an excellent paint. See https://queenseagle.com/all/homes-built-shortly-after-1978-arent-necessarily-safe-from-lead-paint (accessed July 1, 2020).

[31] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4434842/, accessed July 5, 2020.

The NSLAH survey, conducted in 1998-1999 estimated that 35,865,000 pre-1978 homes had LBP, compared to 30,855,000 in AHHS II, a drop of 5,010,000 in the 20 years between the surveys (14.0%). This decrease over a longer time span is statistically significant ($p = 0.03$ one-sided). There were an estimated 59,832,000 pre-78 homes in AHHS II, compared to 65,914,000 in NSLAH, a decrease of 9.2%, smaller than the 14.0% decrease in homes with LBP, but both consistent with an expected demolition of 7.7% - 17.5%. However, the larger decrease in homes with LBP indicates that demolition is not the only factor reducing the number of pre-78 homes with LBP. Gut renovations, window and siding replacement, etc., can eliminate all LBP in some cases.

The survey estimates that 28.5% of housing units where a child under age 6 resides have LBP, almost the same percentage as for all housing units, and similarly lower than the 34.1% reported in AHHS. For households with children under 6, those earning less than $35,000 a year were almost twice as likely to have LBP (40.5%) as those earning $35,000 or more (40.5% vs 21.8%). Because of the small sample sizes in both groups (47 and 61), the difference just fails to reach statistical significance ($p = 0.062$). However, it is strikingly different from AHHS, where both the <$30,000[32] and ≥ $30,000 groups with children under 6 had identical prevalence of LBP. Table B-1 shows that, for pre-1978 homes with children under 6, the difference between the low- and high-income groups is less – 56.0% vs 44.1%, but in AHHS the higher income group had a higher prevalence of LBP. Poor households with children under 6 also had higher prevalence of LBP than those not in poverty though the difference was less – 35.6% vs 25.7% (poverty status depends on household size as well as income), but the reverse was true in AHHS – 29.8% poor with LBP vs 35.2% not poor. The distribution of LBP by age category for units with children under age 6 is similar to the distribution by age category for all units and does not differ significantly from the AHHS distribution for units with a child under age 6.

Reflecting the estimated decrease of 2,460,000 in units with LBP from AHHS to AHHS II, three of the four Census Regions also show decreases, the exception being the Midwest with a very slight increase. The percentage with LBP decreased in all regions. None of the absolute or percentage decreases are statistically significant, again due to smaller regional sample sizes.

The Northeast and Midwest had statistically significantly higher percentages of homes with LBP than the South or West ($p \leq 0.011$ one-sided in all cases), the same pattern seen in AHHS. However, the differences by region are not significant for pre-1978 housing (Table B-1). The percent in the Northeast was also higher than in the Midwest, but the difference was not statistically significant, unlike in AHHS, due to the smaller sample sizes in AHHS II. For pre-78 housing, the difference between the Northeast and Midwest was modest.

The percent of units with LBP increases significantly with age, as expected, and the pattern is consistent between AHHS and AHHS II, but the number with LBP decreased for all age categories except 1978 or later. Here the number of units with LBP increased from 2,675,000 to 3,744,00, an increase of 1,069,000 units (40%). The percent of units with LBP was constant at about 6.5%, and also very similar to the 6.8% in NSLAH. Thus, whether the time interval is 1978-1998 (20 years), 1978-2005 (27 years), or 1978-2017 (39 years) the percent of units with LBP appears constant, between 6-7%. One explanation, as previously noted, is lead in ceramic

[32] The $30,000 threshold in AHHS was changed to $35,000 in AHHS II to account for inflation.

tile glaze which is not banned but is counted as LBP in all three surveys. Ceramic tile glaze does not deteriorate nearly as easily as paint, so that lead in tile is not an important source of exposure, except possibly during demolition or rehab. However, lead in tile is not the only source of LBP in homes built 1978 or later. In AHHS, 1,977,000 of the 2,675,000 post-77 units with LBP (74%) were so classified due to ceramic surfaces only (see Table 4-2); in AHHS II ceramics-only accounted for 1,544,000 of the 3,744,000 post-77 units with LBP (41%).[33] A second source of LBP in post-77 homes is leftover paint that was still used after the 1978 ban, but the influence of this should have decreased over time. A third source may be paint from industrial sources that finds its way into the hands of homeowners or painters. Lead-based paint, sometimes at high concentrations, is still legal for industrial applications such as ships, cars, steel structures, bridges, road markings, etc. Eight post-77 homes in the AHHS II sample had LBP in non-ceramic surfaces, of which the four with the highest levels were all built 1983 or earlier, close to the 1978 ban on LBP. The most recent was built in 2000, suggesting that homes built in the last 20 years are unlikely to have non-ceramic LBP.

In each of the Census Regions, the percent of units with LBP shows a similarly increasing pattern to AHHS as a function of age, although the confidence intervals are wider than in AHHS. In the case of pre-1940 housing in the South, all 11 units in the sample had LBP, giving a point estimate of 100%, with a confidence interval (18.8% - 100%).[34] The number of pre-78 units with LBP decreased from AHHS in every region except the West, where it was essentially constant (6,111,000 vs 6,126,000).

The percent of LBP units shows a consistent drop from AHHS to AHHS II for the variables Urbanization (MSA versus non-MSA), Unit Type (Single- versus Multifamily), Tenure (Owner or Renter), Income (less than $35,000 per annum or not) and Government Support (yes or no). The decrease was statistically significant for non-MSA units ($p = 0.038$ one-sided), for single-family homes ($p = 0.012$ one-sided), rented units ($p= 0.022$ two-sided), units in poverty ($p = 0.006$ two-sided) and Government-supported units ($p = 0.034$ two-sided).[35] However, for pre-78 units, only the decreases for rented units and those in poverty are significant. The percent of Government-supported units with LBP has decreased by two thirds in the last 20 years, from 36% in NSLAH to 26.0% in AHHS to 12.2% in AHHS II Table B-1, when compared to Table 4-1, shows that there were no post-1977 Government supported units with LBP in either survey.

With regard to race, AHHS II showed large, statistically significant decreases from AHHS in the percent of African American and Other-Race units with LBP ($p \leq 0.001$ two-sided in both cases), but essentially no change for White units. The same is true for pre-1978 African American and Other-Race units (the percent of pre-1978 White units with LBP increased). There were no statistically significant differences in percent with LBP by race, unlike in AHHS where African American and Other Race households each had significantly higher percent LBP than White. The

[33] The much smaller percentage of ceramic-only post-77 LBP units in AHHS II compared to AHHS is not significant because of the very small number of post-77 units with LBP in both surveys.

[34] The confidence interval in this case was estimated from the CI for the number of units; it could not be estimated directly because all the sampled units had LBP.

[35] One-sided tests are used for urbanization and type because the number of units with LBP depends only on the structure and therefore the percent with LBP does not increase with time. Two-sided tests are used for tenure, income and Government support because the number of LBP units in these cases depends on the occupants as well as the structure.

lack of significant differences by race is the same finding as in NSLAH, suggesting that the AHHS results were somehow anomalous. With regard to ethnicity, the percent LBP decreased from AHHS for both Hispanic and non-Hispanic units, although neither decrease was statistically significant, and both were much smaller for pre-78 units. As in AHHS and NSLAH, Hispanic households had a slightly higher percent LBP but the difference was again not statistically significant.

Table 4-2 shows the number and percent of homes with LBP on ceramic surfaces, and the number and percent classified as containing LBP only due to readings on ceramic surfaces, both overall and by housing age. An estimated 6,292,000 homes had LBP on one or more ceramic surfaces, of which 3,671,000 (58%) were classified as LBP-containing only because of ceramic readings. All age categories have lead in ceramics, the prevalence being highest for 1940-1959. The number classified as LBP only because of ceramic readings decreases with age, as one would expect. Of the number with LBP on ceramics, the percent classified as LBP only because of ceramics decreased from 100% for post-77 housing to 23% for pre-1940 housing. The true incidence of homes with lead in ceramic surfaces is almost certainly higher than these estimates because the room selection procedure used in AHHS and AHHS II 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.

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 6 million or more homes with tile lead levels of 1.0 mg/cm^2 or greater. It appears unlikely that lead in ceramic tile results in elevated levels of lead in dust under normal circumstances because the surface glaze encapsulates the lead. However, it is certainly possible that lead could be released under some circumstances, such as demolition [6], exposure to acidic agents, abrasion, drilling, or cutting tiles.

Table 4-3 breaks down LBP prevalence by interior and exterior occurrence. There is a statistically significant decrease from AHHS to AHHS II in the percent of units with exterior LBP only ($p = 0.036$). The number with both interior and exterior LBP has decreased from 20,260,000 in NSLAH to 16,203,000 in AHHS to 14,251,000 in AHHS II. The decrease from NSLAH to AHHS II is statistically significant ($p = 0.008$). This is considerably larger than the decrease in units with LBP anywhere from NSLAH to AHHS II, consistent with the effect of renovation, remodeling and lead hazard control activities, which typically do not remove all LBP. For example, window replacement may remove all exterior LBP but not all interior, moving the unit from "interior and exterior" to "interior only" LBP.

The next table, Table 4-4, compares the prevalence of housing units with deteriorated and significantly deteriorated LBP between AHHS and AHHS II, by interior and exterior occurrence. Deteriorated paint means any deterioration no matter how small the area of deterioration. AHHS, consistent with 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 and AHHS II, 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 exact definition of "significantly deteriorated" cannot be exactly replicated. To maximize comparability between the three surveys, the following definition of "significantly deteriorated" was adopted:

> INTERIOR PAINT: ≥1% deteriorated on walls; ≥11% deteriorated on other components;
> EXTERIOR PAINT: ≥1% deteriorated on siding; ≥91% deteriorated on doors; ≥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 AHHS and AHHS II definitions of "significantly deteriorated paint" are the same, and the NSLAH, AHHS and AHHS II definitions closely match in most cases.

The total number of housing units with some deteriorated LBP increased from 20,920,00 in AHHS to 24,393,000 in AHHS II, an increase of 17% on top of a 20% increase from NSLAH to AHHS. The increase from NSLAH to AHHS II is statistically significant ($p = 0.012$ two-sided). The increase is driven by an 84% increase in the number of homes with both interior and exterior deteriorated LBP, also significant ($p = 0.008$). The number of units with significantly deteriorated LBP increased from 15,331,000 in AHHS to 18,191,000 in AHHS II, an increase of 19%, also on top of an increase of 12% from NSLAH to AHHS. However, the increase from NSLAH to AHHS II is not significant in this case. The increase in units with significant deterioration both interior and exterior from NSLAH to AHHS II was much larger, 109% (significant at $p = 0.014$). The picture that emerges is one of increasing deterioration of paint as the housing stock ages, reinforced by the decrease in the total number of units with LBP. The percent of LBP homes with significant deterioration of the LBP increased from 35% in NSLAH to 53% in AHHS II.

Table 4-5 shows the prevalence of deteriorated and significantly deteriorated LBP by housing age category. The number and percent of units with deteriorated and significantly deteriorated LBP increased from AHHS to AHHS II in all age categories. None of the increases are statistically significant, however. Between NSLAH and AHHS, a significant increase in deterioration and significant deterioration of LBP was found for units built 1960-1977. There were increases in this age category from AHHS to AHHS II, but not significant ones. Homes built 1960-1977 are 13 years older in AHHS II than in AHHS, so perhaps most deterioration had already occurred by 2005.

Table 4-6 shows the distribution of maximum paint lead loadings in the interior, on the exterior and anywhere in the dwelling unit. Table 4-7 breaks down Table 4-6 by housing age. The pattern in Table 4-6 shows significant increases from AHHS to AHHS II in the percent of maximum XRF readings (lead loadings) exceeding the lowest and highest lead levels, and decreases for lead levels in between, many of them significant, especially on the exterior. This is a very different pattern than that between NSLAH and AHHS where across-the-board decreases were seen. However, the percent of homes with readings $\geq$ 10 mg/cm^2 in AHHS II is still below the corresponding NSLAH percentage. For example, 9.8% of AHHS II homes had a reading $\geq$ 10 mg/cm^2 compared to 14% in NSLAH. The increases from AHHS to AHHS II may be due, in part, to differences between the XRF instruments. AHHS and NSLAH used the NITON, which employs primarily L-Shell X rays to detect lead in paint. AHHS II used the Heuresis (now Viken) Pb200i, which utilizes more penetrating K-Shell X rays and is therefore more likely to detect deeply buried lead in older paint which has the highest levels of lead. Table 4-7 shows very little change for pre-1960 housing between AHHS and AHHS II for all but the 10 mg/cm^2 level, where there is a large increase. This is consistent with the greater penetration and superior detection of deeply buried lead by the Heuresis instrument, since older homes tend to have more coats of paint than newer homes.

Table 4-1. Comparison of Prevalence of Lead-Based Paint (LBP) by Selected Housing Unit (HU) Characteristics between AHHS and (AHHS II in red)								
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]	106,033 117,751	37,058 34,598	34,047 29,914	40,068 39,283	34.9% 29.4%	32.1% 25.4%	37.8% 33.4%	1,131 703
Region:								
Northeast	20,190 20,993	10,121 9,273	8,722 6,601	11,519 11,945	50.1% 44.2%	43.3% 30.9%	57.0% 57.4%	196 139
Midwest	23,994 26,699	9,358 9,514	7,924 6,715	10,791 12,313	39.0% 35.6%	33.4% 28.3%	44.6% 43.0%	245 161
South	38,996 43,640	11,003 9,561	9,114 7,379	12,892 11,743	28.2% 21.9%	23.2% 16.5%	33.3% 27.4%	440 240
West	22,853 26,420	6,576 6,250	5,345 4,764	7,808 7,736	28.8% 23.7%	23.8% 16.3%	33.8% 31.1%	250 163
Construction Year:								
1978-2005 1978-2017	40,458 57,919	2,675 3,744	1,458 1,670	3,893 5,818	6.6% 6.5%	3.6% 3.0%	9.6% 9.9%	476 224
1960-1977	29,956 25,599	7,376 6,045	5,761 4,375	8,991 7,714	24.6% 23.6%	19.5% 18.3%	29.8% 28.9%	306 225
1940-1959	18,117 18,178	11,921 11,098	10,645 8,695	13,197 13,501	65.8% 61.0%	58.6% 51.7%	73.0% 70.4%	187 154
Before 1940	17,502 16,055	15,085 13,712	13,932 10,459	16,239 16,965	86.2% 85.4%	79.7% 77.4%	92.7% 93.4%	162 100
Region by Construction Year:								
Northeast								
HUs built 1978-2005 HUs built 1978-2017	3,831 6,123	224 532	0 0	544 1,179	5.9% 8.7%	0% 0.0%	14.1% 18.4%	35 37
HUs built 1960-1977	5,288 4,346	1,228 695	659 141	1,797 1,249	23.2% 16.0%	12.4% 3.3%	34.0% 28.7%	57 28
HUs built 1940-1959	4,156 4,180	2,492 2,432	1,748 832	3,237 4,032	60.0% 58.2%	42.1% 31.6%	77.9% 84.7%	42 31
HUs built before 1940	6,915 6,344	6,176 5,614	5,473 4,041	6,878 7,188	89.3% 88.5%	79.2% 75.0%	99.5% 100%	62 43
Midwest								
HUs built 1978-2005 HUs built 1978-2017	8,319 11,826	244 1,604	2 0	487 3,335	2.9% 13.6%	0.0% 0.0%	5.9% 26.4%	107 51
HUs built 1960-1977	5,844 5,213	1,389 1,284	573 277	2,204 2,290	23.8% 24.6%	11.4% 12.0%	36.1% 37.2%	58 50
HUs built 1940-1959	4,436 4,693	3,268 2,994	2,603 1,575	3,933 4,413	73.7% 63.8%	58.0% 48.9%	89.3% 78.7%	36 28
HUs built before 1940	5,395 4,966	4,456 3,633	3,708 1,863	5,204 5,402	82.6% 73.2%	69.1% 58.3%	96.1% 88.0%	44 32

Table 4-1. Comparison of Prevalence of Lead-Based Paint (LBP) by Selected Housing Unit (HU) Characteristics between AHHS and (AHHS II in red)								
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 1978-2005	18,625	1,742	678	2,805	9.4%	3.7%	15.0%	221
HUs built 1978-2017	25,647	1,484	577	2,392	5.8%	2.0%	9.5%	94
HUs built 1960-1977	11,724	3,241	2,138	4,344	27.6%	18.7%	36.6%	122
	10,237	2,475	1,481	3,470	24.2%	16.5%	31.9%	81
HUs built 1940-1959	5,575	3,475	2,976	3,974	62.3%	52.9%	71.8%	71
	5,374	3,220	2,483	3,958	59.9%	45.4%	74.5%	54
HUs built before 1940	3,072	2,545	2,075	3,015	82.9%	67.7%	98.0%	26
	2,381	2,381	448	4,315	100%	18.8%	100%	11
West								
HUs built 1978-2005	9,682	465	24	906	4.8%	0.4%	9.2%	113
HUs built 1978-2017	14,323	124	0	373	0.9%	0.0%	2.6%	42
HUs built 1960-1977	7,101	1,518	864	2,172	21.4%	11.9%	30.9%	69
	5,803	1,591	900	2,282	27.4%	14.9%	39.9%	66
HUs built 1940-1959	3,949	2,686	2,090	3,281	68.0%	53.1%	82.9%	38
	3,931	2,452	1,641	3,262	62.4%	42.1%	82.7%	41
HUs built before 1940	2,121	1,908	1,684	2,131	89.9%	79.4%	100%	30
	2,363	2,084	972	3,196	88.2%	68.9%	100%	14
Urbanization:								
MSA	80,101	28,455	25,178	31,732	35.5%	31.8%	39.2%	889
	90,723	28,678	24,700	32,657	31.6%	27.2%	36.0%	555
Non-MSA	25,933	8,603	6,145	11,061	33.2%	24.7%	41.6%	242
	27,028	5,920	3,447	8,393	21.9%	12.4%	31.4%	148
One or More Children Under Age 6:								
All HU Ages	16,833	5,742	4,237	7,247	34.1%	25.2%	43.1%	207
	14,979	4,271	2,833	5,709	28.5%	19.6%	37.4%	108
HUs built 1978-2017	7,995	442	92	792	5.5%	1.1%	10.0%	103
	7,258	474	0	1,047	6.5%	0.0%	14.1%	32
HUs built 1960-1977	4,002	1,370	819	1,920	34.2%	20.8%	47.7%	48
	3,754	945	297	1,593	25.2%	11.0%	39.3%	41
HUs built 1940-1959	2,641	2,117	1,234	2,999	80.2%	63.5%	96.8%	33
	1,709	1,021	330	1,711	59.7%	40.7%	78.7%	19
HUs built before 1940	2,196	1,813	878	2,749	82.6%	63.8%	100%	23
	2,258	1,831	818	2,845	81.1%	59.1%	100%	16
Housing Unit Type:								
Single family	89,156	33,354	30,699	36,010	37.4%	34.4%	40.4%	950
	95,590	29,907	25,745	34,070	31.3%	26.8%	35.8%	571
Multi-family	16,877	3,703	2,104	5,303	21.9%	13.5%	30.4%	181
	22,161	4,691	2,522	6,860	21.2%	12.6%	29.7%	132

Table 4-1. Comparison of Prevalence of Lead-Based Paint (LBP) by Selected Housing Unit (HU) Characteristics between AHHS and (AHHS II in red)								
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	73,627	24,513	21,644	27,381	33.3%	29.8%	36.8%	772
	75,302	22,679	19,206	26,152	30.1%	25.6%	34.7%	419
Renter-occupied	32,407	12,545	10,466	14,624	38.7%	32.8%	44.6%	359
	42,449	11,919	8,764	15,075	28.1%	21.0%	35.2%	284
Imputed								2
Household Income:								
< $30,000/year	37,059	14,808	12,632	16,984	40.0%	34.2%	45.7%	401
< $35,000/year	45,994	15,352	12,426	18,278	33.4%	27.5%	39.3%	308
≥ $30,000/year	68,975	22,249	19,461	25,038	32.3%	28.7%	35.8%	730
≥ $35,000/year	71,757	19,246	15,296	23,197	26.8%	21.9%	31.8%	395
Imputed								70
								32
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
	14,979	4,271	2,833	5,709	28.5%	19.6%	37.4%	108
< $30,000/year	5,781	1,978	1,063	2,895	34.2%	19.6%	48.9%	74
< $35,000/year	5,365	2,174	1,020	3,328	40.5%	23.3%	57.8%	47
≥ $30,000/year	11,052	3,764	2,491	5,036	34.1%	23.4%	44.7%	133
≥ $35,000/year	9,614	2,097	1,013	3,180	21.8%	11.4%	32.2%	61
Imputed								16
								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
	14,979	4,271	2,833	5,709	28.5%	19.6%	37.4%	108
In Poverty	3,423	1,019	317	1,720	29.8%	12.4%	47.1%	43
	4,223	1,503	552	2,454	35.6%	18.6%	52.6%	41
Not in Poverty	13,410	4,724	3,414	6,033	35.2%	25.8%	44.7%	164
	10,756	2,768	1,668	3,867	25.7%	16.1%	35.3%	67
Imputed								16
								1
Government Support:								
Government support	5,870	1,528	724	2,332	26.0%	14.6%	37.4%	65
	10,781	1,316	641	1,991	12.2%	6.0%	18.4%	70
No government support	99,522	35,237	32,276	38,199	35.4%	32.6%	38.2%	1,059
	106,023	33,176	28,622	37,730	31.3%	27.2%	35.4%	626
Refusal/Don't Know	641							7
	948							7

Table 4-1. Comparison of Prevalence of Lead-Based Paint (LBP) by Selected Housing Unit (HU) Characteristics between AHHS and (AHHS II in red)								
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*	
Poverty by Urbanization:								
MSA								
In poverty	10,469 15,345	4,226 3,193	2,769 1,878	5,682 4,507	40.4% 20.8%	30.6% 12.4%	50.1% 29.2%	125 119
Not in poverty	69,632 75,378	24,229 25,486	21,101 21,821	27,357 29,151	34.8% 33.8%	30.8% 28.8%	38.8% 38.8%	764 436
Non-MSA								
In poverty	4,124 4,995	1,586 1,342	529 377	2,643 2,307	38.5% 26.9%	16.9% 4.9%	60.0% 48.8%	41 38
Not in poverty	21,809 22,033	7,017 4,578	4,338 2,595	9,697 6,561	32.2% 20.8%	21.7% 12.4%	42.7% 29.2%	201 110
All Housing								
In poverty	14,593 20,340	5,811 4,534	4,035 2,904	7,588 6,165	39.8% 22.3%	30.4% 14.1%	49.3% 30.5%	166 157
Not in poverty	91,441 97,411	31,246 30,064	28,079 25,897	34,414 34,231	34.2% 30.9%	31.0% 26.5%	37.4% 35.2%	965 546
Imputed								98 5
Race:								
White	82,739 89,252	26,105 27,463	23,449 23,284	28,760 31,641	31.6% 30.8%	28.5% 26.1%	34.6% 35.4%	868 502
African American	13,161 17,179	5,957 4,328	4,292 3,114	7,622 5,541	45.3% 25.2%	35.1% 18.1%	55.6% 32.2%	151 126
Other[f]	10,134 11,321	4,996 2,808	3,467 1,235	6,525 4,382	49.3% 24.8%	41.7% 13.5%	56.9% 36.1%	112 75
Imputed								2 11
Ethnicity:								
Hispanic/Latino	13,175 15,538	4,860 4,829	3,430 3,247	6,290 6,411	36.9% 31.1%	28.7% 23.2%	45.1% 38.9%	158 120
Not Hispanic/Latino	92,858 102,213	32,198 29,769	28,989 24,937	35,406 34,602	34.7% 29.1%	31.5% 24.5%	37.8% 33.8%	973 583
Imputed								2

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

Table 4-2. Lead in Ceramic Surfaces (AHHS II in Red)							
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							
Built 1978-2005	40,458	2,196	1,139	3,258	5.4%	2.8%	8.0%
Built 1978-2017	57,919	1,544	302	2,787	2.7%	0.4%	4.9%
Built 1960-1977	29,956	2,055	937	3,172	6.9%	3.1%	10.6%
	25,599	1,705	830	2,580	6.7%	3.6%	9.7%
Built 1940-1959	18,117	1,237	555	1,919	6.8%	3.1%	10.6%
	18,178	1,760	727	2,794	9.7%	4.1%	15.3%
Built before 1940	17,503	1,452	578	2,326	8.3%	3.3%	13.3%
	16,055	1,282	359	2,204	8.0%	2.8%	13.2%
All Years	106,033	6,940	4,790	9,089	6.5%	4.5%	8.6%
	117,751	6,292	3,905	8,678	5.3%	3.3%	7.4%
HUs Classified as Containing LBP Due Only to Ceramic Reading(s)							
Built 1978-Present	40,458	1,977	1,095	2,859	4.9%	2.7%	7.1%
Built 1978-2017	57,919	1,544	302	2,787	2.7%	0.4%	4.9%
Built 1960-1977	29,956	1,516	307	2,725	5.1%	1.0%	9.1%
	25,599	996	370	1,621	3.9%	1.6%	6.2%
Built 1940-1959	18,117	670	169	1,171	3.7%	0.9%	6.5%
	18,178	836	123	1,549	4.6%	0.6%	8.6%
Built before 1940	17,503	287	0	628	1.6%	0%	3.6%
	16,055	295	0	721	1.8%	0.0%	4.5%
All Years	106,033	4,451	2,585	6,316	4.2%	2.4%	6.0%
	117,751	3,671	1,879	5,463	3.1%	1.6%	4.7%

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

[b] Estimated percentages are calculated with "all HUs" in 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 II in RED)

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	11,115	8,396	13,835	10.5%	7.9%	13.1%	118
	12,599	9,105	16,092	10.7%	7.7%	13.7%	91
Both Interior and Exterior	16,203	14,065	18,340	15.3%	13.3%	17.3%	155
	14,251	10,442	18,060	12.1%	8.9%	15.3%	103
Exterior Only	9,740	8,058	11,422	9.2%	7.6%	10.8%	100
	7,749	5,541	9,956	6.6%	4.7%	8.5%	59
Subtotal – LBP anywhere in Building	37,058	34,047	40,068	34.9%	32.1%	37.8%	373
	34,598	29,914	39,283	29.4%	25.4%	33.4%	253
No LBP in Building	68,976	65,769	72,183	65.1%	62.2%	67.9%	758
	83,153	73,779	92,526	70.6%	62.7%	78.6%	450
All HUs	106,033			100%			1,131
	117,751			100%			703

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

[b] Estimated percentages are calculated with total housing units (106,033) (117,751) 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 II in RED)

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	3,952 5,320	2,546 3,464	5,357 7,175	3.7% 4.5%	2.4% 2.9%	5.1% 6.1%	40 44
Both Interior and Exterior	8,204 11,476	6,072 7,791	10,336 15,161	7.7% 9.7%	5.8% 6.6%	9.7% 12.9%	80 80
Exterior Only	8,764 7,598	6,965 5,256	10,564 9,939	8.3% 6.5%	6.6% 4.5%	10.0% 8.4%	88 61
Total with Deteriorated LBP	20,920 24,393	18,222 19,439	23,617 29,347	19.7% 20.7%	17.2% 16.5%	22.2% 25.0%	208 185
No Deteriorated LBP	85,114 93,358	82,370 83,453	87,857 103,262	80.3% 79.3%	77.8% 75.0%	82.8% 83.5%	923 518
All HUs	106,033 117,751			100% 100%			1,131 703

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	3,497 3,548	2,362 2,043	4,631 5,053	3.3% 3.0%	2.2% 1.7%	4.4% 4.3%	35 29
Both Interior and Exterior	3,182 7,305	1,952 4,489	4,413 10,122	3.0% 6.2%	1.9% 3.8%	4.2% 8.6%	31 48
Exterior Only	8,652 7,337	6,835 5,049	10,469 9,625	8.2% 6.2%	6.5% 4.3%	9.9% 8.2%	84 57
Total with Significantly Deteriorated LBP	15,331 18,191	12,784 13,428	17,879 22,953	14.5% 15.4%	12.1% 11.4%	16.8% 19.5%	150 134
No Significantly Deteriorated LBP	90,702 99,560	88,200 89,497	93,204 109,624	85.5% 84.6%	83.2% 80.5%	87.9% 88.6%	981 569
All HUs	106,033 117,751			100% 100%			1,131 703

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

[b] Estimated percentages are calculated with total housing units (106,033) (117,751) 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 II in RED)

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*
1978-2005	40,458	308	0	669	0.8%	0.0%	1.7%
1978-2017	57,919	861	15	1,707	1.5%	0.0%	3.0%
1960-1977	29,956	2,953	1,795	4,110	9.9%	6.1%	13.6%
	25,599	3,935	2,494	5,376	15.4%	10.2%	20.5%
1940-1959	18,117	6,579	4,906	8,251	36.3%	27.1%	45.6%
	18,178	8,341	6,435	10,247	45.9%	38.1%	53.7%
Before 1940	17,503	11,081	9,616	12,546	63.3%	55.0%	71.6%
	16,055	11,257	7,757	14,756	70.1%	57.5%	82.7%
All Years	106,033	20,920	18,222	23,617	19.7%	17.2%	22.2%
	117,751	24,393	19,439	29,347	20.7%	16.5%	25.0%

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]*	*Upper 95% CI*	*Estimate*	*Lower 95% CI[c]*	*Upper 95% CI*
1978-2005	40,458	109	0	265	0.3%	0%	0.7%
1978-2017	57,919	724	0	1,640	1.3%	0.0%	2.8%
1960-1977	29,956	1,822	853	2,792	6.1%	3.0%	9.2%
	25,599	1,924	908	2,939	7.5%	3.4%	11.6%
1940-1959	18,117	4,547	2,998	6,097	25.1%	16.5%	33.7%
	18,178	5,612	4,048	7,177	30.9%	22.8%	38.9%
Before 1940	17,503	8,852	7,426	10,279	50.6%	42.5%	58.7%
	16,055	9,930	6,556	13,305	61.9%	50.4%	73.3%
All Years	106,033	15,331	12,784	17,879	14.5%	12.1%	16.8%
	117,751	18,191	13,428	22,953	15.4%	11.4%	19.5%

[a] "Housing units" include permanently occupied, noninstitutional housing units in which children are permitted to live.
[b] Estimated percentages are calculated with "total HUs" in 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 II in RED; Statistically Significant Increases and Decreases Highlighted)

Maximum Paint Lead Loading in HU	*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*
>= 0.3 mg/cm²	39.5%	36.2%	42.8%	34.5%	32.1%	37.0%	48.9%	45.8%	52.1%
	76.5%	71.2%	81.9%	50.8%	45.7%	55.8%	83.7%	80.3%	87.1%
>= 0.6 mg/cm²	31.4%	28.4%	34.3%	29.4%	27.1%	31.7%	41.2%	38.3%	44.1%
	30.9%	26.7%	35.0%	23.5%	19.7%	27.3%	38.0%	34.0%	41.9%
>= 0.8 mg/cm²	27.9%	25.0%	30.9%	26.4%	24.1%	28.6%	36.8%	33.9%	39.7%
	25.9%	21.6%	30.2%	20.4%	16.5%	24.2%	32.2%	28.1%	36.4%
>= 1.0 mg/cm²	25.8%	22.9%	28.6%	24.5%	22.1%	26.8%	34.9%	32.1%	37.8%
	22.8%	18.7%	26.9%	18.7%	14.8%	22.5%	29.4%	25.4%	33.4%
>= 1.3 mg/cm²	23.9%	21.2%	26.5%	23.1%	20.6%	25.7%	32.6%	29.9%	35.3%
	20.2%	16.2%	24.3%	16.8%	13.3%	20.3%	26.2%	22.5%	30.0%
>= 4.0 mg/cm²	12.3%	9.9%	14.6%	11.6%	9.3%	13.9%	18.9%	16.2%	21.5%
	12.8%	9.7%	15.9%	9.8%	6.6%	12.9%	16.4%	13.0%	19.8%
>= 10.0 mg/cm²	3.8%	2.8%	4.9%	2.7%	1.6%	3.8%	6.0%	4.3%	7.6%
	6.4%	4.4%	8.4%	5.9%	3.5%	8.3%	9.8%	6.7%	13.0%

[a]All percentages are calculated with total housing units (106,033) (117,751) 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.

Table 4-7. Distribution of Maximum Paint Lead Loading by Location in the Building and Construction Year (AHHS II in RED)					
Largest Paint Lead Loading in the Housing Unit	***Percent of HUs[a,b] by Year of Construction***				
	1978-1998	***1960-1977***	***1940-1959***	***Before 1940***	***Subtotal***
Interior					
>= 0.3 mg/cm²	13.1% 66.7%	30.6% 75.7%	69.5% 92.3%	84.6% 95.4%	39.5% 76.5%
>= 0.6 mg/cm²	8.6% 10.6%	21.3% 27.5%	55.7% 61.9%	76.1% 74.3%	31.4% 30.9%
>= 0.8 mg/cm²	6.6% 8.1%	18.5% 18.2%	48.5% 51.9%	72.1% 73.0%	27.9% 25.9%
>= 1.0 mg/cm²	6.2% 6.0%	16.7% 15.3%	43.1% 45.1%	68.8% 70.0%	25.8% 22.8%
>= 1.3 mg/cm²	4.2% 4.8%	15.7% 11.6%	39.9% 38.3%	66.7% 69.2%	23.9% 20.2%
>= 4.0 mg/cm²	2.1% 2.9%	6.8% 4.3%	15.4% 21.8%	41.8% 51.6%	12.3% 12.8%
>= 10.0 mg/cm²	0.2% 0.4%	1.3% 1.8%	2.6% 12.0%	17.8% 29.1%	3.8% 6.4%
Exterior					
>= 0.3 mg/cm²	4.1% 35.1%	29.2% 46.3%	65.9% 77.4%	81.5% 84.2%	34.5% 50.8%
>= 0.6 mg/cm²	1.6% 2.8%	21.5% 19.3%	59.5% 49.5%	75.9% 75.5%	29.4% 23.5%
>= 0.8 mg/cm²	0.7% 2.2%	16.6% 14.2%	55.3% 44.7%	72.4% 68.1%	26.4% 20.4%
>= 1.0 mg/cm²	0.6% 1.2%	14.3% 12.1%	50.7% 39.9%	69.8% 68.1%	24.5% 18.7%
>= 1.3 mg/cm²	0.6% 1.2%	13.5% 9.4%	46.8% 35.5%	67.2% 63.5%	23.1% 16.8%
>= 4.0 mg/cm²	0.3% 0.5%	4.0% 2.3%	19.9% 17.3%	42.4% 46.6%	11.6% 9.8%
>= 10.0 mg/cm²	0% 0.5%	1.1% 0.4%	4.0% 6.9%	10.4% 33.5%	2.7% 5.9%
Anywhere in Building					
>= 0.3 mg/cm²	16.6% 75.8%	45.4% 83.6%	83.4% 96.9%	94.1% 97.5%	48.9% 83.7%
>= 0.6 mg/cm²	9.8% 12.4%	33.4% 39.4%	75.5% 73.3%	91.5% 88.1%	41.2% 38.0%
>= 0.8 mg/cm²	7.1% 9.4%	27.2% 27.2%	68.8% 63.6%	88.8% 87.1%	36.8% 32.2%
>= 1.0 mg/cm²	6.6% 6.5%	24.6% 23.6%	65.8% 61.0%	86.2% 85.4%	34.9% 29.4%
>= 1.3 mg/cm²	4.7% 5.2%	23.1% 18.3%	60.8% 55.3%	84.0% 81.6%	32.6% 26.2%
>= 4.0 mg/cm²	2.4% 2.9%	9.6% 6.2%	29.6% 30.2%	61.8% 65.7%	18.9% 16.4%
>= 10.0 mg/cm²	0.2% 0.8%	2.4% 2.3%	6.1% 16.1%	25.3% 47.4%	6.0% 9.8%

[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 in each age category as the denominator.

5.0 SIGNIFICANT LEAD-BASED PAINT HAZARDS IN HOUSING

NSLAH and AHHS defined a *significant LBP hazard* in a housing unit as the presence, at any location in the unit, of (a) significantly deteriorated LBP (as defined previously), or (b) a dust lead hazard, i.e., a floor dust lead level equal to 40 μg/ft^2 or greater, or a windowsill dust lead level equal to 250 μg/ft^2 or greater, or (c) a soil lead hazard, i.e., 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. Since new, lower, thresholds for lead in dust were effective January 6, 2020, AHHS II also used a second, more stringent, definition of dust lead hazard, i.e., a floor dust lead level equal to 10 μg/ft^2 or greater, or a windowsill dust lead level equal to 100 μg/ft^2 or greater.[36]

Table 5-1 shows the prevalence of significant LBP hazards for various subpopulations using both the old and new definitions of lead dust hazard, for both AHHS and AHHS II. AHHS II estimates are shown in RED; results for the new dust standard are in BOLDFACE. For example, black boldface indicates AHHS results for the new standard. The estimated total number of units with significant LBP hazards decreased by 878,000 (3.8%) from AHHS to AHHS II under the old definition of dust hazard, and by 1,249,000 (4.1%) under the new definition. Neither decrease was statistically significant. It is not surprising that the 2,460,000 decrease in homes with LBP did not translate into as large a decrease in LBP hazards under either standard, because the number with significantly deteriorated LBP increased by 2,860,000. This was offset by decreases of 3,096,000 in homes with dust hazards (old standard) and 2,780,00 (new standard), and a decrease of 1,498,000 in home with soil hazards (Table 5-3), resulting in the modest decrease in homes with LBP hazards. In both surveys, there were approximately 7M more homes with significant LBP hazards under the new dust standard.

By region, the West and Midwest showed increases in the number of units with significant LBP hazards under both dust standards from AHHS to AHHS II, while the Northeast and South showed decreases; however, these changes were not significant. By age, homes built 1940-59 showed increases in LBP hazards, with decreases for those built 1960-77 and pre-40, under both dust hazard standards. Post 1977 homes showed a modest number of homes with significant LBP hazards under both standards. This 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.

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[36] The hazard standards for lead in dust and soil used in this report were promulgated by the U.S. under sections 401 and 402 of the Toxic Substances Control Act (TSCA), which were created by the Residential Lead-Based Paint Hazard Reduction Act of 1992 (also referred to as Title X). Although Title X defines these hazards as "lead-based paint hazards", this should not be interpreted to mean that lead-based paint is the only source of lead in these media. For example, an important source of lead in the environment is from the past use of lead in gasoline, which peaked in the early 1970's (*The Rise and Fall of Leaded Gasoline.* J.O. Nriagu. Sci. Total Env. 92 1-28 *at* 16, 1990. https://doi.org/10.1016/0048-9697(90)90318-O). On the general point, EPA has noted that,

> "Lead-based paint hazards … are not limited to the hazards from paint, alone, because they include conditions that cause exposure to residential lead-contaminated dust and soil, regardless of the source of lead." (EPA. Lead; Identification of Dangerous Levels of Lead; Proposed Rule. 63 FR 30302 *at* 30303. June 3, 1998. https://www.federalregister.gov/d/98-14736.)

For homes with children under the age of 6, the number with significant LBP hazards decreased from AHHS under both dust standards, but the decreases were not statistically significant. There was a larger decrease (old dust standard) from 4,155,000 in NSLAH to 2,610,000 in AHHS II (37%), though not quite statistically significant (p = 0.088). For higher-income homes with children under age 6, under the old dust standard, the number with LBP hazards decreased from 2,447,000 in AHHS to 1,018,000, and the percent from 22.1% to 10.6%. The decrease in number was statistically significant (p = 0.036), that in percent almost so (p = 0.058). Under the new dust standard, there was a larger decrease from 2,844,000 to 1,199,000 and from 25.7% to 12.5%, both statistically significant (p = 0.034 and 0.04, respectively). For homes in poverty with children under 6, there were no significant changes in number or percent of homes with LBP hazards under both standards.

The only statistically significant changes in the number or percent of units with significant LBP hazards for urbanization, unit type, tenure, household income, Government support or poverty were:

- a decrease in the percent for poor homes from 30.2% in AHHS to 15.9% in AHHS II under the old dust standard (p = 0.004), and from 36.1% to 23.6% under the new standard (p = 0.03).
- a decrease in the percent for rented homes from 25.2% to 16.8% under the old dust standard (p = 0.04). The decrease from 30.9% to 24.0% under the new standard was not significant.

These decreases under the old standard build on decreases from 38% and 30%, respectively (old dust standard), in NSLAH.

With regard to race and ethnicity, the percent of African American homes with LBP hazards decreased significantly (old dust standard) from 28.2% in AHHS to 13.5% in AHHS II (p = 0.016 two-sided). There was a larger decrease from 42.0% to 21.6% under the new standard (p = 0.004). No other significant changes were noted.

Appendix B contains the same breakdowns as Table 5-1 but aggregated over all pre-1978 housing. Under the old dust standard, an estimated 20,664,000 (34.5%) pre-1978 homes had significant LBP hazards compared to 22,103,000 (33.7%) in AHHS. The comparable figures for the new dust standard are 27,095,000 (41.3%) and 26,335,000 (43.8%). Thus, there was a decrease in the number of pre-1978 homes with significant LBP hazards from AHHS to AHHS II under both dust standards, but the percent went up slightly, due to an estimated decrease of 5,744,000 (8.6%) in the total number of pre-1978 homes. The decrease in the number of pre-1978 homes in consistent with estimates of the annual rate of demolition of homes at 0.6% - 0.96% [6].

Some but not all the significant decreases from AHHS to AHHS II noted for all homes carried through to pre-1978 homes. The decrease in the percent of rented homes with significant LBP hazards under the old dust standard was no longer significant for pre-1978 homes. The decrease in percent of poor homes with significant LBP hazards was significant under both dust standards, but only for the old standard for pre-1978 homes. For African American homes, the percent of all

homes with significant LBP hazards decreased significantly under both dust standards but only the decrease for the new standard remained significant for pre-1978 homes.

Table 5-2 shows the prevalence of significant LBP hazards by location in the building (interior or exterior). Under the old dust standard, there was a statistically significant decrease in the number ($p = 0.038$) and percent ($p = 0.006$) of units with LBP hazards in the interior only. For the new standard, only the decrease in percent was significant ($p = 0.01$). The number with both interior and exterior hazards showed corresponding increases (not statistically significant), while the number with exterior hazards only was essentially unchanged. This indicates an increase in exterior hazards in units that previously had only interior hazards, driven by an increase in significantly deteriorated exterior LBP presumably due to aging of the housing stock.

Table 5-3 breaks down prevalence of LBP hazards for all units and units with children under age 6 by the type of hazard. The total number of units nationwide with dust hazards under both standards decreased substantially from AHHS, by approximately 3 million, although neither decrease was statistically significant. The percent decreased from 13% to 9% under the old standard, which was statistically significant ($p = 0.012$). The decrease from 23.2% to 18.6% under the new standard was not significant, however. The drop in dust hazards was offset by an increase in the number and percent of units with significantly deteriorated paint (not significant), the net result being a modest decrease in the number of units with LBP hazards from AHHS to AHHS II under both dust standards, as noted previously. In the longer timeframe since NSLAH, the number of homes with dust hazards (old standard) showed a statistically significant decrease ($p = 0.012$ two-sided) from 15,468,000 to 10,644,00 (by almost 5 million). For households with children under 6, all three hazard types showed decreases from AHHS under both standards, but the overall drop of approximately 1M homes with significant LBP hazards was not significant.

Table 5-4 breaks down prevalence of LBP hazards by poverty status. The percent of units in poverty with significant LBP hazards under the old dust showed a statistically significant drop from 30.2% in AHHS to 15.9% in AHHS II ($p = 0.004$), and also from 36.1% to 23.6% ($p = 0.03$) under the new standard. This was driven by drops in the percent of poor units with dust hazards, from 18.6% in AHHS to 8.4% in AHHS II ($p = 0.02$) under the old standard and from 29.5% to 19.5% under the new standard ($p = 0.038$ one-sided). Table 5-5 shows the pattern of significant LBP hazards by housing age category and type of hazard. All age categories showed an increase in units with significantly deteriorated LBP (not statistically significant), and all except pre-1940 under the old standard had a decrease in units with dust hazards.

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 decreases in the percent of units with lead-related occupations and hobbies from AHHS to AHHS II, continuing the trend from NSLAH to AHHS. The decline in industrial jobs in the U.S. may explain some of the reduction in lead-related occupations. Also, continuing increased awareness of the hazards of lead could contribute to a reduction in lead-related hobbies. The number and percent of houses rated "some evidence of cleaning" and rated "average clutter" are statistically significantly greater in AHHS II than in AHHS ($p < 0.002$ and $p = 0.05$). It should be borne in mind that the cleanliness and clutter classifications are subjective, so that some differences between the AHHS II and AHHS interviewers are inevitable. For example, AHHS II interviewers may have been more inclined to average ratings on cleanliness and clutter.

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, 13.6% of homes had interior LBP hazards (old dust standard), down from 15.3% in AHHS, though not significantly. The decrease from 24.4% to 21.2% under the new dust standard was not significant either. Of homes reporting a lead related occupation, 13.7% had interior LBP hazards under the old dust standard and 23.1% under the new, not significantly different from homes not reporting a lead-related occupation. Of homes reporting a lead related hobby, 17.7% had significant interior hazards under the old dust standard, compared to 12.2% of homes without a lead related hobby. The difference was 26.7% vs 19.2% under the new standard. Differences for lead related occupations and hobbies were not statistically significant under either dust standard. Thus, lead-related occupations and hobbies do not seem to significantly increase the risk of interior lead hazards, the same conclusion reached in AHHS. 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 10.7% had significant interior LBP hazards under the old dust standard, statistically significantly less than the 26.1% of homes with no evidence of cleaning ($p = 0.02$). Likewise, only 11.4% of organized homes had significant interior hazards, also statistically significantly less than the 24.7% of homes with no organization at all ($p = 0.018$). Thus, cleanliness and lack of clutter are significant predictors of reduced incidence of interior LBP hazards. This is the same conclusion reached in AHHS, even though, as noted previously, the judgments on cleaning and clutter in AHHS II seemed to differ somewhat from those in AHHS. The lower prevalence of interior hazards in clean and organized homes are presumably due to lower dust levels and/or better maintenance of paint in such households. Interestingly, the same conclusions apply even more strongly when the new dust standard is used. Clean homes had 17.2% interior hazards, significantly less than the 37.8% of homes with no evidence of cleaning ($p = 0.002$); Organized homes had 17.7% interior hazards, significantly less than the 38.1% of homes without organization ($p < 0.001$).

Table 5-1. Comparison of Prevalence of Significant Lead-Based Paint (LBP) Hazards, by Selected Housing (HU) Characteristics between AHHS and AHHS II (in RED) and Old[a] and New (in BOLD)[b] Dust Hazard Action Levels

Characteristic	*All HUs (000)*[e]	*No. of HUs with Significant LBP Hazards (000)*			*Percent*[d] *of HUs*[e] *with Significant LBP Hazards (%)*			HUs in Sample
		Estimate	*Lower 95% CI*[f]	*Upper 95% CI*	*Estimate*	*Lower 95% CI*	*Upper 95% CI*	
Total Occupied HUs	106,033	23,186	20,532	25,840	21.9%	19.4%	24.3%	1,131
	106,033	**30,222**	**25,606**	**34,837**	**28.5%**	**24.7%**	**32.3%**	**1,131**
	117,751	22,308	17,670	26,946	18.9%	14.9%	23.0%	703
	117,751	**28,973**	**23,992**	**33,955**	**24.6%**	**20.0%**	**29.2%**	**703**
Region:								
Northeast	20,190	7,507	6,014	9,001	37.2%	29.7%	44.7%	196
	20,190	**8,703**	**6,446**	**10,961**	**43.1%**	**32.2%**	**54.0%**	**196**
	20,993	5,904	3,218	8,590	28.1%	15.3%	40.9%	139
	20,993	**8,020**	**5,519**	**10,522**	**38.2%**	**25.2%**	**51.2%**	**139**
Midwest	23,994	6,398	5,257	7,539	26.7%	22.3%	31.0%	245
	23,994	**7,798**	**5,508**	**10,088**	**32.5%**	**25.5%**	**39.4%**	**245**
	26,699	6,760	4,594	8,927	25.3%	17.7%	33.0%	161
	26,699	**8,014**	**5,753**	**10,276**	**30.0%**	**21.5%**	**38.6%**	**161**
South	38,996	6,067	4,454	7,680	15.6%	11.5%	19.6%	440
	38,996	**9,174**	**6,214**	**12,134**	**23.5%**	**16.9%**	**30.2%**	**440**
	43,640	5,747	3,070	8,423	13.2%	6.8%	19.5%	240
	43,640	**7,470**	**4,241**	**10,698**	**17.1%**	**9.4%**	**24.9%**	**240**
West	22,853	3,214	2,202	4,225	14.1%	9.7%	18.4%	250
	22,853	**4,546**	**3,062**	**6,030**	**19.9%**	**13.8%**	**26.0%**	**250**
	26,420	3,897	2,336	5,458	14.8%	8.0%	21.5%	163
	26,420	**5,469**	**3,732**	**7,206**	**20.7%**	**12.6%**	**28.8%**	**163**
Construction Year:								
HUs built 1978-2005	40,458	1,083	453	1,713	2.7%	1.1%	4.3%	476
	40,458	**3,126**	**2,185**	**4,068**	**7.7%**	**5.6%**	**9.8%**	**476**
HUs built 1978-2017	57,919	1,645	142	3,147	2.8%	0.3%	5.4%	224
	57,919	**2,738**	**779**	**4,696**	**4.7%**	**1.4%**	**8.1%**	**224**
1960-1977	29,956	3,415	1,899	4,930	11.4%	6.5%	16.3%	306
	29,956	**5,842**	**3,985**	**7,699**	**19.5%**	**13.7%**	**25.3%**	**306**
	25,599	2,513	1,472	3,554	9.8%	5.6%	14.1%	225
	25,599	**4,405**	**3,058**	**5,751**	**17.2%**	**11.8%**	**22.6%**	**225**
1940-1959	18,117	6,999	5,391	8,607	38.6%	29.7%	47.6%	187
	18,117	**8,431**	**6,004**	**10,858**	**46.5%**	**38.0%**	**55.1%**	**187**
	18,178	7,098	5,183	9,014	39.0%	30.4%	47.7%	154
	18,178	**9,303**	**6,888**	**11,718**	**51.2%**	**40.1%**	**62.2%**	**154**
Before 1940	17,503	11,689	10,425	12,954	66.8%	59.6%	74.0%	162
	17,503	**12,822**	**9,296**	**16,348**	**73.3%**	**65.5%**	**81.0%**	**162**
	16,055	11,052	7,712	14,392	68.8%	57.8%	79.8%	100
	16,055	**12,527**	**9,046**	**16,009**	**78.0%**	**68.7%**	**87.3%**	**100**
Urbanization								
MSA	80,101	17,590	14,772	20,408	22.0%	18.7%	25.2%	889
	80,101	**23,483**	**19,594**	**27,373**	**29.3%**	**25.0%**	**33.7%**	**889**
	90,723	16,906	12,754	21,057	18.6%	14.1%	23.2%	555
	90,723	**22,553**	**18,418**	**26,688**	**24.9%**	**20.1%**	**29.6%**	**555**

HUD Lead Safe Housing Rule: Significant LBP Hazards[c]

Table 5-1. Comparison of Prevalence of Significant Lead-Based Paint (LBP) Hazards, by Selected Housing (HU) Characteristics between AHHS and AHHS II (in RED) and Old [a] and New (in BOLD)[b] Dust Hazard Action Levels

Characteristic	*All HUs (000)[e]*	*No. of HUs with Significant LBP Hazards (000)*			*Percent[d] of HUs[e] with Significant LBP Hazards (%)*			**HUs in Sample**
		Estimate	*Lower 95% CI[f]*	*Upper 95% CI*	*Estimate*	*Lower 95% CI*	*Upper 95% CI*	
HUD Lead Safe Housing Rule: Significant LBP Hazards[c]								
Non-MSA	25,933	5,596	3,889	7,304	21.6%	15.6%	27.6%	242
	25,933	**6,738**	**4,253**	**9,224**	**26.0%**	**18.3%**	**33.6%**	**242**
	27,028	5,403	3,336	7,470	20.0%	11.0%	29.0%	148
	27,028	**6,421**	**3,643**	**9,198**	**23.8%**	**11.6%**	**35.9%**	**148**
Housing Unit Type:								
Single family	89,156	21,942	19,478	24,406	24.6%	21.9%	27.3%	950
	89,156	**28,267**	**23,881**	**32,654**	**31.7%**	**27.5%**	**35.9%**	**950**
	95,590	20,444	16,305	24,582	21.4%	17.0%	25.8%	571
	95,590	**26,065**	**21,413**	**30,717**	**27.3%**	**22.1%**	**32.5%**	**571**
Multi-family	16,877	1,244	426	2,062	7.4%	2.6%	12.1%	181
	16,877	**1,954**	**940**	**2,968**	**11.6%**	**5.8%**	**17.4%**	**181**
	22,161	1,865	798	2,931	8.4%	3.2%	13.7%	132
	22,161	**2,908**	**1,574**	**4,242**	**13.1%**	**6.9%**	**19.4%**	**132**
Tenure:								
Owner-occupied	73,627	15,036	12,167	17,905	20.4%	16.7%	24.2%	772
	73,627	**20,206**	**16,278**	**24,134**	**27.4%**	**22.9%**	**32.0%**	**772**
	75,302	15,175	11,709	18,641	20.2%	15.7%	24.6%	419
	75,302	**18,794**	**14,906**	**22,682**	**25.0%**	**19.6%**	**30.3%**	**419**
Renter-occupied	32,407	8,150	6,383	9,916	25.2%	19.7%	30.6%	359
	32,407	**10,015**	**8,062**	**11,969**	**30.9%**	**25.0%**	**36.8%**	**359**
	42,449	7,133	4,698	9,569	16.8%	10.7%	22.9%	284
	42,449	**10,179**	**7,621**	**12,737**	**24.0%**	**17.4%**	**30.5%**	**284**
Imputed								2
Household Income:								
Less than $30,000/year	37,059	10,635	8,827	12,443	28.7%	24.2%	33.2%	401
	37,059	**12,799**	**10,252**	**15,346**	**34.5%**	**28.8%**	**40.2%**	**401**
Less than $35,000/year	45,994	11,004	7,715	14,294	23.9%	17.1%	30.8%	308
	45,994	**14,175**	**10,163**	**18,187**	**30.8%**	**22.5%**	**39.1%**	**308**
$30,000/year or more	68,975	12,551	10,027	15,075	18.2%	14.7%	21.7%	730
	68,975	**17,422**	**13,983**	**20,862**	**25.3%**	**20.8%**	**29.7%**	**730**
$35,000/year or more	71,757	11,304	8,138	14,470	15.8%	11.6%	19.9%	395
	71,757	**14,798**	**11,534**	**18,063**	**20.6%**	**16.0%**	**25.2%**	**395**
Imputed								70
AHHS II Both Dust Hazard Standards								32
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
	16,833	**4,409**	**2,711**	**6,107**	**26.2%**	**16.9%**	**35.4%**	**207**
	14,979	2,610	1,257	3,962	17.4%	9.2%	25.7%	108
	14,979	**3,317**	**1,800**	**4,835**	**22.1%**	**13.4%**	**30.9%**	**108**
Less than $30,000/year	5,781	1,138	510	1,765	19.7%	8.8%	30.6%	74
	5,781	**1,565**	**820**	**2,310**	**27.1%**	**14.6%**	**39.5%**	**74**
Less than $35,000/year	5,365	1,592	404	2,780	29.7%	12.5%	46.8%	47
	5,365	**2,119**	**784**	**3,453**	**39.5%**	**22.0%**	**57.0%**	**47**
$30,000/year or more	11,052	2,447	1,330	3,564	22.1%	12.6%	31.7%	133

Table 5-1. Comparison of Prevalence of Significant Lead-Based Paint (LBP) Hazards, by Selected Housing (HU) Characteristics between AHHS and AHHS II (in RED) and Old[a] and New (in BOLD)[b] Dust Hazard Action Levels

Characteristic	*All HUs (000)*[e]	*No. of HUs with Significant LBP Hazards (000)*			*Percent*[d] *of HUs*[e] *with Significant LBP Hazards (%)*			**HUs in Sample**
		Estimate	*Lower 95% CI*[f]	*Upper 95% CI*	*Estimate*	*Lower 95% CI*	*Upper 95% CI*	
HUD Lead Safe Housing Rule: Significant LBP Hazards[c]								
	11,052	**2,844**	**1,487**	**4,201**	**25.7%**	**15.1%**	**36.4%**	**133**
\$35,000/year or more	9,614	1,018	238	1,798	10.6%	3.0%	18.1%	61
	9,614	**1,199**	**458**	**1,940**	**12.5%**	**5.3%**	**19.7%**	**61**
Imputed								16
AHHS II Both Dust Hazard Standards								6
One or More Children Under Age 6:								
All Poverty Categories	16,833	3,585	2,205	4,966	21.3%	13.1%	29.5%	207
	16,833	**4,409**	**2,711**	**6,107**	**26.2%**	**16.9%**	**35.4%**	**207**
	14,979	2,610	1,257	3,962	17.4%	9.2%	25.7%	108
	14,979	**3,317**	**1,800**	**4,835**	**22.1%**	**13.4%**	**30.9%**	**108**
In Poverty	3,423	645	27	1,263	18.8%	1.9%	35.8%	43
	3,423	**715**	**68**	**1,362**	**20.9%**	**3.4%**	**38.4%**	**43**
	4,223	744	36	1,452	17.6%	3.0%	32.3%	41
	4,223	**1,270**	**432**	**2,109**	**30.1%**	**14.8%**	**45.3%**	**41**
Not in Poverty	13,410	2,940	1,754	4,126	21.9%	13.1%	30.7%	164
	13,410	**3,694**	**2,211**	**5,177**	**27.5%**	**17.7%**	**37.4%**	**164**
	10,756	1,866	744	2,988	17.3%	7.2%	27.5%	67
	10,756	**2,047**	**952**	**3,142**	**19.0%**	**9.0%**	**29.0%**	**67**
Imputed								16
								1
Government Support:								
Government support	5,870	721	205	1,238	12.3%	3.0%	21.6%	65
	5,870	**1,327**	**579**	**2,074**	**22.6%**	**10.2%**	**35.0%**	**65**
	10,781	1,199	442	1,957	11.1%	3.6%	18.7%	70
	10,781	**2,268**	**987**	**3,550**	**21.0%**	**9.3%**	**32.7%**	**70**
No government support	99,522	22,320	19,590	25,050	22.4%	19.8%	25.1%	1,059
	99,522	**28,602**	**24,107**	**33,098**	**28.7%**	**24.9%**	**32.6%**	**1,059**
	106,023	21,109	16,418	25,800	19.9%	15.6%	24.2%	626
	106,023	**26,705**	**21,748**	**31,662**	**25.2%**	**20.4%**	**30.0%**	**626**
Refusal/Don't Know	641							7
AHHS II Both Dust Hazard Standards	948							7
Poverty:								
In Poverty	14,593	4,407	2,986	5,828	30.2%	22.8%	37.6%	166
	14,593	**5,270**	**3,681**	**6,859**	**36.1%**	**28.1%**	**44.1%**	**166**
	20,340	3,238	1,879	4,598	15.9%	9.1%	22.7%	157
	20,340	**4,797**	**3,070**	**6,525**	**23.6%**	**15.2%**	**32.0%**	**157**
Not in Poverty	91,441	18,779	16,180	21,378	20.5%	17.8%	23.3%	965
	91,441	**24,951**	**20,523**	**29,380**	**27.3%**	**23.2%**	**31.4%**	**965**
	97,411	19,070	14,748	23,392	19.6%	15.2%	23.9%	546
	97,411	**24,176**	**19,720**	**28,632**	**24.8%**	**20.1%**	**29.6%**	**546**
Imputed								98
AHHS II Both Dust Hazard Standards								5

Table 5-1. Comparison of Prevalence of Significant Lead-Based Paint (LBP) Hazards, by Selected Housing (HU) Characteristics between AHHS and AHHS II (in RED) and Old [a] and New (in BOLD)[b] Dust Hazard Action Levels

Characteristic	*All HUs (000)[e]*	*No. of HUs with Significant LBP Hazards (000)*			*Percent [d] of HUs [e] with Significant LBP Hazards (%)*			**HUs in Sample**
		Estimate	*Lower 95% CI[f]*	*Upper 95% CI*	*Estimate*	*Lower 95% CI*	*Upper 95% CI*	
HUD Lead Safe Housing Rule: Significant LBP Hazards[c]								
Race:								
White	82,739	16,778	14,533	19,022	20.3%	17.7%	22.8%	868
	82,739	**21,355**	**17,402**	**25,309**	**25.8%**	**21.7%**	**29.9%**	**868**
	89,252	18,238	14,341	22,136	20.4%	15.8%	25.0%	502
	89,252	**22,819**	**18,521**	**27,116**	**25.6%**	**20.3%**	**30.8%**	**502**
African American	13,161	3,727	2,455	5,000	28.3%	20.6%	36.1%	151
	13,161	**5,528**	**3,843**	**7,213**	**42.0%**	**32.4%**	**51.6%**	**151**
	17,179	2,318	485	4,151	13.5%	4.0%	22.9%	126
	17,179	**3,714**	**1,561**	**5,868**	**21.6%**	**11.2%**	**32.1%**	**126**
Other[g]	10,134	2,681	1,863	3,499	26.5%	19.8%	33.1%	112
	10,134	**3,339**	**2,326**	**4,351**	**32.9%**	**25.2%**	**40.7%**	**112**
	11,321	1,752	427	3,077	15.5%	4.6%	26.3%	75
	11,321	**2,440**	**957**	**3,923**	**21.6%**	**8.9%**	**34.2%**	**75**
Imputed								2
AHHS II Both Dust Hazard Standards								11
Ethnicity:								
Hispanic/Latino	13,175	2,400	1,607	3,194	18.2%	12.7%	23.7%	158
	13,175	**3,038**	**2,153**	**3,923**	**23.1%**	**16.6%**	**29.5%**	**158**
	15,538	1,938	936	2,941	12.5%	6.1%	18.9%	120
	15,538	**3,094**	**2,037**	**4,150**	**19.9%**	**13.4%**	**26.4%**	**120**
Not Hispanic/Latino	92,858	20,786	18,082	23,490	22.4%	19.8%	25.0%	973
	92,858	**27,183**	**22,643**	**31,724**	**29.3%**	**25.4%**	**33.2%**	**973**
	102,213	20,370	15,859	24,881	19.9%	15.4%	24.4%	583
	102,213	**25,880**	**21,021**	**30,738**	**25.3%**	**20.3%**	**30.4%**	**583**
Imputed								2

[a] Old dust hazard action level is at least 40 µg/ft^2 for floors and at least 250 µg/ft^2 for windowsills.
[b] New dust hazard action level is at least 10 µg/ft^2 for floors and at least 100 µg/ft^2 for windowsills.
[c] Significant LBP hazard as defined in text and HUD Lead Safe Housing Rule.
[d] Estimated percentages are calculated with the "All HUs" column in each row used as the denominator.
[e] "Housing units" include permanently occupied, noninstitutional housing units in which children are permitted to live.
[f] CI = confidence interval for the estimated number or percent.
[g] "Other" race includes Asian, American Indian or Alaskan Native, Native Hawaiian or other Pacific Islander, and more than one race.

Table 5-2. Comparison of Prevalence of Significant Lead-Based Paint (LBP) Hazards by Location in the Building between AHHS and AHHS II (in RED) and Old [a] and New (in BOLD)[b] Dust Hazard Action Levels

HUD Lead Safe Housing Rule: Significant LBP Hazards							
LBP Hazard Location	***Number of HUs[a] (000)***			***Percent of HUs[d]***			***HUs in Sample***
	Estimate	***Lower 95% CI[e]***	***Upper 95% CI***	***Percent***	***Lower 95% CI***	***Upper 95% CI***	
Interior only	9,661	7,646	11,677	9.1%	7.2%	11.0%	98
	16,697	**13,625**	**19,769**	**15.7%**	**13.0%**	**18.5%**	**173**
	6,794	4,935	8,653	5.8%	4.2%	7.3%	49
	13,459	**11,268**	**15,650**	**11.4%**	**9.6%**	**13.3%**	**99**
Both Interior and Exterior	6,558	4,779	8,337	6.2%	4.5%	7.8%	61
	9,197	**6,501**	**11,893**	**8.7%**	**6.2%**	**11.1%**	**87**
	9,276	6,281	12,271	7.9%	5.3%	10.4%	62
	11,461	**8,304**	**14,619**	**9.7%**	**7.1%**	**12.4%**	**79**
Exterior only	6,967	5,267	8,667	6.6%	5.0%	8.2%	69
	4,328	**2,831**	**5,824**	**4.1%**	**2.7%**	**5.4%**	**43**
	6,238	4,103	8,373	5.3%	3.5%	7.1%	54
	4,053	**2,384**	**5,722**	**3.4%**	**2.0%**	**4.9%**	**37**
Anywhere	23,186	20,532	25,840	21.9%	19.4%	24.3%	228
	30,222	**25,606**	**34,837**	**28.5%**	**24.7%**	**32.3%**	**303**
	22,308	17,670	26,946	18.9%	14.9%	23.0%	165
	28,973	**23,992**	**33,955**	**24.6%**	**20.0%**	**29.2%**	**215**
No Significant LBP Hazard	82,847	80,116	85,579	78.1%	75.7%	80.6%	903
	75,812	**69,273**	**82,351**	**71.5%**	**67.7%**	**75.3%**	**828**
	95,443	85,346	105,540	81.1%	72.5%	89.6%	538
	88,778	**78,283**	**99,272**	**75.4%**	**66.5%**	**84.3%**	**488**
Total HUs	106,033			100%			1,131
	117,751			100%			703

[a] Old dust hazard action level is at least 40 µg/ft^2 for floors and at least 250 µg/ft^2 for windowsills.
[b] New dust hazard action level is at least 10 µg/ft^2 for floors and at least 100 µg/ft^2 for windowsills.
[c] "Housing units (HUs)" include permanently occupied, noninstitutional housing units in which children are permitted to live.
[d] Estimated percentages are calculated with total housing units (106,033) (117,751) as the denominator. Percentages may not total 100% due to rounding.
[e] CI = confidence interval for the estimated number or percent.

Table 5-3. Comparison of Prevalence of Significant Lead-Based Paint (LBP) Hazards in Housing Units with a Child Under 6 Years of Age by Type of Hazard between AHHS and AHHS II (in RED) and Old[a] and New (in BOLD)[b] Dust Hazard Action Levels

HUD Lead Safe Housing Rule: Significant LBP Hazards						
Type of Hazard	***Number of HU[c] (000)***			***Percent of HUs[d] (%)***		
	Estimate	***Lower 95% CI[e]***	***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%
	18,191	13,428	22,953	15.4%	11.4%	19.5%
HUs w/ Child Under 6	2,727	1,395	4,060	16.2%	8.3%	24.1%
	2,118	1,078	3,159	14.1%	7.6%	20.7%
Interior Lead Dust						
All HUs	13,740	11,776	15,704	13.0%	11.2%	14.8%
	24,642	**20,513**	**28,771**	**23.2%**	**19.7%**	**26.8%**
	10,644	7,704	13,584	9.0%	6.4%	11.6%
	21,862	**17,814**	**25,911**	**18.6%**	**14.7%**	**22.4%**
HUs w/ Child Under 6	2,144	1,350	2,939	12.7%	8.0%	17.5%
	3,363	**2,132**	**4,594**	**20.0%**	**13.3%**	**26.7%**
	1,272	170	2,374	8.5%	1.3%	15.7%
	2,080	**667**	**3,492**	**13.9%**	**5.1%**	**22.6%**
Soil Lead Hazard						
All HUs	3,848	2,235	5,461	3.6%	2.1%	5.2%
	2,350	743	3,956	2.0%	0.6%	3.4%
HUs w/ Child Under 6	1,042	367	1,717	6.2%	2.2%	10.2%
	573	0	1,387	3.8%	0.0%	9.1%
Any LBP Hazard						
All HUs	23,186	20,532	25,840	21.9%	19.4%	24.3%
	30,222	**25,606**	**34,837**	**28.5%**	**24.7%**	**32.3%**
	22,308	17,670	26,946	18.9%	14.9%	23.0%
	28,973	**23,992**	**33,955**	**24.6%**	**20.0%**	**29.2%**
HUs w/ Child Under 6	3,585	2,205	4,966	21.3%	13.1%	29.5%
	4,409	**2,711**	**6,107**	**26.2%**	**16.9%**	**35.4%**
	2,610	1,257	3,962	17.4%	9.2%	25.7%
	3,317	**1,800**	**4,835**	**22.1%**	**13.4%**	**30.9%**

[a] Old dust hazard action level is at least 40 µg/ft^2 for floors and at least 250 µg/ft^2 for windowsills.

[b] New dust hazard action level is at least 10 µg/ft^2 for floors and at least 100 µg/ft^2 for windowsills.

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

[d] Estimated percentages are calculated with total housing units (106,033) (117,751) or with housing units with a child under age 6 (14,979) as the denominator, as applicable.

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

Table 5-4. Comparison of Prevalence of Significant Lead-Based Paint (LBP) Hazards in Housing Units by Type of Hazard and Poverty Status between AHHS and AHHS II (in RED) and Old[a] and New (in BOLD)[b] Dust Hazard Action Levels						
HUD Lead Safe Housing Rule: Significant LBP Hazards						
Type of Hazard	*Number of HUs[c] (000)*			*Percent of HUs[d] (%)*		
	Estimate	*Lower 95% CI[e]*	*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%
	18,191	13,428	22,953	15.4%	11.4%	19.5%
HUs in Poverty	2,803	1,707	3,899	19.2%	12.3%	26.1%
	2,574	1,371	3,777	12.7%	6.5%	18.8%
HUs not in Poverty	12,528	10,317	14,739	13.7%	11.4%	16.0%
	15,617	11,314	19,920	16.0%	11.7%	20.4%
Interior Lead Dust						
All HUs	13,740	11,776	15,704	13.0%	11.2%	14.8%
	24,642	**20,513**	**28,771**	**23.2%**	**19.7%**	**26.8%**
	10,644	7,704	13,584	9.0%	6.4%	11.6%
	21,862	**17,814**	**25,911**	**18.6%**	**14.7%**	**22.4%**
HUs in Poverty	2,706	1,487	3,926	18.6%	11.3%	25.8%
	4,306	**2,870**	**5,741**	**29.5%**	**21.6%**	**37.5%**
	1,699	693	2,704	8.4%	3.4%	13.3%
	3,975	**2,335**	**5,615**	**19.5%**	**11.6%**	**27.5%**
HUs not in Poverty	11,033	9,171	12,896	12.1%	10.1%	14.1%
	20,336	**16,330**	**24,343**	**22.2%**	**18.4%**	**26.1%**
	8,945	6,154	11,736	9.2%	6.3%	12.1%
	17,887	**14,227**	**21,547**	**18.4%**	**14.3%**	**22.4%**
Soil Lead Hazard						
All HUs	3,848	2,235	5,461	3.6%	2.1%	5.2%
	2,350	743	3,956	2.0%	0.6%	3.4%
HUs in Poverty	352	0	720	2.4%	0%	4.9%
	658	0	1,453	3.2%	0.0%	7.2%
HUs not in Poverty	3,496	1,960	5,032	3.8%	2.1%	5.5%
	1,692	437	2,947	1.7%	0.5%	3.0%
Any LBP Hazard						
All HUs	23,186	20,532	25,840	21.9%	19.4%	24.3%
	30,222	**25,606**	**34,837**	**28.5%**	**24.7%**	**32.3%**
	22,308	17,670	26,946	18.9%	14.9%	23.0%
	28,973	**23,992**	**33,955**	**24.6%**	**20.0%**	**29.2%**
HUs in Poverty	4,407	3,986	5,828	30.2%	22.8%	37.6%
	5,270	**3,681**	**6,859**	**36.1%**	**28.1%**	**44.1%**
	3,238	1,879	4,598	15.9%	9.1%	22.7%
	4,797	**3,070**	**6,525**	**23.6%**	**15.2%**	**32.0%**
HUs not in Poverty	18,779	16,180	21,378	20.5%	17.8%	23.3%

	24,951 19,070 **24,176**	**20,523** 14,748 **19,720**	**29,380** 23,392 **28,632**	**27.3%** 19.6% **24.8%**	**23.2%** 15.2% **20.1%**	**31.4%** 23.9% **29.6%**

[a] Old dust hazard action level is at least 40 µg/ft^2 for floors and at least 250 µg/ft^2 for windowsills.
[b] New dust hazard action level is at least 10 µg/ft^2 for floors and at least 100 µg/ft^2 for windowsills.
[c] "Housing units" include permanently occupied, noninstitutional housing units in which children are permitted to live.
[d] Estimated percentages are calculated with total HUs (106,033) (117,751), total HUs in poverty (14,593) (20,340) or total HUs not in poverty (91,441) (97,411) as the denominator, as applicable.
[e] CI = confidence interval for the estimated number or percent.

Table 5-5. Comparison of Prevalence of Significant Lead-Based Paint (LBP) Hazards in Housing Units by Type of Hazard and Housing Unit Age between AHHS and AHHS II (in RED) and Old [a] and New (in BOLD)[b] Dust Hazard Action Levels

HUD Lead Safe Housing Rule: Significant LBP Hazards

Type of Hazard	*Number of HUs[c] (000)*			*Percent of HUs[d] (%)*		
	Estimate	*Lower 95% CI[e]*	*Upper 95% CI*	*Estimate*	*Lower 95% CI*	*Upper 95% CI*
Significantly Deteriorated Lead Based Paint						
Built 1978-2005	109	0	265	0.3%	0%	0.7%
Built 1978-2017	724	0	1,640	1.3%	0.0%	2.8%
Built 1960-1977	1,822	853	2,792	6.1%	3.0%	9.2%
	1,924	908	2,939	7.5%	3.4%	11.6%
Built 1940-1959	4,547	2,998	6,097	25.1%	16.5%	33.7%
	5,612	4,048	7,177	30.9%	22.8%	38.9%
Built Before 1940	8,852	7,426	10,279	50.6%	42.5%	58.7%
	9,930	6,556	13,305	61.9%	50.4%	73.3%
Interior Lead Dust						
Built 1978-2005	865	289	1,441	2.1%	0.7%	3.6%
	2,961	**2,059**	**3,863**	**7.3%**	**5.3%**	**9.4%**
Built 1978-2017	489	0	1,306	0.8%	0.0%	2.2%
	2,275	**466**	**4,083**	**3.9%**	**0.8%**	**7.0%**
Built 1960-1977	1,970	1,002	2,939	6.6%	3.4%	9.8%
	4,674	**3,164**	**6,183**	**15.6%**	**10.9%**	**20.3%**
	866	241	1,490	3.4%	0.9%	5.8%
	2,970	**1,711**	**4,229**	**11.6%**	**6.8%**	**16.4%**
Built 1940-1959	4,148	2,882	5,414	22.9%	15.9%	29.9%
	6,907	**4,892**	**8,922**	**38.1%**	**30.5%**	**45.8%**
	2,383	1,091	3,674	13.1%	6.9%	19.3%
	6,713	**4,493**	**8,933**	**36.9%**	**26.5%**	**47.4%**
Built Before 1940	6,756	5,545	7,967	38.6%	31.7%	45.5%
	10,100	**7,015**	**13,185**	**57.7%**	**48.4%**	**67.0%**
	6,907	4,544	9,270	43.0%	29.2%	56.8%
	9,905	**7,152**	**12,658**	**61.7%**	**50.0%**	**73.3%**
Soil Lead Hazard						
Built 1978-2005	109	0	321	0.3%	0%	0.8%
Built 1978-2017	432	0	1,299	0.7%	0.0%	2.2%
Built 1960-1977	178	0	429	0.6%	0%	1.4%
	106	0	318	0.4%	0.0%	1.2%
Built 1940-1959	877	209	1,544	4.8%	1.2%	8.5%
	242	0	728	1.3%	0.0%	4.0%
Built Before 1940	2,685	1,511	3,859	15.3%	8.6%	22.1%
	1,570	326	2,815	9.8%	3.1%	16.5%

Table 5-5. Comparison of Prevalence of Significant Lead-Based Paint (LBP) Hazards in Housing Units by Type of Hazard and Housing Unit Age between AHHS and AHHS II (in RED) and Old[a] and New (in BOLD)[b] Dust Hazard Action Levels

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*
Any LBP Hazard						
Built 1978-2005	1,083	453	1,713	2.7%	1.1%	4.3%
	3,126	**2,185**	**4,068**	**7.7%**	**5.6%**	**9.8%**
Built 1978-2017	1,645	142	3,147	2.8%	0.3%	5.4%
	2,738	**779**	**4,696**	**4.7%**	**1.4%**	**8.1%**
Built 1960-1977	3,415	1,899	4,930	11.4%	6.5%	16.3%
	5,842	**3,985**	**7,699**	**19.5%**	**13.7%**	**25.3%**
	2,513	1,472	3,554	9.8%	5.6%	14.1%
	4,405	**3,058**	**5,751**	**17.2%**	**11.8%**	**22.6%**
Built 1940-1959	6,999	5,391	8,607	38.6%	29.7%	47.6%
	8,549	**6,110**	**10,988**	**47.2%**	**38.6%**	**55.8%**
	7,098	5,183	9,014	39.0%	30.4%	47.7%
	9,303	**6,888**	**11,718**	**51.2%**	**40.1%**	**62.2%**
Built Before 1940	11,689	10,425	12,954	66.8%	59.6%	74.0%
	12,688	**9,070**	**16,306**	**72.5%**	**63.8%**	**81.2%**
	11,052	7,712	14,392	68.8%	57.8%	79.8%
	12,527	**9,046**	**16,009**	**78.0%**	**68.7%**	**87.3%**

[a] Old dust hazard action level is at least 40 µg/ft^2 for floors and at least 250 µg/ft^2 for windowsills.
[b] New dust hazard action level is at least 10 µg/ft^2 for floors and at least 100 µg/ft^2 for windowsills.
[c] "Housing units" include permanently occupied, noninstitutional housing units in which children are permitted to live.
[d] Estimated percentages are calculated with total housing units built in that time period as the denominator.
[e] CI = confidence interval for the estimated number or percent.

Table 5-6. Prevalence of Housing Units with Selected Lead-Related Characteristics (AHHS II in RED)							
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	20,082 17,267	16,517 13,680	23,646 20,855	19.0% 14.7%	15.6% 11.6%	22.4% 17.7%	206 116
Lead Related Hobby	30,876 30,505	27,041 25,103	34,712 35,908	29.2% 25.9%	25.6% 21.3%	32.7% 30.5%	334 189
Cleanliness							
House Appears Clean	73,099 70,817	69,700 62,443	77,128 79,190	68.9% 60.1%	65.3% 53.0%	72.6% 67.3%	777 396
Some Evidence of Cleaning	24,016 34,921	20,282 29,068	27,751 40,774	22.7% 29.7%	19.1% 24.7%	26.2% 34.6%	260 223
No Evidence of Cleaning	8,919 11,474	7,048 8,206	10,789 14,742	8.4% 9.7%	6.7% 7.0%	10.2% 12.5%	94 80
Missing	0 540						0 4
Clutter							
Clutter Organized	51,548 52,801	46,947 43,596	56,148 62,006	48.6% 44.8%	44.2% 37.0%	53.0% 52.7%	534 287
Average Amount of Clutter	41,159 50,038	36,847 42,013	45,472 58,063	38.8% 42.5%	34.8% 35.7%	42.8% 49.3%	456 315
No Organization	13,327 14,372	10,802 11,023	15,851 17,722	12.6% 12.2%	10.2% 9.4%	14.9% 15.1%	141 97
Missing	0 540						0 4
Total HUs	106,033 117,751						1,131 703

[a] "Housing units" include permanently occupied, noninstitutional housing units in which children are permitted to live.
[b] Estimated percentages are calculated with total housing units (106,033) (117,751) 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. Comparison of Prevalence of Significant Interior LBP Hazards in Homes by Selected Characteristics between AHHS and AHHS II (in RED) and Old [a] and New (in BOLD)[b] Dust Hazard Action Levels

Characteristic	*Number of HUs (000)[c]*			*Percent of HUs (%)[d]*			*HUs in Sample*
	Estimate	*Lower 95% CI[e]*	*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%	30
	5,442	**3,629**	**7,255**	**27.1%**	**19.2%**	**35.0%**	**51**
	2,366	1,128	3,604	13.7%	6.6%	20.8%	17
	3,987	**2,565**	**5,408**	**23.1%**	**14.4%**	**31.7%**	**32**
No Lead Related Occupation	12,616	10,440	14,792	14.8%	12.3%	17.2%	127
	20,232	**16,328**	**24,136**	**23.7%**	**19.7%**	**27.6%**	**207**
	13,704	10,319	17,089	13.6%	10.2%	17.1%	94
	20,934	**16,734**	**25,133**	**20.8%**	**16.4%**	**25.3%**	**147**
Lead Related Hobby	4,354	2,665	6,042	14.1%	9.3%	18.9%	57
	7,423	**5,134**	**9,712**	**24.0%**	**17.8%**	**30.3%**	**74**
	5,408	3,515	7,301	17.7%	11.7%	23.7%	36
	8,151	**5,968**	**10,333**	**26.7%**	**19.5%**	**34.0%**	**56**
No Lead Related Hobby	11,726	9,565	13,887	15.6%	13.0%	18.3%	118
	18,332	**15,028**	**21,635**	**24.5%**	**20.6%**	**28.3%**	**185**
	10,662	7,776	13,549	12.2%	8.6%	15.9%	75
	16,770	**13,359**	**20,180**	**19.2%**	**14.6%**	**23.8%**	**123**
Cleanliness							
House Appears Clean	8,331	5,970	10,692	11.4%	8.4%	14.4%	80
	13,493	**10,388**	**16,598**	**18.5%**	**14.6%**	**22.3%**	**134**
	7,600	4,761	10,440	10.7%	7.1%	14.4%	47
	12,202	**8,816**	**15,587**	**17.2%**	**12.7%**	**21.8%**	**84**
Some Evidence of Cleaning	5,318	3,334	7,302	22.1%	15.7%	28.6%	53
	8,706	**6,143**	**11,270**	**36.3%**	**29.1%**	**43.4%**	**90**
	5,479	3,508	7,449	15.7%	9.9%	21.5%	40
	8,329	**5,624**	**11,034**	**23.9%**	**15.7%**	**32.0%**	**59**
No Evidence of Cleaning	2,570	1,512	3,627	28.8%	19.1%	38.5%	26
	3,695	**2,123**	**5,267**	**41.4%**	**28.2%**	**54.6%**	**36**
	2,991	1,624	4,358	26.1%	13.4%	38.7%	24
	4,339	**2,843**	**5,836**	**37.8%**	**25.5%**	**50.1%**	**35**
Missing	0						0
	0						**0**
	0						0
	51						**1**

Table 5-7. Comparison of Prevalence of Significant Interior LBP Hazards in Homes by Selected Characteristics between AHHS and AHHS II (in RED) and Old [a] and New (in BOLD)[b] Dust Hazard Action Levels							
Clutter							
Clutter Organized	5,212 **8,716** 6,007 **9,353**	3,487 **6,391** 3,661 **6,788**	6,937 **11,041** 8,353 **11,917**	10.1% **16.9%** 11.4% **17.7%**	7.0% **12.9%** 7.4% **13.1%**	13.2% **21.0%** 15.4% **22.4%**	48 **84** 37 **65**
Average Amount of Clutter	7,051 **11,136** 6,513 **10,038**	5,210 **8,833** 4,316 **7,243**	8,893 **13,438** 8,710 **12,833**	17.1% **27.1%** 13.0% **20.1%**	13.3% **22.1%** 8.5% **14.1%**	21.0% **32.0%** 17.5% **26.1%**	70 **115** 49 **73**
No Organization	3,956 **6,042** 3,550 **5,479**	2,516 **4,023** 2,064 **3,676**	5,396 **8,062** 5,036 **7,282**	29.7% **45.3%** 24.7% **38.1%**	20.9% **35.3%** 14.1% **27.1%**	38.5% **55.4%** 35.3% **49.1%**	41 **61** 25 **40**
Missing	0 **0** 0 **51**						0 **0** 0 **1**
Overall							
ALL HOUSING UNITS	16,219 **25,894** 16,070 **24,920**	13,883 **21,569** 12,292 **20,596**	18,556 **30,219** 19,848 **29,245**	15.3% **24.4%** 13.6% **21.2%**	13.1% **20.7%** 10.3% **17.0%**	17.5% **28.1%** 17.0% **25.3%**	159 **260** 111 **179**

[a] Old dust hazard action level is at least 40 µg/ft^2 for floors and at least 250 µg/ft^2 for windowsills.
[b] New dust hazard action level is at least 10 µg/ft^2 for floors and at least 100 µg/ft^2 for windowsills.
[c] "Housing units" include permanently occupied, noninstitutional housing units in which children are permitted to live.
[d] All percentages are calculated with total housing units reporting the corresponding characteristic as the denominator.
[e] CI = confidence interval for the estimated number or percent.

6.0 DUST LEAD HAZARDS IN HOUSING

In AHHS II, the dust wipe samples were analyzed by the lab on two different instruments. QuanTech periodically calculated a method detection limit for each instrument using the EPA method.[37] The average detection limit was 0.179 µg/wipe for one instrument and 0.639 µg/wipe for the other, both well below 1 µg/wipe. Since a 1 ft^2 area was wiped for floor samples, the detection limit for floor samples was < 1 $\mu g/ft^2$, considerably lower than the 5 $\mu g/ft^2$ in AHHS. The detection limit for windowsill samples in $\mu g/ft^2$ depends on the area wiped, which can vary considerably. Of 3,485 floor dust wipe samples taken in completed units, 1,663 (48%) were above the detection limit. For windowsill dust wipe samples, 1,542 of 2,075 (74%) were detectable. Thus, even with the lower detection limit, more than half of floor samples and more than one quarter of windowsill samples were below the detection limit. Therefore, as in AHHS, 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 (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 [7]. 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 for means 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 [7], especially when a substantial number of values are below the detection limit.

Table 6-1 shows the prevalence of floor dust lead hazards by selected housing characteristics for AHHS II and AHHS and for the old and new floor dust standards. There are very few significant differences between AHHS and AHHS II. The number and percent of multifamily homes with floor dust hazards increased significantly from AHHS to AHHS II (both standards). The same was true for government supported units (old standard), and for the number of Hispanic units (new standard). On the other hand, the number and percent of higher-income units with children under 6 with floor dust hazards decreased significantly (both standards). The same was true for units not in poverty with children under 6 (new standard). Overall, then, there was little change in prevalence of floor dust hazards in the 13 years between the two surveys. Table 6-2 for windowsill dust hazards presents a very different picture. Almost all housing characteristics show significant decreases in percent of units with windowsill dust hazards, usually for both the old and new standards. Many also show significant drops in the absolute number of homes with windowsill hazards, which is even more important because percentages tend to decrease anyway because of the 11.6 million homes built since AHHS. Thus, there has been a significant decrease in windowsill dust hazards across multiple housing characteristics.

Table 6-3 compares arithmetic mean floor and windowsill dust lead loadings, in micrograms per square foot ($\mu g/ft^2$), for AHHS II and AHHS, broken down by various housing characteristics of interest. Arithmetic means were used because a high percentage of dust samples were below the

[37] https://www.epa.gov/sites/production/files/2016-12/documents/mdl-procedure_rev2_12-13-2016.pdf, accessed July 15, 2020.

detection limit, see the first paragraph of this chapter. The estimated mean dust lead loading on floors nationwide was 3.68 $\mu g/ft^2$, essentially the same as the 3.48 $\mu g/ft^2$ found in AHHS. For windowsills, however, the mean was 54 $\mu g/ft^2$, statistically significantly lower than the 156 $\mu g/ft^2$ in AHHS ($p < 0.001$). The floor mean is considerably less than both the old and new regulatory standards of 40 $\mu g/ft^2$ and 10 $\mu g/ft^2$, respectively. The windowsill mean is relatively somewhat higher – at 54 $\mu g/ft^2$ it is slightly more than half the new regulatory level of 100 $\mu g/ft^2$. As in Table 6-2, the statistically significant nationwide drop in windowsill dust lead levels is partially reflected in all the housing characteristics shown in Table 6-3, depending on cell sample sizes. For example, there are significant drops in windowsill lead dust levels in the Northeast and South, in homes built 1960-1977 and in homes of African American households.

As in AHHS, 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 (greater than $\pm$40% even at the national level), reflecting the skewed distribution of dust lead levels. Mean floor dust levels in the Northeast are statistically significantly higher than in the West. The mean windowsill level in the Northeast (148 $\mu g/ft^2$) is above the new regulatory standard of 100 $\mu g/ft^2$. As in AHHS, 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 291 $\mu g/ft^2$, almost 3 times the new 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 show some changes from AHHS. In AHHS, mean floor dust lead levels were statistically significantly higher for single family vs. multifamily homes, and for units without Government support vs. units with Government support. Neither is true in AHHS II. In AHHS, mean windowsill dust lead levels were 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. None hold true in AHHS II. This is due more to substantial narrowing of the difference in each case rather than to the smaller sample sizes in AHHS II. Both mean floor and mean windowsill dust lead levels were statistically significantly higher in non-Hispanic than Hispanic homes in AHHS, and this remains true for windowsills in AHHS II ($p = 0.01$), with the difference for floors falling short of significance.

Tables C-1 (floors) and C-2 (windowsills) in Appendix C are the analogues of Table 6-3 for the median and 90th percentile dust lead levels rather than the mean. The median floor dust level in AHHS II was 0.31 $\mu g/ft^2$, more than 10 times less than the mean of 3.68 $\mu g/ft^2$ reflecting the extreme skewness of floor dust lead levels. Unlike the mean level, the median decreased significantly from 0.57 $\mu g/ft^2$ in AHHS. Significant decreases in the median floor dust lead level from AHHS to AHHS II were also seen for comparisons based on almost all housing characteristics. However, the median values were very low in both surveys in all cases, the largest value being only 2.61 $\mu g/ft^2$ for homes built before 1940. The differences in median values between the two surveys could therefore be due in part to the difference in detection limits between the surveys. The estimated 90th percentile floor dust lead level was unchanged from AHHS to AHHS II, and no significant changes in these values were seen for any of the housing characteristics. In general, the 90th percentile values were comparable to the means, again

reflecting extreme skewness in the data. For example, the 90th percentile for AHHS II was 4.90 µg/ft^2 , compared to a mean of 3.68 µg/ft^2.

The median windowsill dust lead level decreased significantly from 4.24 µg/ft^2 in AHHS to 1.74 µg/ft^2 in AHHS II. The medians were more than an order of magnitude smaller than the means. As for floors, significant decreases in the median were seen for almost all housing characteristics, and the median values were also quite low although larger than for floors. Unlike for floors, the 90th percentile dust lead level for windowsills decreased significantly from 136.5 µg/ft^2 in AHHS to 45.73 µg/ft^2 in AHHS II. Significant decreases were also seen for comparisons based on most housing characteristics. As for floors, 90th percentile values for windowsills were generally comparable to means. For example, the nationwide windowsill 90th percentile in AHHS II was 45.73 µg/ft^2 compared to the mean of 54.08 µg/ft^2.

Table 6-4 shows the distribution of the maximum dust lead loading in housing units, separately for floors and windowsills. In AHHS, the number and percent of units exceeding each threshold level was lower for floors than in NSLAH, except for the number exceeding 100 µg/sq ft^2, which increased slightly in AHHS. In AHHS II the pattern is reversed: the number and percent of units exceeding each threshold is higher than in AHHS. For windowsill lead loadings, the number and percent exceeding all thresholds[38] continue the decreases from NSLAH to AHHS, and the further drops from AHHS to AHHS II are all statistically significant. The pattern over time in the 20 years from NSLAH to AHHS II appears to be not much change in floor dust lead levels but significant decreases on windowsills.

Tables 6-5 and 6-6 break down Table 6-4 by age of housing, for floors and windowsills, respectively. For the oldest housing (pre-1940), the number and percent of homes with floor dust lead levels above each threshold increased from AHHS to AHHS II. For the other age categories, the two higher thresholds show decreases, with mostly increases for the three lower categories. This is consistent with Table 6-3, where the oldest age category is the only one showing a mean increase. It also indicates that the overall increase for all thresholds is largely driven by the oldest housing age category, which has the highest percentage of homes with LBP. The number and percent of homes with windowsill dust lead levels above the thresholds in Table 6-6 decreases for all age categories, with the exception of a small increase in the highest threshold for post 1977 homes. Many of the decreases are statistically significant. These patterns confirm that floor dust and windowsill dust lead levels appear to have moved in opposite directions between AHHS and AHHS II.

Tables 6-7 and 6-8 break down Table 6-2 by annual household income (less than $35,000 versus $35,000 or greater), with comparisons to AHHS for the comparable lower income threshold in 2005-2006 (less than $30,000 versus $30,000 or greater). There is little difference in the pattern of increases in homes exceeding the thresholds for floor dust lead levels between the two income categories, although the under-$35,000 category shows larger increases. This is consistent with the higher mean dust lead for the under-$35,000 category shown in Table 6-3. With respect to windowsill dust lead, the pattern is much more consistent: the number and percent of homes exceeding each threshold is lower in AHHS II than in AHHS. Many of the decreases are

[38] NSLAH data for 50 and 100 µg/ft^2 not available

statistically significant. For windowsills, the overall pattern of a decrease from NSLAH to AHHS continued and even intensified for both income categories.

Table 6-1. Comparison of Prevalence of Floor Dust Lead Hazards, by Selected Housing (HU) Characteristics between AHHS and AHHS II (in RED) and Old[a] and New (in BOLD)[b] Dust Hazard Action Levels. Statistically Significant Differences Highlighted

Characteristic	*All HUs (000)*	*No. of HUs with Floor Dust Lead Hazards (000)*			*Percent[c] of HUs[d] with Floor Dust Lead Hazards (%)*			HUs in Sample
		Estimate	*Lower 95% CI[e]*	*Upper 95% CI*	*Estimate*	*Lower 95% CI*	*Upper 95% CI*	
Total Occupied HUs	106,033	5,237	3,581	6,894	4.9%	3.4%	6.5%	1,131
	106,033	**12,992**	**9,752**	**16,233**	**12.3%**	**9.3%**	**15.2%**	**1,131**
	117,751	5,742	3,676	7,808	4.9%	3.1%	6.7%	703
	117,751	**16,508**	**13,084**	**19,933**	**14.0%**	**10.8%**	**17.2%**	**703**
Region:								
Northeast	20,190	1,589	751	2,427	7.9%	3.5%	12.3%	196
	20,190	**3,156**	**1,921**	**4,391**	**15.6%**	**8.2%**	**23.1%**	**196**
	20,993	1,488	394	2,581	7.1%	1.2%	12.9%	139
	20,993	**4,490**	**3,227**	**5,753**	**21.4%**	**13.5%**	**29.3%**	**139**
Midwest	23,994	1,909	1,038	2,780	8.0%	4.3%	11.7%	245
	23,994	**4,193**	**2,729**	**5,658**	**17.5%**	**11.6%**	**23.4%**	**245**
	26,699	2,196	1,092	3,299	8.2%	4.0%	12.4%	161
	26,699	**5,332**	**3,229**	**7,435**	**20.0%**	**11.3%**	**28.6%**	**161**
South	38,996	1,347	320	2,373	3.5%	0.9%	6.0%	440
	38,996	**4,052**	**1,543**	**6,562**	**10.4%**	**4.3%**	**16.5%**	**440**
	43,640	1,353	156	2,550	3.1%	0.4%	5.8%	240
	43,640	**4,336**	**2,202**	**6,471**	**9.9%**	**4.8%**	**15.1%**	**240**
West	22,853	393	0	871	1.7%	0.0%	3.7%	250
	22,853	**1,591**	**861**	**2,320**	**7.0%**	**4.2%**	**9.7%**	**250**
	26,420	706	56	1,356	2.7%	0.1%	5.2%	163
	26,420	**2,350**	**1,275**	**3,424**	**8.9%**	**4.4%**	**13.4%**	**163**
Construction Year:								
HUs built 1978-2005	40,458	212	0	473	0.5%	0.0%	1.2%	476
	40,458	**1,442**	**858**	**2,026**	**3.6%**	**2.2%**	**4.9%**	**476**
HUs built 1978-2017	57,919	93	0	280	0.2%	0.0%	0.5%	224
	57,919	**1,515**	**64**	**2,966**	**2.6%**	**0.1%**	**5.1%**	**224**
1960-1977	29,956	598	45	1,150	2.0%	0.1%	3.9%	306
	29,956	**1,973**	**1,129**	**2,817**	**6.6%**	**3.6%**	**9.5%**	**306**
	25,599	383	0	773	1.5%	0.0%	3.0%	225
	25,599	**2,363**	**1,187**	**3,539**	**9.2%**	**4.9%**	**13.6%**	**225**
1940-1959	18,117	1,549	762	2,335	8.5%	4.6%	12.5%	187
	18,117	**3,674**	**2,296**	**5,053**	**20.3%**	**14.0%**	**26.6%**	**187**
	18,178	1,017	144	1,890	5.6%	1.0%	10.2%	154
	18,178	**5,045**	**3,188**	**6,903**	**27.8%**	**18.1%**	**37.4%**	**154**
Before 1940	17,503	2,879	1,576	4,183	16.5%	10.4%	22.5%	162
	17,503	**5,903**	**3,617**	**8,188**	**33.7%**	**23.3%**	**44.1%**	**162**
	16,055	4,250	2,318	6,182	26.5%	15.4%	37.5%	100
	16,055	**7,586**	**5,175**	**9,997**	**47.2%**	**36.8%**	**57.7%**	**100**
Urbanization								
MSA	80,101	3,368	2,255	4,482	4.2%	2.9%	5.6%	889
	80,101	**9,652**	**7,487**	**11,817**	**12.1%**	**9.4%**	**14.7%**	**889**

Table 6-1. Comparison of Prevalence of Floor Dust Lead Hazards, by Selected Housing (HU) Characteristics between AHHS and AHHS II (in RED) and Old[a] and New (in BOLD)[b] Dust Hazard Action Levels. Statistically Significant Differences Highlighted

Characteristic	*All HUs (000)*	*No. of HUs with Floor Dust Lead Hazards (000)*			*Percent[c] of HUs[d] with Floor Dust Lead Hazards (%)*			HUs in Sample
		Estimate	*Lower 95% CI[e]*	*Upper 95% CI*	*Estimate*	*Lower 95% CI*	*Upper 95% CI*	
	90,723	4,286	2,347	6,226	4.7%	2.6%	6.9%	555
	90,723	**12,182**	**9,474**	**14,891**	**13.4%**	**10.3%**	**16.6%**	**555**
Non-MSA	25,933	1,869	642	3,095	7.2%	2.6%	11.8%	242
	25,933	**3,340**	**929**	**5,751**	**12.9%**	**3.8%**	**22.0%**	**242**
	27,028	1,456	744	2,168	5.4%	2.2%	8.5%	148
	27,028	**4,326**	**2,231**	**6,421**	**16.0%**	**6.5%**	**25.5%**	**148**
Housing Unit Type:								
Single family	89,156	5,237	3,581	6,894	5.9%	4.1%	7.7%	950
	89,156	**12,728**	**9,525**	**15,931**	**14.3%**	**10.8%**	**17.8%**	**950**
	95,590	5,191	3,180	7,201	5.4%	3.3%	7.6%	571
	95,590	**14,793**	**11,393**	**18,192**	**15.5%**	**11.7%**	**19.3%**	**571**
Multi-family	16,877	0	0	0	0.0%	0.0%	0.0%	181
	16,877	**264**	**0**	**587**	**1.6%**	**0.0%**	**3.5%**	**181**
	22,161	552	170	933	2.5%	0.6%	4.4%	132
	22,161	**1,716**	**633**	**2,798**	**7.7%**	**2.7%**	**12.7%**	**132**
Tenure:								
Owner-occupied	73,627	4,084	2,481	5,687	5.5%	3.4%	7.7%	772
	73,627	**8,871**	**6,008**	**11,734**	**12.0%**	**8.3%**	**15.8%**	**772**
	75,302	4,078	2,216	5,940	5.4%	2.9%	7.9%	419
	75,302	**10,341**	**7,665**	**13,017**	**13.7%**	**10.0%**	**17.5%**	**419**
Renter-occupied	32,407	1,153	490	1,816	3.6%	1.6%	5.5%	359
	32,407	**4,121**	**2,968**	**5,275**	**12.7%**	**9.2%**	**16.3%**	**359**
	42,449	1,664	633	2,696	3.9%	1.3%	6.6%	284
	42,449	**6,168**	**4,358**	**7,978**	**14.5%**	**9.9%**	**19.1%**	**284**
Household Income:								
Less than $30,000/year	37,059	2,305	1,410	3,200	6.2%	3.9%	8.5%	401
	37,059	**5,604**	**3,757**	**7,452**	**15.1%**	**10.5%**	**19.7%**	**401**
Less than $35,000/year	45,994	2,241	971	3,511	4.9%	2.2%	7.6%	308
	45,994	**8,426**	**5,702**	**11,150**	**18.3%**	**12.6%**	**24.0%**	**308**
$30,000/year or more	68,975	2,932	1,602	4,263	4.3%	2.3%	6.2%	730
	68,975	**7,388**	**5,124**	**9,652**	**10.7%**	**7.4%**	**14.0%**	**730**
$35,000/year or more	71,757	3,502	1,490	5,514	4.9%	2.1%	7.6%	395
	71,757	**8,082**	**5,333**	**10,831**	**11.3%**	**7.4%**	**15.1%**	**395**
One or More Children Under Age 6:								
All Income Categories	16,833	639	142	1,135	3.8%	0.8%	6.7%	207
	16,833	**1,870**	**964**	**2,775**	**11.1%**	**5.7%**	**16.5%**	**207**
	14,979	489	0	1,144	3.3%	0.0%	7.6%	108
	14,979	**1,097**	**188**	**2,006**	**7.3%**	**1.7%**	**12.9%**	**108**
Less than $30,000/year	5,781	175	0	425	3.0%	0.0%	7.3%	74
	5,781	**737**	**301**	**1,172**	**12.7%**	**5.2%**	**20.3%**	**74**
Less than $35,000/year	5,365	489	0	1,144	9.1%	0.0%	21.1%	47
	5,365	**1,014**	**121**	**1,907**	**18.9%**	**4.0%**	**33.8%**	**47**
$30,000/year or more	11,052	463	35	892	4.2%	0.3%	8.1%	133
	11,052	**1,133**	**391**	**1,875**	**10.3%**	**3.6%**	**17.0%**	**133**
$35,000/year or more	9,614	0	0	0	0.0%	0.0%	0.0%	61

Table 6-1. Comparison of Prevalence of Floor Dust Lead Hazards, by Selected Housing (HU) Characteristics between AHHS and AHHS II (in RED) and Old[a] and New (in BOLD)[b] Dust Hazard Action Levels. Statistically Significant Differences Highlighted

Characteristic	*All HUs (000)*	*No. of HUs with Floor Dust Lead Hazards (000)*			*Percent[c] of HUs[d] with Floor Dust Lead Hazards (%)*			HUs in Sample
		Estimate	*Lower 95% CI[e]*	*Upper 95% CI*	*Estimate*	*Lower 95% CI*	*Upper 95% CI*	
	9,614	**83**	**0**	**250**	**0.9%**	**0.0%**	**2.6%**	**61**
One or More Children Under Age 6:								
All Poverty Categories	16,833	639	142	1,135	3.8%	0.8%	6.7%	207
	16,833	**1,870**	**964**	**2,775**	**11.1%**	**5.7%**	**16.5%**	**207**
	14,979	489	0	1,144	3.3%	0.0%	7.6%	108
	14,979	**1,097**	**188**	**2,006**	**7.3%**	**1.7%**	**12.9%**	**108**
In Poverty	3,423	97	0	292	2.8%	0.0%	8.5%	43
	3,423	**272**	**0**	**587**	**7.9%**	**0.0%**	**16.7%**	**43**
	4,223	368	0	975	8.7%	0.0%	22.9%	41
	4,223	**793**	**65**	**1,521**	**18.8%**	**3.2%**	**34.4%**	**41**
Not in Poverty	13,410	541	85	998	4.0%	0.6%	7.5%	164
	13,410	**1,598**	**716**	**2,480**	**11.9%**	**5.3%**	**18.5%**	**164**
	10,756	121	0	365	1.1%	0.0%	3.4%	67
	10,756	**304**	**0**	**661**	**2.8%**	**0.0%**	**6.1%**	**67**
Imputed								16
								1
Government Support:								
Government support	5,870	0	0	0	0.0%	0.0%	0.0%	65
	5,870	**583**	**94**	**1,072**	**9.9%**	**2.3%**	**17.6%**	**65**
	10,781	320	66	573	3.0%	0.5%	5.5%	70
	10,781	**1,769**	**611**	**2,928**	**16.4%**	**5.8%**	**27.0%**	**70**
No government support	99,522	5,237	3,581	6,894	5.3%	3.6%	6.9%	1,059
	99,522	12,261	9,217	15,306	12.3%	9.3%	15.3%	1,059
	106,023	5,423	3,359	7,486	5.1%	3.2%	7.0%	626
	106,023	**14,739**	**11,374**	**18,104**	**13.9%**	**10.6%**	**17.2%**	**626**
Poverty:								
In Poverty	14,593	923	402	1,445	6.3%	3.1%	9.6%	166
	14,593	**2,123**	**1,306**	**2,940**	**14.5%**	**9.4%**	**19.7%**	**166**
	20,340	1,041	157	1,926	5.1%	0.7%	9.5%	157
	20,340	**3,006**	**1,467**	**4,545**	**14.8%**	**7.2%**	**22.3%**	**157**
Not in Poverty	91,441	4,314	2,673	5,954	4.7%	3.0%	6.5%	965
	91,441	**10,869**	**7,774**	**13,964**	**11.9%**	**8.6%**	**15.1%**	**965**
	97,411	4,701	2,685	6,717	4.8%	2.8%	6.9%	546
	97,411	**13,503**	**10,377**	**16,629**	**13.9%**	**10.4%**	**17.3%**	**546**
Race:								
White	82,739	3,909	2,421	5,397	4.7%	2.9%	6.5%	868
	82,739	**9,852**	**7,326**	**12,378**	**11.9%**	**8.9%**	**14.9%**	**868**
	89,252	4,538	2,436	6,639	5.1%	2.6%	7.5%	502
	89,252	**12,492**	**9,413**	**15,570**	**14.0%**	**10.2%**	**17.8%**	**502**
African American	13,161	944	386	1,502	7.2%	3.2%	11.1%	151
	13,161	**2,080**	**1,061**	**3,100**	**15.8%**	**9.0%**	**22.6%**	**151**
	17,179	993	186	1,800	5.8%	1.7%	9.9%	126
	17,179	**2,691**	**1,317**	**4,064**	**15.7%**	**8.8%**	**22.6%**	**126**
Other[f]	10,134	384	0	772	3.8%	0.0%	7.8%	112

Table 6-1. Comparison of Prevalence of Floor Dust Lead Hazards, by Selected Housing (HU) Characteristics between AHHS and AHHS II (in RED) and Old[a] and New (in BOLD)[b] Dust Hazard Action Levels. Statistically Significant Differences Highlighted

Characteristic	*All HUs (000)*	*No. of HUs with Floor Dust Lead Hazards (000)*			*Percent[c] of HUs[d] with Floor Dust Lead Hazards (%)*			HUs in Sample
		Estimate	*Lower 95% CI[e]*	*Upper 95% CI*	*Estimate*	*Lower 95% CI*	*Upper 95% CI*	
	10,134	**1,060**	**482**	**1,638**	**10.5%**	**4.5%**	**16.4%**	**112**
	11,321	212	0	513	1.9%	0.0%	4.5%	75
	11,321	**1,326**	**490**	**2,163**	**11.7%**	**4.5%**	**18.9%**	**75**
Ethnicity:								
Hispanic/Latino	13,175	348	0	703	2.6%	0.0%	5.3%	158
	13,175	**916**	**282**	**1,550**	**7.0%**	**2.2%**	**11.7%**	**158**
	15,538	645	36	1,253	4.1%	0.1%	8.2%	120
	15,538	**2,159**	**1,233**	**3,084**	**13.9%**	**8.4%**	**19.3%**	**120**
Not Hispanic/Latino	92,858	4,889	3,301	6,478	5.3%	3.6%	6.9%	973
	92,858	**12,076**	**8,934**	**15,219**	**13.0%**	**9.8%**	**16.2%**	**973**
	102,213	5,098	3,062	7,134	5.0%	3.0%	7.0%	583
	102,213	**14,349**	**10,948**	**17,751**	**14.0%**	**10.4%**	**17.7%**	**583**
Imputed								2

[a] Old dust hazard action level is at least 40 µg/ft^2 for floors and at least 250 µg/ft^2 for windowsills.
[b] New dust hazard action level is at least 10 µg/ft^2 for floors and at least 100 µg/ft^2 for windowsills.
[c] Estimated percentages are calculated with the "All HUs" column in each row used as the denominator.
[d] "Housing units" include permanently occupied, noninstitutional housing units in which children are permitted to live.
[e] CI = confidence interval for the estimated number or percent.
[f] "Other" race includes Asian, American Indian or Alaskan Native, Native Hawaiian or other Pacific Islander, and more than one race.

Table 6-2. Comparison of Prevalence of Windowsill Dust Lead Hazards, by Selected Housing (HU) Characteristics between AHHS and AHHS II (in RED) and Old[a] and New (in BOLD)[b] Dust Hazard Action Levels. Statistically Significant Differences Highlighted.

Characteristic	*All HUs (000)*	*No. of HUs with Windowsill Dust Lead Hazards (000)*			*Percent[c] of HUs[d] with Windowsill Dust Lead Hazards (%)*			HUs in Sample
		Estimate	*Lower 95% CI[e]*	*Upper 95% CI*	*Estimate*	*Lower 95% CI*	*Upper 95% CI*	
Total Occupied HUs	106,033	11,090	8,549	13,630	10.5%	8.2%	12.8%	1,131
	106,033	**18,387**	**15,117**	**21,657**	**17.3%**	**14.5%**	**20.2%**	**1,131**
	117,751	6,913	4,398	9,428	5.9%	3.7%	8.1%	703
	117,751	**11,919**	**8,625**	**15,214**	**10.1%**	**7.2%**	**13.1%**	**703**
Region:								
Northeast	20,190	3,365	2,196	4,535	16.7%	11.2%	22.1%	196
	20,190	**5,496**	**3,980**	**7,011**	**27.2%**	**20.0%**	**34.5%**	**196**
	20,993	2,717	769	4,666	12.9%	2.5%	23.4%	139
	20,993	**3,855**	**1,990**	**5,720**	**18.4%**	**7.4%**	**29.3%**	**139**
Midwest	23,994	3,387	1,732	5,043	14.1%	7.8%	20.4%	245
	23,994	**4,917**	**2,698**	**7,135**	**20.5%**	**12.9%**	**28.0%**	**245**
	26,699	1,649	862	2,436	6.2%	3.5%	8.8%	161
	26,699	**3,338**	**1,847**	**4,829**	**12.5%**	**8.0%**	**17.0%**	**161**
South	38,996	3,536	2,212	4,859	9.1%	5.9%	12.2%	440
	38,996	**5,850**	**4,253**	**7,447**	**15.0%**	**11.3%**	**18.7%**	**440**
	43,640	1,785	543	3,027	4.1%	1.3%	6.9%	240
	43,640	**3,219**	**1,056**	**5,382**	**7.4%**	**2.3%**	**12.5%**	**240**
West	22,853	802	31	1,572	3.5%	0.1%	7.1%	250
	22,853	**2,125**	**1,167**	**3,083**	**9.3%**	**4.4%**	**14.2%**	**250**
	26,420	762	156	1,367	2.9%	0.5%	5.3%	163
	26,420	**1,507**	**820**	**2,194**	**5.7%**	**2.7%**	**8.7%**	**163**
Construction Year:								
HUs built 1978-2005	40,458	653	109	1,197	1.6%	0.3%	3.0%	476
	40,458	**1,587**	**870**	**2,303**	**3.9%**	**2.2%**	**5.6%**	**476**
HUs built 1978-2017	57,919	396	0	1,191	0.7%	0.0%	2.0%	224
	57,919	**760**	**0**	**1,840**	**1.3%**	**0.0%**	**3.2%**	**224**
1960-1977	29,956	1,663	703	2,624	5.6%	2.4%	8.7%	306
	29,956	**3,572**	**2,193**	**4,951**	**11.9%**	**7.6%**	**16.3%**	**306**
	25,599	483	24	942	1.9%	0.0%	3.7%	225
	25,599	**786**	**234**	**1,338**	**3.1%**	**0.8%**	**5.3%**	**225**
1940-1959	18,117	3,318	1,965	4,670	18.3%	11.9%	24.7%	187
	18,117	**5,360**	**3,696**	**7,024**	**29.6%**	**22.7%**	**36.5%**	**187**
	18,178	1,598	778	2,419	8.8%	4.8%	12.8%	154
	18,178	**3,263**	**2,134**	**4,392**	**17.9%**	**12.7%**	**23.2%**	**154**
Before 1940	17,503	5,455	3,467	7,444	31.2%	23.8%	38.5%	162
	17,503	**7,868**	**5,228**	**10,508**	**45.0%**	**35.8%**	**54.1%**	**162**
	16,055	4,436	2,336	6,535	27.6%	14.2%	41.1%	100
	16,055	**7,111**	**4,548**	**9,673**	**44.3%**	**30.4%**	**58.2%**	**100**
Urbanization								
MSA	80,101	8,975	6,627	11,324	11.2%	8.4%	14.1%	889
	80,101	**14,915**	**11,871**	**17,959**	**18.6%**	**15.1%**	**22.2%**	**889**
	90,723	5,695	3,251	8,139	6.3%	3.5%	9.0%	555

Table 6-2. Comparison of Prevalence of Windowsill Dust Lead Hazards, by Selected Housing (HU) Characteristics between AHHS and AHHS II (in RED) and Old[a] and New (in BOLD)[b] Dust Hazard Action Levels. Statistically Significant Differences Highlighted.

Characteristic	*All HUs (000)*	*No. of HUs with Windowsill Dust Lead Hazards (000)*			*Percent[c] of HUs[d] with Windowsill Dust Lead Hazards (%)*			HUs in Sample
		Estimate	*Lower 95% CI[e]*	*Upper 95% CI*	*Estimate*	*Lower 95% CI*	*Upper 95% CI*	
	90,723	**8,941**	**6,283**	**11,600**	**9.9%**	**6.9%**	**12.8%**	**555**
Non-MSA	25,933	2,114	1,145	3,083	8.2%	4.8%	11.5%	242
	25,933	**3,472**	**2,279**	**4,665**	**13.4%**	**9.4%**	**17.4%**	**242**
	27,028	1,218	626	1,810	4.5%	2.0%	7.0%	148
	27,028	**2,978**	**1,032**	**4,924**	**11.0%**	**3.0%**	**19.0%**	**148**
Housing Unit Type:								
Single family	89,156	10,569	8,234	12,905	11.9%	9.4%	14.3%	950
	89,156	**17,200**	**14,172**	**20,228**	**19.3%**	**16.2%**	**22.3%**	**950**
	95,590	6,354	3,923	8,785	6.6%	4.0%	9.3%	571
	95,590	11,181	7,974	14,387	11.7%	8.3%	15.1%	571
Multi-family	16,877	520	0	1,090	3.1%	0.0%	6.5%	181
	16,877	**1,187**	**515**	**1,859**	**7.0%**	**3.0%**	**11.1%**	**181**
	22,161	559	0	1,140	2.5%	0.0%	5.4%	132
	22,161	**738**	**163**	**1,314**	**3.3%**	**0.5%**	**6.1%**	**132**
Tenure:								
Owner-occupied	73,627	7,205	5,246	9,163	9.8%	7.3%	12.3%	772
	73,627	**11,927**	**9,224**	**14,630**	**16.2%**	**12.9%**	**19.5%**	**772**
	75,302	5,232	3,242	7,222	6.9%	4.2%	9.7%	419
	75,302	**8,318**	**5,496**	**11,139**	**11.0%**	**7.3%**	**14.8%**	**419**
Renter-occupied	32,407	3,885	2,253	5,517	12.0%	6.9%	17.1%	359
	32,407	**6,460**	**4,582**	**8,338**	**19.9%**	**14.3%**	**25.6%**	**359**
	42,449	1,681	513	2,849	4.0%	1.1%	6.8%	284
	42,449	**3,602**	**2,055**	**5,148**	**8.5%**	**4.6%**	**12.3%**	**284**
Household Income:								
Less than $30,000/year	37,059	5,891	4,138	7,644	15.9%	11.5%	20.3%	401
	37,059	**8,629**	**6,409**	**10,848**	**23.3%**	**18.0%**	**28.6%**	**401**
Less than $35,000/year	45,994	3,588	1,824	5,353	7.8%	4.0%	11.6%	308
	45,994	6,397	3,813	8,981	13.9%	8.4%	19.4%	308
$30,000/year or more	68,975	5,198	3,114	7,283	7.5%	4.7%	10.4%	730
	68,975	**9,758**	**7,239**	**12,278**	**14.1%**	**10.9%**	**17.4%**	**730**
$35,000/year or more	71,757	3,325	1,894	4,755	4.6%	2.6%	6.6%	395
	71,757	**5,522**	**3,343**	**7,702**	**7.7%**	**4.8%**	**10.6%**	**395**
One or More Children Under Age 6:								
All Income Categories	16,833	1,796	966	2,625	10.7%	6.0%	15.3%	207
	16,833	**2,654**	**1,444**	**3,864**	**15.8%**	**9.2%**	**22.3%**	**207**
	14,979	905	0	1,824	6.0%	0.0%	12.1%	108
	14,979	**1,299**	**265**	**2,332**	**8.7%**	**1.8%**	**15.5%**	**108**
Less than $30,000/year	5,781	584	130	1,039	10.1%	2.5%	17.7%	74
	5,781	**968**	**307**	**1,630**	**16.8%**	**5.7%**	**27.8%**	**74**
Less than $35,000/year	5,365	613	0	1,467	11.4%	0.0%	26.4%	47
	5,365	**826**	**0**	**1,732**	**15.4%**	**0.0%**	**31.1%**	**47**
$30,000/year or more	11,052	1,211	558	1,865	11.0%	5.7%	16.3%	133
	11,052	**1,686**	**723**	**2,648**	**15.3%**	**7.7%**	**22.8%**	**133**
$35,000/year or more	9,614	292	0	632	3.0%	0.0%	6.5%	61

Table 6-2. Comparison of Prevalence of Windowsill Dust Lead Hazards, by Selected Housing (HU) Characteristics between AHHS and AHHS II (in RED) and Old[a] and New (in BOLD)[b] Dust Hazard Action Levels. Statistically Significant Differences Highlighted.

Characteristic	*All HUs (000)*	*No. of HUs with Windowsill Dust Lead Hazards (000)*			*Percent[c] of HUs[d] with Windowsill Dust Lead Hazards (%)*			HUs in Sample
		Estimate	*Lower 95% CI[e]*	*Upper 95% CI*	*Estimate*	*Lower 95% CI*	*Upper 95% CI*	
	9,614	**473**	**0**	**971**	**4.9%**	**0.0%**	**10.2%**	**61**
One or More Children Under Age 6:								
All Poverty Categories	16,833	1,796	966	2,625	10.7%	6.0%	15.3%	207
	16,833	**2,654**	**1,444**	**3,864**	**15.8%**	**9.2%**	**22.3%**	**207**
	14,979	905	0	1,824	6.0%	0.0%	12.1%	108
	14,979	**1,299**	**265**	**2,332**	**8.7%**	**1.8%**	**15.5%**	**108**
In Poverty	3,423	311	0	626	9.1%	0.0%	17.8%	43
	3,423	**585**	**55**	**1,116**	**17.1%**	**2.7%**	**31.5%**	**43**
	4,223	96	0	288	2.3%	0.0%	6.8%	41
	4,223	**309**	**0**	**668**	**7.3%**	**0.0%**	**15.9%**	**41**
Not in Poverty	13,410	1,485	776	2,194	11.1%	6.1%	16.0%	164
	13,410	**2,069**	**1,056**	**3,081**	**15.4%**	**8.7%**	**22.1%**	**164**
	10,756	809	0	1,708	7.5%	0.0%	15.7%	67
	10,756	**990**	**20**	**1,959**	**9.2%**	**0.3%**	**18.1%**	**67**
Government Support:								
Government support	5,870	527	52	1,002	9.0%	0.4%	17.5%	65
	5,870	**638**	**113**	**1,164**	**10.9%**	**1.5%**	**20.3%**	**65**
	10,781	137	0	412	1.3%	0.0%	3.7%	70
	10,781	**490**	**0**	**1,076**	**4.5%**	**0.0%**	**9.8%**	**70**
No government support	99,522	10,563	8,077	13,048	10.6%	8.3%	13.0%	1,059
	99,522	**17,604**	**14,404**	**20,803**	**17.7%**	**14.8%**	**20.6%**	**1,059**
	106,023	6,776	4,056	9,496	6.4%	3.8%	9.0%	626
	106,023	**11,429**	**8,030**	**14,829**	**10.8%**	**7.6%**	**14.0%**	**626**
Poverty:								
In Poverty	14,593	2,142	1,076	3,208	14.7%	8.0%	21.3%	166
	14,593	**3,661**	**2,279**	**5,043**	**25.1%**	**16.9%**	**33.3%**	**166**
	20,340	807	243	1,370	4.0%	1.2%	6.8%	157
	20,340	**1,861**	**855**	**2,867**	**9.2%**	**4.3%**	**14.0%**	**157**
Not in Poverty	91,441	8,948	6,502	11,393	9.8%	7.3%	12.3%	965
	91,441	**14,726**	**11,614**	**17,838**	**16.1%**	**13.1%**	**19.1%**	**965**
	97,411	6,107	3,742	8,471	6.3%	3.8%	8.7%	546
	97,411	**10,058**	**6,828**	**13,289**	**10.3%**	**7.0%**	**13.7%**	**546**
Race:								
White	82,739	7,769	5,596	9,942	9.4%	6.9%	11.8%	868
	82,739	**12,754**	**9,924**	**15,584**	**15.4%**	**12.3%**	**18.5%**	**868**
	89,252	5,572	3,839	7,306	6.2%	4.2%	8.3%	502
	89,252	**9,289**	**6,558**	**12,020**	**10.4%**	**7.1%**	**13.7%**	**502**
African American	13,161	2,200	1,357	3,042	16.7%	10.7%	22.7%	151
	13,161	**3,508**	**2,506**	**4,511**	**26.7%**	**20.3%**	**33.0%**	**151**
	17,179	666	0	1,426	3.9%	0.0%	8.1%	126
	17,179	**1,391**	**354**	**2,428**	**8.1%**	**2.7%**	**13.5%**	**126**
Other[f]	10,134	1,121	437	1,804	11.1%	4.4%	17.7%	112
	10,134	**2,124**	**1,278**	**2,970**	**21.0%**	**14.1%**	**27.8%**	**112**

Table 6-2. Comparison of Prevalence of Windowsill Dust Lead Hazards, by Selected Housing (HU) Characteristics between AHHS and AHHS II (in RED) and Old[a] and New (in BOLD)[b] Dust Hazard Action Levels. Statistically Significant Differences Highlighted.

Characteristic	*All HUs (000)*	*No. of HUs with Windowsill Dust Lead Hazards (000)*			*Percent[c] of HUs[d] with Windowsill Dust Lead Hazards (%)*			HUs in Sample
		Estimate	*Lower 95% CI[e]*	*Upper 95% CI*	*Estimate*	*Lower 95% CI*	*Upper 95% CI*	
	11,321	675	0	1,579	6.0%	0.0%	13.5%	75
	11,321	**1,240**	**102**	**2,377**	**11.0%**	**1.2%**	**20.7%**	**75**
Ethnicity:								
Hispanic/Latino	13,175	1,018	350	1,686	7.7%	2.9%	12.6%	158
	13,175	**1,702**	**912**	**2,491**	**12.9%**	**7.5%**	**18.3%**	**158**
	15,538	308	0	666	2.0%	0.0%	4.3%	120
	15,538	**1,010**	**583**	**1,436**	**6.5%**	**3.6%**	**9.4%**	**120**
Not Hispanic/Latino	92,858	10,072	7,613	12,530	10.8%	8.4%	13.3%	973
	92,858	**16,685**	**13,609**	**19,762**	**18.0%**	**15.1%**	**20.8%**	**973**
	102,213	6,605	4,097	9,113	6.5%	4.0%	8.9%	583
	102,213	**10,910**	**7,666**	**14,154**	**10.7%**	**7.4%**	**13.9%**	**583**

[a] Old dust hazard action level is at least 40 µg/ft^2 for floors and at least 250 µg/ft^2 for windowsills.
[b] New dust hazard action level is at least 10 µg/ft^2 for floors and at least 100 µg/ft^2 for windowsills.
[c] Estimated percentages are calculated with the "All HUs" column in each row used as the denominator.
[d] "Housing units" include permanently occupied, noninstitutional housing units in which children are permitted to live.
[e] CI = confidence interval for the estimated number or percent.
[f] "Other" race includes Asian, American Indian or Alaskan Native, Native Hawaiian or other Pacific Islander, and more than one race.

Table 6-3. Mean Floor and Windowsill Dust Lead Loadings (µg/ft^2) by Various Housing Characteristics (AHHS II in red)							
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
	3.68	2.09	5.27	54	22	86	703/672
Region:							
Northeast	5.19	2.47	7.91	489	285	694	196/189
	6.76	1.42	12.1	148	0	301	139/136
Midwest	4.70	2.63	6.78	122	37	207	245/225
	6.22	0.92	11.52	71	0	151	161/150
South	3.14	0.90	5.39	75	35	115	440/393
	2.08	0.71	3.45	18	8	27	240/225
West	1.65	0.34	2.95	21	9	32	250/236
	1.32	0.58	2.06	21	4	39	163/161
Construction Year:							
1978-2005	0.62	0.23	1.00	14	1	26	476/421
1978-2017	0.47	0.21	0.73	4	2	7	224/209
1960-1977	1.65	0.57	2.72	27	17	37	306/280
	0.91	0.61	1.21	8	5	10	225/214
1940-1959	5.64	3.32	7.96	230	32	429	187/183
	4.23	2.14	6.32	62	12	112	154/151
Before 1940	11.50	5.77	17.23	584	240	927	162/159
	19.08	9.02	29.14	291	76	506	100/98
Region by Construction Year:							
Northeast							
Built 1978-2005	0.46	0.15	0.77	3.5	0.1	6.8	35/34
Built 1978-2017	1.05	0	2.32	1.7	0.6	2.9	37/37
Built 1960-1977	3.82	0	9.41	39	18	60	57/52
	0.93	0.13	1.73	6	1	11	28/26
Built 1940-1959	3.04	0	6.27	631	0	1468	42/42
	4.65	0	9.67	61	24	97	31/30
Built before 1940	10.15	4.90	15.39	989	182	1797	62/61
	17.64	0.47	34.81	434	0	913	43/43
Midwest							
Built 1978-2005	0.58	0.17	1.00	4.9	3.0	6.7	107/96
Built 1978-2017	0.58	0	1.36	3.1	0.1	6.2	51/47
Built 1960-1977	1.07	0	2.21	13	4	21	58/51
	0.76	0.14	1.38	4.7	1.9	7.5	50/46
Built 1940-1959	9.25	3.23	15.26	128	2	253	36/35
	4.44	0.78	8.10	124	0	317	28/27
Built before 1940	11.26	4.08	18.43	395	69	720	44/43
	27.07	3.55	50.59	246	0	595	32/30
South							
Built 1978-2005	0.53	0.31	0.76	26	0	53	221/189
Built 1978-2017	0.35	0.07	0.63	5	0	10	94/83
Built 1960-1977	1.41	0.50	2.32	29	10	48	122/111
	0.89	0.43	1.35	9	4	15	81/77
Built 1940-1959	5.63	2.44	8.83	152	64	240	71/68
	5.73	0.79	10.67	44	22	66	54/54
Built before 1940	21.04	0	48.86	366	0	774	26/25

Table 6-3. Mean Floor and Windowsill Dust Lead Loadings (µg/ft^2) by Various Housing Characteristics (AHHS II in red)							
Characteristic	*Floors*			*Windowsills*			*HUs in Sample (Floor/Sill)*
	Mean	*Lower 95% CI[a]*	*Upper 95% CI*	*Mean*	*Lower 95% CI*	*Upper 95% CI*	
	17.65	2.63	32.67	119	0	247	11/11
West							
Built 1978-2005	0.87	0	2.36	4	2	6	113/102
Built 1978-2017	0.32	0.08	0.56	4	1	7	42/42
Built 1960-1977	0.90	0.55	1.25	26	5	48	69/66
	1.08	0.48	1.68	8	4	12	66/65
Built 1940-1959	4.35	0	10.34	29	14	44	38/38
	1.47	0.81	2.13	15	8	21	41/40
Built before 1940	2.68	1.55	3.82	59	1	118	30/30
	7.65	3.09	12.21	169	0	374	14/14
Urbanization							
MSA	2.86	2.04	3.67	180	119	241	889/835
	3.08	1.67	4.49	59	19	98	555/542
Non-MSA	5.75	1.70	9.79	76	21	130	242/208
	5.71	0.53	10.89	37	4	71	148/130
Children Under Age 6:							
All HU ages	3.34	1.04	5.64	304	0	681	207/189
	5.53	0	13.34	66	0	168	108/106
Built 1978-2005	0.38	0.18	0.59	2	1	4	103/89
	0.24	0	0.68	11	0	29	32/31
Built 1960-1977	1.28	0.47	2.09	43	7	80	48/46
	0.46	0.22	0.70	8	1	14	41/40
Built 1940-1959	4.57	1.53	7.61	425	0	1096	33/31
	1.11	0.07	2.15	14	0	30	19/19
Built before 1940	16.36	1.87	30.85	1565	0	3897	23/23
	34.31	0	84.70	374	0	1056	16/16
No Children Under Age 6:							
All HU ages	3.61	2.31	4.90	128	74	182	924/854
	3.41	2.02	4.80	52	21	84	595/566
Built 1978-2005	0.67	0.20	1.15	16	1	31	373/332
	0.50	0.20	0.80	3	2	4	192/178
Built 1960-1977	1.70	0.46	2.94	25	14	35	258/234
	0.99	0.65	1.33	8	5	11	184/174
Built 1940-1959	5.83	3.14	8.51	198	4	393	154/152
	4.55	2.26	6.84	67	11	122	135/132
Built before 1940	10.80	4.54	17.06	439	224	655	139/136
	16.59	7.27	25.91	277	57	498	84/82
Housing Unit Type:							
Single family	4.11	2.76	5.45	172	120	225	950/876
	3.97	2.20	5.74	63	26	100	571/544
Multi-family	0.70	0.44	0.96	65	0	154	181/167
	2.44	0	5.07	16	1	31	132/128
Tenure:							
Owner-occupied	3.65	2.12	5.18	108	51	165	772/712

Table 6-3. Mean Floor and Windowsill Dust Lead Loadings (µg/ft^2) by Various Housing Characteristics (AHHS II in red)							
Characteristic	*Floors*			*Windowsills*			*HUs in Sample (Floor/Sill)*
	Mean	*Lower 95% CI[a]*	*Upper 95% CI*	*Mean*	*Lower 95% CI*	*Upper 95% CI*	
	3.29	1.74	4.84	49	19	78	419/398
Renter-occupied	3.37	2.03	4.70	264	52	476	359/331
	4.37	1	7.74	64	11	117	284/274
Household Income:							
Less than $30,000/year	5.16	2.60	7.72	225	87	363	401/356
Less than $35,000/year	4.91	1.68	8.14	90	28	151	308/289
$30,000/year or more	2.71	1.81	3.60	120	32	208	730/687
$35,000/year or more	2.89	1.06	4.72	32	6	59	395/383
Children Under Age 6:							
All Income Categories	3.34	1.04	5.64	304	0	681	207/189
	5.53	0	13.34	66	0	168	108/106
Less than $30,000/year	2.13	1.17	3.09	221	0	572	74/63
Less than $35,000/year	14.77	0	36.16	37	5	69	47/46
$30,000/year or more	3.97	0.53	7.41	342	0	852	133/126
$35,000/year or more	0.37	0.13	0.61	83	0	240	61/60
No Children Under Age 6:							
All Income Categories	3.61	2.31	4.90	128	74	182	924/854
	3.41	2.02	4.80	52	21	84	595/566
Less than $30,000/year	5.72	2.65	8.79	225	80	371	327/293
Less than $35,000/year	3.61	2	5.22	97	29	165	261/243
$30,000/year or more	2.46	1.58	3.35	78	30	125	597/561
$35,000/year or more	3.28	1.15	5.41	24	13	36	334/323
Government Support:							
Government support	1.25	0.59	1.92	28	5	51	65/63
	1.89	0.64	3.14	23	0	52	70/67
No government support	3.70	2.52	4.89	164	114	215	1059/974
	3.89	2.14	5.64	58	21	95	626/598
Refusal/Don't Know [b]							7/6
							7/7
Poverty:							
In Poverty	3.46	1.71	5.21	273	0	549	166/143
	3.13	0.86	5.40	32	11	54	157/145
Not in Poverty	3.58	2.34	4.82	138	69	208	965/900
	3.80	2.05	5.55	58	19	97	546/527
Poverty by Urbanization:							
MSA							
In poverty	3.13	1.79	4.47	343	0	702	125/116
	1.85	0.73	2.97	27	12	42	119/115
Not in poverty	2.81	1.93	3.70	155	66	245	764/719
	3.33	1.64	5.02	65	16	114	436/427
Non-MSA							
In poverty	4.30	0	9.39	44	4	84	41/27
	7.08	0	15.74	50	0	139	38/30
Not in poverty	6.02	1.35	10.69	80	17	144	201/181
	5.40	0.02	10.78	35	0	70	110/100

Table 6-3. Mean Floor and Windowsill Dust Lead Loadings (µg/ft^2) by Various Housing Characteristics (AHHS II in red)

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
	4.04	1.87	6.21	59	23	95	502/479
African American	4.46	2.35	6.58	437	212	662	151/141
	3.46	1.29	5.63	51	0	115	126/118
Other[c]	2.06	1.12	3.01	84	15	152	112/107
	1.17	0.51	1.83	22	2	42	75/75
Ethnicity:							
Hispanic/Latino	1.79	0.96	2.61	63	9	117	158/147
	2.09	0.84	3.34	11	5	17	120/117
Not Hispanic/Latino	3.81	2.56	5.07	169	114	223	973/896
	3.92	2.15	5.69	61	24	98	583/555

[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 6-4. Distribution of Maximum Dust Lead Loadings in Housing Units by Surface (AHHS in RED, AHHS II in BLUE)

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]						
>= 5	28,200	24,920	31,481	30%	26%	33%
	20,698	17,484	23,911	19.5%	16.5%	22.5%
	24,754	20,684	28,824	21.0%	17.2%	24.8%
>= 10	15,964	13,141	18,787	17%	14%	20%
	12,992	10,206	15,778	12.3%	9.7%	14.9%
	16,508	13,084	19,933	14.0%	10.8%	17.2%
>= 20	8,989	6,871	11,108	9%	7%	12%
	8,259	6,298	10,220	7.8%	6.0%	9.6%
	9,981	7,193	12,769	8.5%	6.0%	10.9%
>= 40	5,495	3,770	7,220	6%	4%	8%
	5,237	3,809	6,665	4.9%	3.6%	6.3%
	5,742	3,676	7,808	4.9%	3.1%	6.7%
>= 100	2,426	1,470	3,382	3%	2%	4%
	2,988	1,929	4,047	2.8%	1.8%	3.8%
	3,416	1,891	4,941	2.9%	1.6%	4.2%
Windowsills						
>= 50	24,550	20,671	28,430	23.2%	19.8%	26.5%
	16,650	12,522	20,778	14.1%	10.4%	17.8%
>= 100	18,387	15,117	21,657	17.3%	14.5%	20.2%
	11,919	8,625	15,214	10.1%	7.2%	13.1%
>= 125	20,338	17,590	23,085	21%	19%	24%
	15,680	13,452	17,909	14.8%	12.8%	16.8%
	9,579	7,054	12,105	8.1%	5.9%	10.4%
>= 250	13,439	11,516	15,362	14%	12%	16%
	11,090	9,126	13,053	10.5%	8.7%	12.3%
	6,913	4,398	9,428	5.9%	3.7%	8.1%
>= 500	9,042	7,136	10,949	10%	8%	12%
	7,361	5,943	8,779	6.9%	5.6%	8.3%
	4,337	2,361	6,313	3.7%	2.0%	5.4%
No sill present in HU[e]	2,221	848	3,594	2%	1%	4%
	2,857	1,667	4,047	2.7%	1.6%	3.8%
	2,262	792	3,732	1.9%	0.7%	3.2%
Missing[f]	1,731			2%		
	4,411			4.2%		
	4,692			4.0%		

[a] "Housing units" include permanently occupied, noninstitutional housing units in which children are permitted to live.
[b] Estimated percentages are calculated with total housing units (106,033) (117,751) as the denominator.
[c] CI = confidence interval for the estimated number or percent.
[d] Floors include both carpeted and uncarpeted floors.
[e] "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.
[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).

Table 6-5. Maximum Floor Dust Lead Loading by Year of Construction (AHHS II in RED)

Maximum Floor Dust Lead Loading(µg/ ft²)[a]		*Year of Construction*							
		1978-2005 (1978-2017)		*1960-1977*		*1940-1959*		*Before 1940*	
		Number (000)	*Percent (%)*[b]	*Number (000)*	*Percent (%)*	*Number (000)*	*Percent (%)*	*Number (000)*	*Percent (%)*
>= 5	Number HUs[d]	2,268 3,875	5.6% 6.7%	4,574 4,304	15.3% 16.8%	5,842 7,320	32.3% 40.3%	8,014 9,255	45.8% 57.6%
	Lower 95% CI[e]	1,485 1,583	3.7% 3.0%	3,268 2,625	10.8% 10.6%	4,299 5,299	23.7% 31.7%	6,205 6,207	35.5% 45.6%
	Upper 95% CI	3,051 6,167	7.5% 10.4%	5,881 5,982	19.7% 23.1%	7,386 9,341	40.8% 48.8%	9,822 12,304	56.1% 69.7%
>= 10	Number HUs	1,442 1,515	3.6% 2.6%	1,973 2,363	6.6% 9.2%	3,674 5,045	20.3% 27.8%	5,903 7,586	33.7% 47.2%
	Lower 95% CI	895 64	2.2% 0.1%	1,112 1,187	3.7% 4.9%	2,492 3,188	13.7% 18.1%	4,125 5,175	23.6% 36.8%
	Upper 95% CI	1,989 2,966	4.9% 5.1%	2,835 3,539	9.5% 13.6%	4,856 6,903	26.8% 37.4%	7,680 9,997	43.8% 57.7%
>= 20	Number HUs	691 994	1.7% 1.7%	898 1,098	3.0% 4.3%	2,319 2,784	12.8% 15.3%	4,351 5,105	24.9% 31.8%
	Lower 95% CI	256 0	0.6% 0.0%	314 316	1.1% 1.4%	1,407 1,495	7.8% 8.5%	2,898 3,020	16.6% 20.7%
	Upper 95% CI	1,125 2,144	2.8% 3.7%	1,483 1879	5.% 7.2%	3,231 4,074	17.9% 22.1%	5,805 7,190	33.2% 42.9%
>= 40	Number HUs	212 93	0.5% 0.2%	598 383	2.0% 1.5%	1,549 1,017	8.6% 5.6%	2,879 4,250	16.5% 26.5%
	Lower 95% CI	0 0	0.0% 0.0%	35 0	0.1% 0.0%	844 144	4.7% 1.0%	1,815 2,318	10.4% 15.4%
	Upper 95% CI	472 280	1.2% 0.5%	1,160 773	3.9% 3.0%	2,253 1890	12.5% 10.2%	3,944 6,182	22.5% 37.5%
>= 100	Number HUs	103 93	0.3% 0.2%	400 0	1.3% 0.0%	913 569	5.0% 3.1%	1,571 2,754	9.0% 17.2%
	Lower 95% CI	0 0	0.0% 0.0%	0 0	0.0% 0.0%	345 0	1.9% 0.0%	879 1,260	5.0% 8.2%
	Upper 95% CI	311 280	0.8% 0.5%	886 0	3.0% 0.0%	1,482 1,194	8.2% 6.5%	2,263 4,248	12.9% 26.1%

[a] Floors include both carpeted and uncarpeted floors.
[b] Estimated percentages are calculated with total housing units in the age category as the denominator.

Table 6-6. Maximum Windowsill Dust Lead Loading by Year of Construction (AHHS II in RED)

Maximum Floor Dust Lead Loading(µg/ ft²)		*Year of Construction*							
		1978-2005 (1978-2017)		*1960-1977*		*1940-1959*		*Before 1940*	
		Number (000)	*Percent (%)[a]*	*Number (000)*	*Percent (%)*	*Number (000)*	*Percent (%)*	*Number (000)*	*Percent (%)*
>= 50	Number HUs[b]	2,755 2,155	6.8% 3.7%	4,779 1,868	16.0% 7.3%	7,454 4,451	41.1% 24.5%	9,563 8,176	54.6% 50.9%
	Lower 95% CI	1,782 477	4.5% 0.8%	3,195 903	11.1% 3.6%	5,293 2,947	33.3% 17.7%	6,781 5,548	46.1% 38.3%
	Upper 95% CI	3,727 3,833	9.1% 6.6%	6,364 2,832	20.8% 11.0%	9,615 5,954	49.0% 31.3%	12,344 10,805	63.2% 63.5%
>= 100	Number HUs	1,587 760	3.9% 1.3%	3,572 786	11.9% 3.1%	4,687 3,263	25.9% 17.9%	6,536 7,111	37.3% 44.3%
	Lower 95% CI	870 0	2.2% 0.0%	2,193 234	7.6% 0.8%	3,183 2,134	19.4% 12.7%	4,381 4,548	29.3% 30.4%
	Upper 95% CI	2,303 1,840	5.6% 3.2%	4,951 1,338	16.3% 5.3%	6,192 4,392	32.4% 23.2%	8,692 9,673	45.4% 58.2%
>= 125	Number HUs	1,414 396	3.5% 0.7%	3,042 732	10.2% 2.9%	4,687 2,848	25.9% 15.7%	6,536 5,603	37.4% 34.9%
	Lower 95% CI	774 0	1.9% 0.0%	1,866 176	6.2% 0.6%	3,527 1,710	19.5% 10.2%	5,184 3,506	29.6% 22.1%
	Upper 95% CI	2,054 1,191	5.1% 2.0%	4,219 1,288	14.1% 5.1%	5,848 3,986	32.3% 21.2%	7,889 7,701	45.1% 47.7%
>= 250	Number HUs	653 396	1.6% 0.7%	1,663 483	5.6% 1.9%	3,318 1,598	18.3% 8.8%	5,455 4,436	31.2% 27.6%
	Lower 95% CI	134 0	0.3% 0.0%	730 24	2.4% 0.0%	2,189 778	12.1% 4.8%	4,231 2,336	24.2% 14.2%
	Upper 95% CI	1,173 1,191	2.9% 2.0%	2,597 942	8.7% 3.7%	4,446 2,419	24.5% 12.8%	6,680 6,535	38.2% 41.1%
>= 500	Number HUs	293 396	0.7% 0.7%	969 0	3.2% 0.0%	1,942 911	10.7% 5.0%	4,157 3,030	23.8% 18.9%
	Lower 95% CI	0 0	0.0% 0.0%	319 0	1.1% 0.0%	959 279	5.3% 1.6%	3,146 1,526	18.0% 9.4%
	Upper 95% CI	598 1,191	1.5% 2.0%	1,618 0	5.4% 0.0%	2,925 1,542	16.1% 8.4%	5,169 4,534	29.6% 28.4%
Missing[b]	Number HUs	2,122 2,770	5.3% 4.8%	1,694 1,391	5.7% 5.4%	236 322	1.3% 1.8%	358 209	2.0% 1.3%
No sills[b]	Number HUs	2,061 1,544	5.1% 2.7%	796 406	2.7% 1.6%	0 312	0.0% 1.7%	0 0	0.0% 0.0%
	Lower 95% CI	1,030 434	2.6% 0.7%	172 0	0.6% 0.0%	0 0	0.0% 0.0%	0 0	0.0% 0.0%
	Upper 95% CI	3,092 2,655	7.6% 4.6%	1,420 828	4.7% 3.3%	0 767	0.0% 4.1%	0 0	0.0% 0.0%

[a] Estimated percentages are calculated with total housing units in the age category as the denominator.

[b] 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. Maximum Floor Dust Lead Loadings by Household Income (AHHS II in RED)

Maximum Floor Dust Lead Loading(µg/ ft²)[a]		*Household Income*			
		Less than $30,000/year *Less than $35,000/year*		*Equal to or above $30,000/year* *Equal to or above $35,000/year*	
		Number (000)	*Percent (%)[a]*	*Number (000)*	*Percent (%)*
>= 5	Number HUs[b]	9,080 12,288	24.5% 26.7%	11,618 12,467	16.8% 17.4%
	Lower 95% CI[c]	6,970 9,072	19.3% 20.5%	9,381 8,874	13.6% 12.5%
	Upper 95% CI	11,190 15,503	29.7% 32.9%	13,854 16,059	20.1% 22.2%
>= 10	Number HUs	5,604 8,426	15.1% 18.3%	7,388 8,082	10.7% 11.3%
	Lower 95% CI	3,915 5,702	10.8% 12.6%	5,383 5,333	7.8% 7.4%
	Upper 95% CI	7,294 11,150	19.4% 24.0%	9,393 10,831	13.6% 15.1%
>= 20	Number HUs	3,390 5,184	9.2% 11.3%	4,870 4,797	7.1% 6.7%
	Lower 95% CI	2,336 2,808	6.3% 6.3%	3,284 2,558	4.7% 3.7%
	Upper 95% CI	4,443 7,560	12.0% 16.3%	6,445 7,036	9.4% 9.7%
>= 40	Number HUs	2,305 2,241	6.2% 4.9%	2,932 3,502	4.3% 4.9%
	Lower 95% CI	1,447 971	4.0% 2.2%	1,763 1,490	2.5% 2.1%
	Upper 95% CI	3,162 3,511	8.5% 7.6%	4,102 5,514	6.0% 7.6%
>= 100	Number HUs	1,239 1,509	3.3% 3.3%	1,749 1,907	2.5% 2.7%
	Lower 95% CI	501 395	1.4% 0.9%	876 384	1.3% 0.5%
	Upper 95% CI	1,977 2,623	5.3% 5.7%	2,621 3,431	3.8% 4.8%

[a] Estimated percentages are calculated with total housing units in that income class as the denominator.
[b] "HUs" include permanently occupied, noninstitutional housing units in which children are permitted to live.
[c] CI = confidence interval for the estimated number or percent.

Table 6-8. Maximum Windowsill Lead Dust Loadings by Household Income (AHHS II in RED)

Windowsill Dust Lead Loading ($\mu g/ ft^2$)[a]		*Household Income*			
		Less than $30,000/year *Less than $35,000/year*		*Equal to or Above $30,000/year* *Equal to or Above $35,000/year*	
		Number (000)	*Percent[a]*	*Number (000)*	*Percent*
>= 50	Number HUs[b]	11,000 8,972	29.7% 19.5%	13,550 7,678	19.6% 10.7%
	Lower 95% CI[c]	8,634 5,846	24.2% 13.1%	10,557 4,900	15.9% 6.9%
	Upper 95% CI	13,367 12,098	35.2% 25.9%	16,542 10,456	23.4% 14.5%
>= 100	Number HUs	8,629 6,397	23.3% 13.9%	9,758 5,522	14.1% 7.7%
	Lower 95% CI	6,409 3,813	18.0% 8.4%	7,239 3,343	10.9% 4.8%
	Upper 95% CI	10,848 8,981	28.6% 19.4%	12,278 7,702	17.4% 10.6%
>= 125	Number HUs	7,318 5,019	19.8% 10.9%	8,362 4,561	12.1% 6.4%
	Lower 95% CI	5,361 3,206	14.9% 7.1%	6,551 2,693	9.8% 3.8%
	Upper 95% CI	9,275 6,831	24.6% 14.7%	10,174 6,428	14.5% 8.9%
>= 250	Number HUs	5,891 3,588	15.9% 7.8%	5,198 3,325	7.5% 4.6%
	Lower 95% CI	4,112 1,824	11.5% 4.0%	3,503 1894	4.7% 2.6%
	Upper 95% CI	7,670 5,353	20.3% 11.6%	6,894 4,755	10.4% 6.6%
>= 500	Number HUs	3,911 2,587	10.6% 5.6%	3,449 1,750	5.0% 2.4%
	Lower 95% CI	2,551 1,126	7.1% 2.6%	2,274 733	3.3% 1.0%
	Upper 95% CI	5,272 4,048	14.0% 8.7%	4,624 2,766	6.7% 3.9%
Missing[d]	Number HUs	2,442 2,886	6.6% 6.3%	1,969 1,806	2.9% 2.5%
No sill[d]	Number HUs	1,244 1,195	3.4% 2.6%	1,613 1,067	2.3% 1.5%
	Lower 95% CI	428 232	1.3% 0.5%	767 0	1.2% 0.0%
	Upper 95% CI	2,059 2,157	5.4% 4.7%	2,459 2,199	3.5% 3.0%

[a] Estimated percentages are calculated with total housing units in that income class as the denominator.
[b] "HUs" include permanently occupied, noninstitutional housing units in which children are permitted to live.
[c] CI = confidence interval for the estimated number or percent.
[d] 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.

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 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.[39] The definition of soil lead hazard in AHHS II is the same as in NSLAH and AHHS. As in AHHS, a soil sample was collected in AHHS II only if there was soil associated with the specific unit sampled.[40] In AHHS II as 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.[41] Thus, the AHHS and AHHS II soil data are directly comparable, allowing for an estimate of trends in soil data over time which was not possible for AHHS vs. NSLAH because of differences in soil collection and play area definitions between the two surveys [1].

The number and percent of homes with soil lead hazards decreased substantially from AHHS to AHHS II (Table 7-1), although the differences are not statistically significant because of small sample sizes. Only 12 units out of 703 were found to have soil hazards in AHHS II. Eight of the 12 had significantly deteriorated LBP and 2 of the 4 that did not, had a dust hazard under the new standard; soil lead contributes only a very small amount to the total number of units with significant lead hazards. Table 7-1 breaks down soil hazards by whether or not they occur in children's play areas. The number and percent of units with a soil lead hazard in a non-play area decreased significantly from AHHS to AHHS II. It is clear from the table that the 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 and compares them to AHHS. Mean estimates for each housing unit were first calculated as the arithmetic average of all sample concentrations for the unit. The detection limit for a soil sample in AHHS II was 0.48 ppm or 1.62 ppm depending on the instrument the sample was analyzed on, significantly lower than the detection limit of 20 ppm in AHHS. As a result, only 4 of the 2,159 soil samples taken in AHHS II were below the detection limit. For these samples, raw analytical data from the laboratory was used to calculate a lead concentration. The national mean soil lead level was 106 ppm, and 99 ppm for bare soil. 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[26]. (Note that, in contrast to the dust lead hazard standards, there has been no formal review of the adequacy of the soil lead hazard standards by the EPA since they became effective in 2001.) They are also statistically significantly lower than the corresponding numbers for AHHS ($p = 0.007$ in both cases). Significant reductions are also seen in mean soil concentrations based on comparisons for all characteristics in Table 7-2 except for region. This shows that although the reductions in the number and percent of units with soil hazards were not statistically significant, there were significant across-the-board reductions in the levels of lead in soil in the 13 years between AHHS and AHHS II.

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

[39] 24 CFR Part 35.1320
[40] A different procedure was followed in NSLAH, see [1].
[41] Play areas were defined differently in NSLAH, see [1].

higher than the South or West for all soil and bare soil; pre-1940 housing has the highest mean soil and bare soil lead at 428 and 405 ppm, respectively – approximately one third of the bare soil standard of 1,200 ppm. The differences between pre-1940 levels and those for other age groups are statistically significant. In AHHS, mean soil lead levels were 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. These differences were no longer significant in AHHS II, largely due to the overall reduction in mean soil lead levels.

Table 7-3 shows the distribution of maximum bare soil lead concentrations in AHHS II compared to AHHS. The number and percent of units with maximum soil lead levels above most thresholds from 20 ppm to 5,000 ppm are significantly lower in AHHS II than in AHHS, confirming the broad reduction in soil lead noted previously. Table 7-4 breaks down the national distributions in Table 7-3 by age of the housing. The number and percent exceeding each threshold is lower in AHHS II than AHHS, except for post-1977 housing. The patterns by age are as expected, with the oldest housing having the highest levels. Units with maximum levels exceeding 400 ppm and higher are heavily concentrated in pre-1940 units. Tables 7-5 and 7-6 are the companion tables for maximum bare soil lead concentrations in children's play areas. Interestingly, the pattern of large reductions in soil lead levels from AHHS to AHHS II is not apparent for play areas alone. However, less than 1% of units have bare soil lead levels above the 400 ppm standard for children's play areas in either survey. 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. Table 7-7 shows statistically significant reductions in the percent and number of units above most thresholds in AHHS II compared to AHHS I.

Table 7-9 in a companion table to 7-2, presenting median and 90th percentile bare soil lead loadings[42] by a subset of the housing characteristics in 7-2 for AHHS and AHHS II. The median bare soil loading decreased from 29 ppm to 24 ppm and the 90th percentile from 380 ppm to 240 ppm (statistically significant). Statistically significant decreases in the median were seen in the Northeast, in MSA units, and in units with no children under age 6, not in poverty, of Other Race and Hispanic. Significant decreases in the 90h percentile were seen in MSA units, owner-occupied units, higher income units, and units not receiving Government support, not in poverty and not Hispanic. The pattern is similar to Table 7-2, with significant across-the-board decreases in bare soil lead levels between AHHS and AHHS II. The regional and age patterns are also similar, with the Northeast showing a significantly higher median and 90th percentile than the South and West in both surveys, and significant increases in both with increasing age of housing. The distribution of bare soil lead loadings is highly skewed, although not quite as much as for lead dust levels. While the mean and 90th percentile are similar for dust lead, the 90th percentile for bare soil is typically at least twice the mean.

In Table 7-9, percentage decreases in the 90th percentile from AHHS to AHHS II are typically greater than for the median, suggesting larger decreases in the highest bare soil lead levels. Table 7-10 shows the number and percent of housing units with maximum bare soil lead level of 200 ppm or greater, nationwide and by various housing characteristics. Table 7-11 is the same table for 400 ppm. In both tables, percentages are calculated with the total number of units with bare

[42] As in Table 7-2, the bare soil lead loading for a housing unit is the average over all bare soil samples in the unit.

soil as the denominator. The percent of units with bare soil lead $\geq$ 200 ppm decreased from 22.5% in AHHS to 15.8% in AHHS (not quite statistically significant). For the 400 ppm threshold, the decrease was from 16.5% to 10.1% (statistically significant). There are more significant decreases in Table 7-11 than 7-10, again suggesting that the highest bare soil lead levels decreased the most from AHHS to AHHS II.

Table 7-1. Prevalence of Soil Lead Hazards in Play and Non-Play Areas (AHHS II in Red)						
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	512 832	65 0	960 1,893	0.5% 0.7%	0.1% 0.0%	0.9% 1.6%
Play Area Only	413 832	0 0	833 1,893	0.4% 0.7%	0% 0.0%	0.8% 1.6%
Non-Play Area	3,435 1,517	2,003 360	4,866 2,675	3.2% 1.3%	1.9% 0.3%	4.6% 2.3%
Non-Play Area Only	3,336 1,517	1,936 360	4,736 2,675	3.2% 1.3%	1.8% 0.3%	4.5% 2.3%
Both Play and Non-Play Area	99 509	0 0	290 1,235	0.1% 0.4%	0% 0.0%	0.3% 1.1%
Any Soil Hazard	3,848 2,350	2,235 743	5,461 3,956	3.6% 2.0%	2.1% 0.6%	5.2% 3.4%

[a] "Housing units" include permanently occupied, noninstitutional housing units in which children are permitted to live.
[b] Estimated percentages are calculated with total housing units (106,033) (117,751) 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 (AHHS II in Red)							
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	169 106	132 77	207 134	184 99	127 70	240 127	942/681 595/393
Region:							
Northeast	373 222	238 112	508 332	400 224	198 113	602 334	151/83 104/58
Midwest	190 150	100 73	280 227	217 136	97 59	338 213	227/181 142/106
South	83 53	57 28	109 78	67 52	44 23	91 82	375/259 227/149
West	124 67	58 31	191 103	184 62	32 28	337 97	189/158 122/80
Construction Year:							
1978-2005 1978-2017	25 36	16 3	33 68	26 41	13 0	39 82	390/267 194/134
1960-1977	72 43	45 31	99 55	70 51	44 32	96 70	248/191 184/118
1940-1959	194 111	131 78	257 144	205 87	123 63	288 111	162/122 128/89
Before 1940	604 428	447 306	760 549	691 405	421 285	961 525	142/101 89/52

Table 7-2. Mean Soil and Mean Bare Soil Lead Concentrations (ppm) by Various Housing Characteristics (AHHS II in Red)							
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***	
Region by Construction Year:							
Northeast							
Built 1978-2005	55	0	115	97	0	246	34/14
Built 1978-2017	47	21	73	33	14	52	28/18
Built 1960-1977	150	14	286	161	0	322	41/19
	49	25	74	62	21	103	20/10
Built 1940-1959	251	93	410	285	44	525	26/17
	127	61	193	125	60	189	20/13
Built before 1940	797	480	1114	730	344	1116	50/33
	524	240	807	624	282	965	36/17
Midwest							
Built 1978-2005	30	15	46	26	14	37	97/72
Built 1978-2017	94	0	232	108	0	268	47/36
Built 1960-1977	51	23	78	51	24	78	54/48
	53	15	91	71	14	128	41/29
Built 1940-1959	232	75	388	239	58	419	35/29
	136	42	230	73	49	96	25/20
Built before 1940	539	295	782	657	290	1023	41/32
	380	199	561	322	192	451	29/21
South							
Built 1978-2005	17	12	22	16	13	20	182/121
Built 1978-2017	15	11	20	18	12	24	87/62
Built 1960-1977	62	25	100	69	27	111	101/78
	41	24	58	49	22	76	76/45
Built 1940-1959	119	75	163	118	71	164	67/50
	90	50	129	74	34	115	53/36
Built before 1940	435	216	653	394	78	711	25/10
	389	228	551	375	107	643	44141
West							
Built 1978-2005	19	12	26	20	11	29	77/60
Built 1978-2017	17	13	21	21	17	26	32/18
Built 1960-1977	55	29	81	50	36	65	52/46
	33	24	42	30	19	40	47/34
Built 1940-1959	218	74	362	235	26	443	34/26
	97	56	138	100	26	175	30/20
Built before 1940	476	96	857	847	0	1892	26/26
	337	207	467	255	125	386	13/8
Urbanization							
MSA	192	142	243	211	133	288	709/510
	103	72	134	90	62	118	469/295
Non-MSA	111	65	157	113	63	164	233/171
	114	44	184	123	50	196	126/98
Children Under Age 6:							
All HU ages	172	101	242	185	94	277	176/133
	83	43	122	85	42	129	97/67
HUs built 1978-2005	31	2	59	38	0	85	87/64
HUs built 1978-2017	20	15	24	22	18	27	30/21

Table 7-2. Mean Soil and Mean Bare Soil Lead Concentrations (ppm) by Various Housing Characteristics (AHHS II in Red)							
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*	
HUs built 1960-1977	111 40	42 23	180 57	119 35	30 22	207 49	39/30 34/20
HUs built 1940-1959	367 72	153 27	580 118	410 74	108 19	712 129	29/24 17/12
HUs built before 1940	533 341	195 247	871 435	530 295	281 215	779 376	21/15 16/14
No Children Under Age 6:							
All HU ages	169 109	132 77	205 141	183 101	123 69	243 133	766/548 498/326
HUs built 1978-2005 HUs built 1978-2017	23 38	18 1	28 76	22 45	18 0	27 93	303/203 164/113
HUs built 1960-1977	66 44	38 30	94 57	62 53	37 32	87 75	209/161 150/98
HUs built 1940-1959	165 115	107 79	222 151	166 89	92 65	239 112	133/98 111/77
HUs built before 1940	614 443	455 301	773 586	716 439	405 285	1026 593	121/86 73/38
Housing Unit Type:							
Single family	174 110	134 80	213 140	190 107	130 78	250 137	880/639 510/345
Multi-family	107 80	9 32	205 129	97 50	0 15	216 85	62/42 85/48
Tenure							
Owner-occupied	144 91	106 68	182 114	151 85	102 59	200 111	717/508 374/244
Renter-occupied	254 134	180 74	329 195	285 125	130 68	439 182	225/173 221/149
Household Income:							
Less than $30,000/year Less than $35,000/year	203 130	137 84	269 176	205 101	88 65	322 137	317/245 260/182
$30,000/year or more $35,000/year or more	152 91	113 62	191 119	172 97	122 60	222 134	625/436 335/211
Children Under Age 6:							
All Income Categories	172 83	101 43	242 122	185 85	94 42	277 129	176/133 97/67
Less than $30,000/year Less than $35,000/year	92 99	47 38	138 160	61 120	36 42	86 198	60/47 45/31
$30,000/year or more $35,000/year or more	210 73	110 16	310 129	252 64	118 14	386 114	116/86 52/36
No Children Under Age 6:							
All Income Categories	169 109	132 77	206 141	183 101	123 69	243 133	766/548 498/326
Less than $30,000/year Less than $35,000/year	224 134	148 84	300 185	234 98	94 60	374 137	257/198 215/151
$30,000/year or more $35,000/year or more	141 93	101 62	180 125	155 103	109 61	201 145	509/350 283/175

Table 7-2. Mean Soil and Mean Bare Soil Lead Concentrations (ppm) by Various Housing Characteristics (AHHS II in Red)							
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*	
Government Support:							
Government support	60 81	28 21	93 142	57 82	19 3	95 161	41/29 56/36
No government support	172 108	134 79	209 138	190 101	131 73	249 129	894/649 537/356
Refusal/Don't Know [b]							44015 43862
Poverty:							
In Poverty	181 92	94 52	268 133	234 101	5 49	464 152	131/103 133/93
Not in Poverty	167 108	125 77	210 139	175 98	120 68	231 128	811/578 462/300
Poverty by Urbanization:							
MSA							
In poverty	225 75	98 33	351 117	313 81	0 25	668 136	92/69 101/65
Not in poverty	188 109	132 74	244 143	196 92	123 60	269 124	617/441 368/230
Non-MSA							
In poverty	98 152	47 60	148 243	96 153	46 50	147 255	39/34 32/28
Not in poverty	114 107	58 39	170 175	117 115	59 44	175 187	194/137 94/70
Race:							
White	156 114	117 79	195 149	173 103	115 67	232 139	745/545 424/269
African American	229 85	137 39	321 130	202 99	97 39	308 158	114/81 113/81
Other[c]	216 69	93 22	340 117	270 67	67 30	473 105	83/55 58/43
Ethnicity:							
Hispanic/Latino	174 93	75 41	274 144	199 73	52 24	346 122	118/84 102/66
Not Hispanic/Latino	169 108	130 78	207 137	182 102	124 71	240 134	824/597 493/327

[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 (AHHS II in Red)

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*
>= 20 ppm	44,071	39,330	48,811	41.6%	37.1%	46.1%
	42,733	34,843	50,623	36.3%	30.1%	42.5%
>= 50 ppm	27,046	23,052	31,040	25.5%	21.7%	29.3%
	24,449	18,339	30,559	20.8%	15.8%	25.7%
>= 200 ppm	14,441	11,525	17,357	13.6%	10.9%	16.4%
	10,362	6,500	14,225	8.8%	5.5%	12.1%
>= 400 ppm	10,578	8,138	13,018	10.0%	7.7%	12.3%
	6,608	3,507	9,710	5.6%	2.9%	8.3%
>= 1,200 ppm	3,435	2,003	4,866	3.2%	1.9%	4.6%
	1,747	501	2,992	1.5%	0.4%	2.5%
>= 1,600 ppm	2,764	1,453	4,074	2.6%	1.4%	3.8%
	778	0	1,570	0.7%	0.0%	1.3%
>= 2,000 ppm	2,280	1,123	3,437	2.2%	1.1%	3.3%
	548	0	1,193	0.5%	0.0%	1.0%
>= 5,000 ppm	875	157	1,593	0.8%	0.1%	1.5%
	141	0	423	0.1%	0.0%	0.4%

[a] "Housing units" include permanently occupied, noninstitutional housing units in which children are permitted to live.
[b] Estimated percentages are calculated with total housing units (106,033) (117,751) as the denominator.
[c] CI = confidence interval for the estimated number or percent.

Table 7-4. Distribution of Maximum Bare Soil Sample Lead Concentration by Construction Year (AHHS II in Red)								
Bare Soil Lead Concentration	*Number of HUs[a] (000)*				*Percent[b] of HUs (%)*			
	Before 1940	*1940 - 1959*	*1960 - 1977*	*1978 – 2005* *1978 – 2017*	*Before 1940*	*1940 - 1959*	*1960 - 1977*	*1978 – 2005* *1978 – 2017*
>= 20 ppm	10,514 8,644	11,732 10,202	13,597 10,051	8,227 13,836	60.1% 53.8%	64.8% 56.1%	45.4% 39.3%	20.3% 23.9%
>= 50 ppm	10,060 8,040	8,527 6,161	5,942 4,550	2,517 8,040	57.5% 50.1%	47.1% 33.9%	19.8% 17.8%	6.2% 9.8%
>= 200 ppm	8,084 5,659	3,982 2,356	1,811 679	565 1,668	46.2% 35.3%	22.0% 13.0%	6.0% 2.7%	1.4% 2.9%
>= 400 ppm	6,409 4,010	2,611 872	1,363 544	195 1,183	36.6% 25.0%	14.4% 4.8%	4.6% 2.1%	0.5% 2.0%
>= 1,200 ppm	2,469 1,291	776 121	81 106	109 229	14.1% 8.0%	4.3% 0.7%	0.3% 0.4%	0.3% 0.4%
>= 1,600 ppm	1,798 548	776 0	81 0	109 229	10.3% 3.4%	4.3% 0.0	0.3% 0.0	0.3% 0.4%
>= 2,000 ppm	1,558 548	613 0	0 0	109 0	8.9% 3.4%	3.4% 0.0%	0% 0.0%	0.3% 0.0%
>= 5,000 ppm	625 141	250 0	0 0	0 0	3.6% 0.9%	1.4% 0.0%	0% 0.0%	0% 0.0%

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

[b] Estimated percentages are calculated with total housing units of that age as the common denominator.

Table 7-5. Distribution of Maximum Bare Soil Lead Concentrations in Children's Play Areas (AHHS II in Red)

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*	
>= 20 ppm	7,326 9,484	4,908 5,369	9,744 13,600	6.9% 8.1%	4.6% 4.5%	9.2% 11.6%	76 62
>= 50 ppm	3,895 5,443	2,362 2,637	5,427 8,248	3.7% 4.6%	2.2% 2.2%	5.1% 7.1%	38 34
>= 200 ppm	1,391 1,968	680 193	2,103 3,743	1.3% 1.7%	.6% 0.1%	2.0% 3.2%	13 11
>= 400 ppm	512 832	65 0	960 1,893	0.5% 0.7%	0.1% 0.0%	0.9% 1.6%	5 4
>= 1,200 ppm	0 229	0 0	0 690	0% 0.2%	0% 0.0%	0% 0.6%	0 1
Total	106,033 117,751			100% 100%			1,131 703

[a] "Housing units" are permanently occupied, noninstitutional residential units in which children are permitted to live.
[b] Estimated percentages are calculated with total housing units (106,033) (117,751) as the denominator.
[c] CI = 95% confidence interval for the estimated number or percent.

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

Bare Soil Lead Concentration	*Number of HUs (000)*[a]				*Percent of HUs (%)*[b]			
	Before 1940	***1940 - 1959***	***1960 - 1977***	***1978 – 2005*** ***1978 – 2017***	***Before 1940***	***1940 - 1959***	***1960 - 1977***	***1978 – 2005*** ***1978 - 2017***
>= 20 ppm	2,362 1,696	2,484 2,713	1,293 1,839	1,187 3,238	13.5% 10.6%	13.7% 14.9%	4.3% 7.2%	2.9% 5.6%
>= 50 ppm	2,129 1,696	920 1,263	613 687	233 1,797	12.2% 10.6%	5.1% 7.0%	2.1% 2.7%	0.6% 3.1%
>= 200 ppm	742 695	442 539	207 51	0 683	4.2% 4.3%	2.4% 3.0%	0.7% 0.2%	0% 1.2%
>= 400 ppm	315 279	100 121	97 0	0 432	1.8% 1.7%	0.6% 0.7%	0.3% 0.0%	0% 0.7%
>= 1,200 ppm	0 0	0 0	0 0	0 229	0% 0.0%	0% 0.0%	0% 0.0%	0% 0.4%
Total	17,503 16,055	18,117 18,178	29,956 25,599	40,458 57,919	100% 100%	100% 100%	100% 100%	100% 100%

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

[b] Estimated percentages are calculated with total housing units of that age as the common denominator.

Table 7-7. Distribution of Maximum Bare Soil Lead Concentrations in the Rest of the Yard (AHHS II in Red)

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*	
>= 20 ppm	42,212 39,720	37,627 32,038	46,797 47,402	39.8% 33.7%	35.5% 27.9%	44.2% 39.6%	435 270
>= 50 ppm	26,150 21,931	22,338 16,056	29,962 27,806	24.7% 18.6%	21.0% 13.9%	28.3% 23.3%	263 155
>= 200 ppm	14,045 9,299	11,164 5,662	16,926 12,936	13.3% 7.9%	10.5% 4.8%	16.0% 11.0%	136 63
>= 400 ppm	10,262 6,208	7,913 3,222	12,610 9,194	9.7% 5.3%	7.5% 2.7%	11.9% 7.8%	99 40
>= 1,200 ppm	3,435 1,517	2,003 360	4,866 2,675	3.2% 1.3%	1.9% 0.3%	4.6% 2.3%	31 8
>= 1,600 ppm	2,764 548	1,453 0	4,074 1,193	2.6% 0.5%	1.4% 0.0%	3.8% 1.0%	24 3
>= 2,000 ppm	2,280 548	1,123 0	3,437 1,193	2.2% 0.5%	1.1% 0.0%	3.3% 1.0%	20 3
>= 5,000 ppm	875 141	157 0	1,593 423	0.8% 0.1%	0.1% 0.0%	1.5% 0.4%	8 1
Total	106,033 117,751			100% 100%			1,131 703

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

[b] Estimated percentages are calculated with total housing units (106,033) (117,751) as the denominator.

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

Table 7-8. Distribution of Maximum Bare Soil Lead Concentrations in the Rest of the Yard, by Construction Year (AHHS II in Red)								
Bare Soil Lead Concentration	*Number of HUs[a] (000)*				*Percent[b] of HUs (%)*			
	Before 1940	*1940 - 1959*	*1960 - 1977*	*1978 – 2005* *1978 – 2017*	*Before 1940*	*1940 - 1959*	*1960 - 1977*	*1978 – 2005* *1978 – 2017*
>= 20 ppm	10,061 7,644	11,438 9,604	13,165 9,525	7,548 12,947	57.5% 47.6%	63.1% 52.8%	44.0% 37.2%	18.7% 22.4%
>= 50 ppm	9,506 7,040	8,427 5,773	5,912 4,259	2,306 4,859	54.3% 43.8%	46.5% 31.8%	19.7% 16.6%	5.7% 8.4%
>= 200 ppm	7,788 4,964	3,882 1,988	1,811 679	565 1,668	44.5% 30.9%	21.4% 10.9%	6.0% 2.7%	1.4% 2.9%
>= 400 ppm	6,193 3,730	2,510 751	1,363 544	195 1,183	35.4% 23.2%	13.9% 4.1%	4.6% 2.1%	0.5% 2.0%
>= 1,200 ppm	2,469 1,291	776 121	81 106	109 0	14.1% 8.0%	4.3% 0.7%	0.3% 0.4%	0.3% 0.0%
>= 1,600 ppm	1,798 548	776 0	81 0	109 0	10.3% 3.4%	4.3% 0.0%	0.3% 0.0%	0.3% 0.0%
>= 2,000 ppm	1,558 548	613 0	0 0	109 0	8.9% 3.4%	3.4% 0.0%	0% 0.0%	0.3% 0.0%
>= 5,000 ppm	625 141	250 0	0 0	0 0	3.6% 0.9%	1.4% 0.0%	0% 0.0%	0% 0.0%
Total	17,503 16,055	18,117 18,178	29,956 25,599	40,458 57,919	100% 100%	100% 100%	100% 100%	100% 100%

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

[b] Estimated percentages are calculated with total housing units of that age as the common denominator.

Table 7-9. Comparison of Median and 90th Percentile Bare Soil Lead Concentrations (ppm) by Various Housing Characteristics between AHHS and AHHS II (in red)

Characteristic	*Median*			*90th Percentile*			*HUs in Sample)*
	Estimate	*Lower 95% CI[a]*	*Upper 95% CI*	*Estimate*	*Lower 95% CI*	*Upper 95% CI*	
All Occupied HUs	29 24	25 21	33 28	380 240	316 180	515 356	681 393
Region:							
Northeast	156 43	81 28	200 90	1008 480	730 314	1845 1506	83 58
Midwest	30 30	25 23	38 49	508 346	328 239	889 665	181 106
South	18 18	16 14	23 21	155 90	93 60	215 175	259 149
West	29 24	22 18	36 32	247 120	187 70	494 393	158 80
Construction Year:							
1978-2005 1978-2017	13 15	12 13	14 17	39 56	33 39	62 154	267 134
1960-1977	24 26	22 22	28 33	163 84	101 61	248 191	191 118
1940-1959	69 49	50 40	87 61	467 181	266 138	898 336	122 89
Before 1940	307 239	227 179	380 346	1650 841	1027 614	2713 1716	101 52
Urbanization							
MSA	30 23	25 20	34 28	442 212	327 135	666 331	510 295
Non-MSA	28 26	22 20	34 41	314 359	214 212	453 565	171 98
Housing Unit Type:							
Single family	29 25	25 21	33 32	407 270	327 207	558 372	639 345
Multi-family	26 23	20 16	34 26	88 58	41 52	1429 513	42 48
Tenure:							
Owner-occupied	26 21	22 19	30 25	377 192	254 152	494 306	508 244
Renter-occupied	36 29	31 25	48 41	482 359	307 234	1052 590	173 149
Household Income:							
Less than $30,000/year Less than $35,000/year	37 29	30 23	47 39	314 327	246 209	400 475	245 182
$30,000/year or more $35,000/year or more	25 22	22 19	29 25	475 184	345 151	716 349	436 211
Children Under Age 6:							
All Income Categories	22 25	17 18	31 33	489 316	266 155	1090 374	133 67
Less than $30,000/year Less than $35,000/year	21 41	13 17	49 880	164 343	98 238	330 880	47 31
$30,000/year or more	25	16	34	928	420	1285	86

Table 7-9. Comparison of Median and 90th Percentile Bare Soil Lead Concentrations (ppm) by Various Housing Characteristics between AHHS and AHHS II (in red)

Characteristic	*Median*			*90th Percentile*			*HUs in Sample)*
	Estimate	*Lower 95% CI[a]*	*Upper 95% CI*	*Estimate*	*Lower 95% CI*	*Upper 95% CI*	
$35,000/year or more	23	15	32	171	55	401	36
No Children Under Age 6:							
All Income Categories	30	26	34	378	288	503	548
	23	21	28	239	178	379	326
Less than $30,000/year	30	26	34	378	288	503	198
Less than $35,000/year	23	21	28	239	178	379	151
$30,000/year or more	30	26	34	378	288	503	350
$35,000/year or more	23	21	28	239	178	379	175
Government Support:							
Government support	25	16	375	127	37	375	29
	19	11	28	71	47	1345	36
No government support	25	16	375	127	37	375	649
	19	11	28	71	47	1345	356
Refusal/Don't Know[b]	25	16	375	127	37	375	3
	19	11	28	71	47	1345	1
Poverty:							
In Poverty	29	22	40	326	256	436	103
	28	21	48	288	143	461	93
Not in Poverty	29	22	40	326	256	436	578
	28	21	48	288	143	461	300
Race:							
White	26	22	31	330	251	474	545
	23	21	28	242	180	397	269
African American	46	29	91	512	360	765	81
	27	18	54	222	99	583	81
Other[c]	54	25	77	812	273	2211	55
	24	11	32	214	83	491	43
Ethnicity:							
Hispanic/Latino	55	36	68	270	241	1111	84
	19	13	28	125	64	637	66
Not Hispanic/Latino	27	23	31	391	320	521	597
	25	21	29	242	183	364	327

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 7-10. Comparison of Number and Percent of Housing Units with Bare Soil lead Concentrations at or above 200ppm between AHHS I and AHHS II (in red)								
HU Characteristic	*All HUs (000)*	*Number of HUs[a] with Bare Soil Lead >= 200ppm (000)*			*Percent of HUs[b] with Bare Soil Lead >= 200ppm (%)*			*HUs in Sample*
		Estimate	*Lower 95% CI[c]*	*Upper 95% CI*	*Estimate*	*Lower 95% CI*	*Upper 95% CI*	
Total Housing Units[a]	64,128 65,624	14,441 10,362	11,097 6,500	17,786 14,225	22.5% 15.8%	18.4% 10.5%	26.7% 21.1%	681 393
Region:								
Northeast	9,338 8,589	5,141 2,554	2,641 1,700	7,641 3,408	55.1% 29.7%	43.1% 18.8%	67.0% 40.7%	83 58
Midwest	18,052 17,301	4,455 4,844	3,001 1,691	5,910 7,996	24.7% 28.0%	17.4% 11.9%	32.0% 44.1%	181 106
South	22,706 27,444	2,441 1,780	1,202 273	3,681 3,288	10.8% 6.5%	6.1% 1.5%	15.4% 11.5%	259 149
West	14,031 12,290	2,404 1,185	1,271 0	3,537 2,592	17.1% 9.6%	10.2% 0.0%	24.1% 19.8%	158 80
Construction Year:								
1978-2017	22,836 33,196	565 1,668	0 0	1,151 5,020	2.5% 5.0%	0.0% 0.0%	5.0% 14.8%	267 134
1960-1977	18,510 13,104	1,811 679	578 89	3,043 1,268	9.8% 5.2%	3.4% 0.7%	16.2% 9.6%	191 118
1940-1959	12,032 10,680	3,982 2,356	2,415 1,078	5,548 3,634	33.1% 22.1%	23.3% 12.1%	42.9% 32.0%	122 89
Before 1940	10,750 8,644	8,084 5,659	5,450 3,637	10,719 7,681	75.2% 65.5%	65.9% 50.2%	84.5% 80.8%	101 52
Urbanization:								
MSA (total) (estimated)	46,434 48,504	10,936 6,731	8,211 4,400	13,661 9,061	23.6% 13.9%	18.8% 9.6%	28.3% 18.1%	510 295
Non-MSA	17,694 17,119	3,505 3,632	1,566 551	5,444 6,712	19.8% 21.2%	11.1% 5.0%	28.5% 37.4%	171 98
Housing Unit Type:								
Single family	59,817 55,639	13,991 9,918	10,804 6,491	17,178 13,345	23.4% 17.8%	19.2% 12.2%	27.5% 23.4%	639 345
Multi-family	4,311 9,985	451 445	0 0	904 1,046	10.5% 4.5%	0.0% 0.0%	20.9% 10.4%	42 48
Tenure:								
Owner-occupied	48,352 43,205	10,072 6,428	7,524 3,806	12,620 9,051	20.8% 14.9%	16.6% 9.3%	25.1% 20.4%	508 244
Renter-occupied	15,776 22,419	4,369 3,934	3,081 1,645	5,657 6,223	27.7% 17.5%	20.5% 8.2%	34.9% 26.9%	173 149
Household Income:								
Less than $30,000/year Less than $35,000/year	22,955 28,192	5,049 5,268	3,768 2,724	6,330 7,812	22.0% 18.7%	17.0% 10.6%	27.0% 26.8%	245 182
Equal to or more than $30,000/year Equal to or more than $35,000/year	41,173 37,432	9,392 5,094	6,663 2,759	12,122 7,430	22.8% 13.6%	17.5% 7.8%	28.1% 19.4%	436 211
One or More Children Under Age 6:								
All Income Categories	11,047 10,074	2,926 1,870	1,477 415	4,376 3,326	26.5% 18.6%	15.3% 5.0%	37.7% 32.2%	133 67
Less than $30,000/year	3,855	737	203	1,271	19.1%	5.7%	32.5%	47

Table 7-10. Comparison of Number and Percent of Housing Units with Bare Soil lead Concentrations at or above 200ppm between AHHS I and AHHS II (in red)								
HU Characteristic	*All HUs (000)*	*Number of HUs[a] with Bare Soil Lead >= 200ppm (000)*			*Percent of HUs[b] with Bare Soil Lead >= 200ppm (%)*			*HUs in Sample*
		Estimate	*Lower 95% CI[c]*	*Upper 95% CI*	*Estimate*	*Lower 95% CI*	*Upper 95% CI*	
Less than $35,000/year	3,883	1,012	160	1,863	26.0%	6.0%	46.1%	31
Equal to or more than $30,000/year	7,192	2,190	903	3,476	30.4%	15.9%	45.0%	86
Equal to or more than $35,000/year	6,191	859	0	2,039	13.9%	0.0%	32.0%	36
No Children Under Age 6:								
All Income Categories	53,080	11,515	8,991	14,039	21.7%	17.8%	25.6%	548
	55,550	8,492	4,956	12,028	15.3%	9.5%	21.1%	326
Less than $30,000/year	19,099	4,312	3,118	5,506	22.6%	17.1%	28.1%	198
Less than $35,000/year	24,309	4,257	1,941	6,572	17.5%	8.9%	26.1%	151
Equal to or more than $30,000/year	33,981	7,203	5,277	9,128	21.2%	16.5%	25.9%	350
Equal to or more than $35,000/year	31,241	4,235	2,224	6,247	13.6%	7.5%	19.6%	175
Government Support:								
Government support	2,794	229	0	555	8.2%	0.0%	19.7%	29
	6,720	528	0	1,213	7.9%	0.0%	18.1%	36
No government support	61,063	14,212	10,807	17,617	23.3%	18.9%	27.6%	649
	58,769	9,834	6,339	13,330	16.7%	11.3%	22.1%	356
Refusal/Don't Know[d]	271	0	0	0	0.0%	0.0%	0.0%	3
	134	0	0	0	0.0%	0.0%	.	1
Poverty:								
In poverty	9,108	2,460	1,601	3,319	27.0%	18.5%	35.5%	103
	12,545	2,092	765	3,419	16.7%	6.2%	27.1%	93
Not in poverty	55,020	11,981	8,749	15,214	21.8%	17.2%	26.4%	578
	53,079	8,271	4,975	11,566	15.6%	9.9%	21.3%	300
Race:								
White	52,230	10,631	7,986	13,276	20.4%	16.4%	24.3%	545
	47,335	7,859	4,364	11,355	16.6%	9.8%	23.4%	269
African American	7,082	2,347	1,121	3,573	33.1%	20.7%	45.6%	81
	11,626	1,533	205	2,862	13.2%	3.4%	23.0%	81
Other[e]	4,816	1,463	237	2,690	30.4%	11.0%	49.8%	55
	6,663	970	259	1,680	14.6%	2.9%	26.2%	43
Ethnicity:								
Hispanic/Latino	7,197	2,015	767	3,262	28.0%	12.6%	43.4%	84
	8,492	829	179	1,478	9.8%	2.9%	16.6%	66
Not Hispanic/Latino	56,930	12,427	9,505	15,348	21.8%	17.8%	25.9%	597
	57,132	9,534	5,746	13,321	16.7%	10.7%	22.7%	327

[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] 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.

Table 7-11. Comparison of Number and Percent of Housing Units with Bare Soil lead Concentrations at or above 400ppm between AHHS I and AHHS II (in red)								
HU Characteristic	*All HUs (000)*	*Number of HUs[a] with Bare Soil Lead >= 400ppm (000)*			*Percent of HUs[b] with Bare Soil Lead >= 400ppm (%)*			*HUs in Sample*
		Estimate	*Lower 95% CI[c]*	*Upper 95% CI*	*Estimate*	*Lower 95% CI*	*Upper 95% CI*	
Total Housing Units[a]	64,128 65,624	10,578 6,608	7,838 3,507	13,317 9,710	16.5% 10.1%	12.8% 5.7%	20.2% 14.5%	681 393
Region:								
Northeast	9,338 8,589	3,505 1,727	1,450 1,147	5,561 2,308	37.5% 20.1%	24.0% 13.9%	51.1% 26.3%	83 58
Midwest	18,052 17,301	3,891 2,884	2,544 386	5,238 5,382	21.6% 16.7%	14.3% 3.3%	28.8% 30.0%	181 106
South	22,706 27,444	1,538 1,144	700 0	2,376 2,495	6.8% 4.2%	3.6% 0.0%	10.0% 8.9%	259 149
West	14,031 12,290	1,643 853	770 0	2,516 1,957	11.7% 6.9%	5.6% 0.0%	17.8% 15.1%	158 80
Construction Year:								
1978-2017	22,836 33,196	195 1,183	0 0	475 3,558	0.9% 3.6%	0.0% 0.0%	2.1% 10.5%	267 134
1960-1977	18,510 13,104	1,363 544	411 0	2,316 1,100	7.4% 4.2%	2.5% 0.0%	12.2% 8.4%	191 118
1940-1959	12,032 10,680	2,611 872	1,266 0	3,955 1,751	21.7% 8.2%	12.3% 0.0%	31.1% 16.0%	122 89
Before 1940	10,750 8,644	6,409 4,010	4,270 2,440	8,547 5,580	59.6% 46.4%	50.9% 33.7%	68.3% 59.1%	101 52
Urbanization:								
MSA (total) (estimated)	46,434 48,504	8,105 3,934	5,710 2,100	10,500 5,768	17.5% 8.1%	12.9% 4.7%	22.0% 11.6%	510 295
Non-MSA	17,694 17,119	2,473 2,674	1,142 173	3,803 5,175	14.0% 15.6%	7.9% 2.3%	20.1% 29.0%	171 98
Housing Unit Type:								
Single family	59,817 55,639	10,353 6,164	7,656 3,514	13,049 8,814	17.3% 11.1%	13.4% 6.7%	21.2% 15.5%	639 345
Multi-family	4,311 9,985	225 445	0 0	546 1,046	5.2% 4.5%	0.0% 0.0%	12.7% 10.4%	42 48
Tenure:								
Owner-occupied	48,352 43,205	7,583 3,879	5,389 1,978	9,778 5,780	15.7% 9.0%	11.6% 4.7%	19.7% 13.2%	508 244
Renter-occupied	15,776 22,419	2,994 2,729	2,005 763	3,984 4,696	19.0% 12.2%	13.1% 3.8%	24.8% 20.6%	173 149
Household Income:								
Less than $30,000/year Less than $35,000/year	22,955 28,192	3,896 3,023	2,749 1,330	5,044 4,716	17.0% 10.7%	12.4% 5.4%	21.5% 16.1%	245 182
Equal to or more than $30,000/year Equal to or more than $35,000/year	41,173 37,432	6,682 3,585	4,550 1,387	8,813 5,783	16.2% 9.6%	11.6% 3.9%	20.8% 15.2%	436 211
One or More Children Under Age 6:								
All Income Categories	11,047 10,074	2,188 1,068	954 134	3,422 2,002	19.8% 10.6%	9.9% 2.0%	29.7% 19.2%	133 67

Table 7-11. Comparison of Number and Percent of Housing Units with Bare Soil lead Concentrations at or above 400ppm between AHHS I and AHHS II (in red)								
HU Characteristic	*All HUs (000)*	*Number of HUs[a] with Bare Soil Lead >= 400ppm (000)*			*Percent of HUs[b] with Bare Soil Lead >= 400ppm (%)*			*HUs in Sample*
		Estimate	*Lower 95% CI[c]*	*Upper 95% CI*	*Estimate*	*Lower 95% CI*	*Upper 95% CI*	
Less than $30,000/year	3,855	454	38	869	11.8%	0.9%	22.7%	47
Less than $35,000/year	3,883	489	0	1,140	12.6%	0.0%	28.1%	31
Equal to or more than $30,000/year	7,192	1,734	660	2,809	24.1%	11.7%	36.5%	86
Equal to or more than $35,000/year	6,191	579	0	1,249	9.4%	0.0%	19.8%	36
No Children Under Age 6:								
All Income Categories	53,080	8,390	6,174	10,605	15.8%	12.1%	19.5%	548
	55,550	5,540	2,624	8,456	10.0%	5.0%	14.9%	326
Less than $30,000/year	19,099	3,443	2,328	4,558	18.0%	12.9%	23.2%	198
Less than $35,000/year	24,309	2,534	970	4,098	10.4%	4.6%	16.2%	151
Equal to or more than $30,000/year	33,981	4,947	3,324	6,570	14.6%	10.1%	19.0%	350
Equal to or more than $35,000/year	31,241	3,006	916	5,096	9.6%	3.1%	16.1%	175
Government Support:								
Government support	2,794	229	0	555	8.2%	0.0%	19.7%	29
	6,720	417	0	961	6.2%	0.0%	14.4%	36
No government support	61,063	10,349	7,572	13,125	16.9%	13.1%	20.8%	649
	58,769	6,192	3,435	8,948	10.5%	6.2%	14.9%	356
Refusal/Don't Know[d]	271	0	0	0	0.0%	0.0%	0.0%	3
	134	0	0	0	0.0%	0.0%	.	1
Poverty:								
In poverty	9,108	2,062	1,243	2,880	22.6%	14.1%	31.1%	103
	12,545	1,341	289	2,393	10.7%	2.2%	19.1%	93
Not in poverty	55,020	8,516	5,982	11,050	15.5%	11.5%	19.5%	578
	53,079	5,267	2,695	7,840	9.9%	5.4%	14.5%	300
Race:								
White	52,230	7,805	5,545	10,066	14.9%	11.1%	18.8%	545
	47,335	5,383	2,609	8,157	11.4%	5.9%	16.9%	269
African American	7,082	1,710	811	2,609	24.1%	14.4%	33.9%	81
	11,626	890	0	1,944	7.7%	0.0%	15.4%	81
Other[e]	4,816	1,063	179	1,947	22.1%	7.7%	36.4%	55
	6,663	335	0	679	5.0%	0.0%	10.3%	43
Ethnicity:								
Hispanic/Latino	7,197	1,345	489	2,200	18.7%	8.1%	29.3%	84
	8,492	551	2	1,099	6.5%	0.2%	12.8%	66
Not Hispanic/Latino	56,930	9,233	6,682	11,784	16.2%	12.3%	20.1%	597
	57,132	6,058	3,052	9,063	10.6%	5.7%	15.5%	327

[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] 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.

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APPENDIX A: WEIGHTING, NONRESPONSE ADJUSTMENT AND STATISTICAL ANALYSIS

A.1 Weighting of the AHHS II Sample

The 504 longitudinal units released for recruiting in AHHS II each had an assigned final weight from AHHS. The final weight is the number of housing units in the U.S represented in AHHS by that unit, after nonresponse adjustment and poststratification [1]. The AHHS unit weights were divided by the probability of inclusion in AHHS II of the PSU to which the unit belonged to account for the fact that only 78 of the 100 AHHS PSUs were included in AHHS II. As discussed in Chapter 1, the 16 certainty PSUs in AHHS were automatically included in AHHS II, so that no adjustment of AHHS weights for units in those PSUs is needed. Since 62 of the 84 noncertainty AHHS PSUs were selected, each with equal probability 62/84, the AHHS weights for units in the noncertainty PSUs were multiplied by 84/62 = 1.348839. The adjusted final AHHS weights were the base weights for AHHS II, before adjustment for nonresponse, poststratification and trimming, (if needed)

Each ABS housing unit released for recruitment in AHHS II has a known probability P of selection given by the formula

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

In this formula, Pr(PSU in AHHS) is the probability of selecting the PSU containing the unit in the AHHS sample. This is proportional to Census 2000 PSU population within strata, except for the 16 larger certainty selections, where Pr(PSU in AHHS) = 1. The second term Pr(PSU|AHHS) is the probability that the PSU was also selected in AHHS II. This is 1 for certainty PSUs and 62/84 = 0.738095 for noncertainty PSUs. The third term, Pr(Segment|PSU), is the probability of selecting the segment containing the unit, at the second stage of sampling in AHHS II. This is proportional to the number of occupied housing units in the segment in Census 2010. The fourth term in the equation varies between 4/(#Units in Segment) and 7/(#Units in Segment), depending on the number of ABS units released for recruitment in the segment. As discussed in Chapter 1, not all ABS units in a segment were released for recruitment until Round 6 of the sampling. The reciprocal of the unit selection probability is the base weight for the ABS unit.

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

Parameter	***Longitudinal Value***	***ABS value***
N	504	1,834
Total	64,052,902	121,426,463
Minimum	32,233	5,605
25th Percentile	97,549	47,757
Median	118,638	60,749
Mean	127,089	66,209
75th Percentile	148,427	76,705
95th Percentile	212,107	109,998
Maximum	327,777	515,477

The 121,426,463 total of the ABS base weights is the estimate from the ABS sample of the total number of occupied housing units in the U.S. at the time the survey was conducted. It is close to the Census Bureau's 2014-2018 estimate of 119,730,128 households but is larger than the number of AHHS II-eligible housing units because not all occupied units are eligible. The 64,052,902 total of the longitudinal weights is an estimate of the number of AHHS-eligible[43] housing units built before 1978. The base ABS weights range from a minimum of 5,605 to a maximum of 515,477 (a factor of approximately 92). The longitudinal base weights are less variable, ranging from 32,233 to 327,77, a factor of only10. Although the variation in neither set of weights is unusual, it means that all estimates from the survey data must be properly weighted to avoid biases. Weighting is especially important in AHHS II because of the oversampling of pre-1978 units caused by the inclusion of the longitudinal sample.

A.2 Nonresponse Adjustment

Estimates from the survey data can be based only on the 703 completed units. Since this is only 30% of the 2,338 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. It must be conducted separately for the longitudinal and ABS samples because, as discussed in Chapter 2, the response rate for the longitudinal sample was much higher than for the ABS sample. 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 classification of completed units according to these variables is discussed in Chapter 3 above.

For units that were not recruited into the survey and completed, only the Census region was always available. There was some information on the other variables in some cases. For example, a respondent who agreed to do the survey but subsequently cancelled may have given the interviewer information on the age of the home. As another example, the interviewer may have recorded their impression of the race of a respondent who refused. In general, however, it was necessary to impute values for race, ethnicity, socioeconomic status and housing age for nonrespondents. This was done by assigning the percentage distribution for each variable in the Census Block Group containing the unit according to the 2018 American Community Survey.

Adjustment of the AHHS II 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 for nonrespondents 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-2 shows the values of NR1.

[43] An AHHS-eligible unit may not be eligible in AHHS II, e.g., if it was vacant at the time of recruitment into AHHS II.

Table A-2. Nonresponse Adjustment Factors for Unknown Eligibility		
NONRESPONSE ADJUSTMENT CELL	***LONGITUDINAL ADJUSTMENT FACTOR***	***ABS ADJUSTMENT FACTOR***
In poverty, African American or Hispanic	1.380	1.549
Not in poverty, African American or Hispanic	1.690	2.066
In poverty, not African American or Hispanic	1.465	2.196
Not in poverty, not African American or Hispanic	1.812	2.627

The higher values of NR1 for the ABS sample compared to the longitudinal sample reflect the higher percentage of unknown eligibility in the ABS sample (Table 2-6).

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 Eligible Units)/(Sum of Base Weights * NR1 for Respondents).

The adjustment factors for nonresponse among eligible units are in Table A-3.

Table A-3. Adjustment Factors for Nonresponse Among Eligible Units			
Nonresponse Adjustment Cell		***Longitudinal Adjustment Factor***	***ABS Adjustment Factor***
Housing Age	***Region***		
1939 or earlier	Midwest	1.561	1.440
1939 or earlier	Northeast	1.227	1.263
1939 or earlier	South	1.330	1.492
1939 or earlier	West	1.310	2.690
1940-1959	Midwest	1.187	1.537
1940-1959	Northeast	1.058	1.335
1940-1959	South	1.046	1.232
1940-1959	West	1.335	1.133
1960-1977	Midwest	1.227	1.391
1960-1977	Northeast	1.177	1.385
1960-1977	South	1.180	1.517
1960-1977	West	1.116	1.219
1978-2017	Midwest	N/A	1.446
1978-2017	Northeast	N/A	1.240
1978-2017	South	N/A	1.458
1978-2017	West	N/A	1.328

The overall nonresponse adjustment factor for respondents is the product NR1*NR2, and ranges from a minimum of 1.44 to a maximum of 2.83 for the longitudinal sample, and from 1.76 to 7.07 for the ABS sample. The higher nonresponse adjustment factors for the ABS sample reflect the lower response rate for ABS compared to longitudinal units noted in Chapter 2. The lowest nonresponse adjustment factors (highest response rates) for both longitudinal and ABS samples

are for poor, African American or Hispanic, households due to the larger effect of the $130 incentive in these households. Homes bult before 1940 had the lowest response rates, holding race and ethnicity constant. Other housing ages had similar response rates to each other. There was no pattern of response rates by region. The highest response rate for longitudinal units was for poor, African American or Hispanic, homes in the South built between 1940 and 1959; the lowest was for households that were not poor, not African American or Hispanic,[44] located in the Midwest and built before 1939. For ABS units, the highest response rate was for poor, African American or Hispanic, homes in the West built between 1940 and 1959; the lowest was for households that were not poor, not African American or Hispanic, located in the West and built before 1939.

A.3 Compositing of ABS and Longitudinal Samples

Compositing was used to combine the longitudinal sample with the pre-1978 HUs in the ABS sample, since HUs built before 1978 were represented by both samples. In this compositing step, the nonresponse adjusted weights of the longitudinal sample were adjusted by a factor λ (where $0 < \lambda < 1$), and the nonresponse adjusted weights of pre-1978 HUs in the ABS sample were adjusted by $(1- \lambda)$. For AHHS II, the compositing factor λ was equal to the effective sample size of the longitudinal sample divided by the sum of the effective sample sizes of the each of the two samples (where these effective sample sizes were restricted to pre-1978 HUs). Since there were 266 completed pre-1978 units in the ABS sample and 213 in the longitudinal sample, we have

$$\lambda = 213/(266 + 213) = 266/479 = 0.4447$$
$$1 - \lambda = 266/479 = 0.5553.$$

HUs in the ABS sample that were built after 1978 received a compositing factor of 1.

A.4 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 II, the 2017 American Housing Survey (AHS) [8] 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, non-age-restricted 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" [1] 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 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.

[44] "Not African American or Hispanic" households are almost 90% White, see Table 3-1.

A technical issue needed to be addressed in the poststratification process. The 2017 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 assuming that 40% of AHS homes in the 1975-1979 age category were built in 1978 or 1979.

A.4 Trimming

As stated in [9,10], "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. 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 AHHS, trimming was not necessary [1]. In AHHS II, as in AHHS, the trimming limit was calculated as T = the square root of 10 times the mean square weight using the NAEP procedure [9]. The four largest weights exceeded the trimming limit T and were trimmed to T. Because a single trimming step reduced the very largest weight, which had been approximately 3 times the next largest, to only 20% larger than the next largest, trimming was terminated after a single step in order to minimize any bias introduced by trimming.

A.5 Statistical Analysis

Weighted statistical analysis for the AHHS II was conducted in SAS. For purposes of variance estimation and calculation of confidence intervals for estimates, the JK(n) version of the Jackknife method [11] was used. The AHHS II first-stage sample consisted of the 16 large certainty PSUs in AHHS and 62 non-certainty PSUs drawn as a stratified random subsample of the 84 non-certainty PSUs in AHHS.

The 16 certainty PSUs were each split into two "variance units" by randomly selecting approximately half of the segments for each variance unit in a manner that equalized the number of DUs in each variance unit as closely as possible. Each certainty PSU was then a separate variance stratum with 2 variance units. Noncertainty PSUs in the sample 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 62 noncertainty PSUs were grouped in this way into 28 variance strata, 22 with 2 variance units (PSUs) and 6 with 3 variance units. This resulted in a total of 94 variance units in 44 variance strata. The variance estimation therefore used a total of 94 replicates, resulting in 94 - 44 = 50 degrees of freedom for estimating standard errors.

APPENDIX B: PREVALENCE OF LBP AND SIGNIFICANT LBP HAZARDS IN PRE-1978 HOUSING

Table B-1. Comparison of Prevalence of Lead-Based Paint (LBP) in Pre-1978 Housing by Selected Housing Unit (HU) Characteristics between AHHS and (AHHS II in red)

Characteristic	*All HUs (000)*[a]	*No. of HUs with LBP (000)*			*Percent*[b] *of HUs with LBP (%)*			HUs in Sample
		Estimate	*Lower 95% CI*[c]	*Upper 95% CI*	*Estimate*	*Lower 95% CI*	*Upper 95% CI*	
Total Occupied HUs	65,576	34,382	29,089	39,676	52.4%	47.3%	57.6%	655
	59,832	30,854	26,583	35,126	51.6%	46.3%	56.9%	479
Region:								
Northeast	16,359	9,896	6,703	13,090	60.5%	47.1%	73.9%	161
	14,870	8,741	6,283	11,200	58.8%	44.2%	73.4%	102
Midwest	15,675	9,113	6,280	11,946	58.1%	47.7%	68.6%	138
	14,873	7,911	5,433	10,388	53.2%	46.3%	60.1%	110
South	20,371	9,261	6,701	11,822	45.5%	37.7%	53.2%	219
	17,993	8,076	6,012	10,141	44.9%	36.5%	53.3%	146
West	13,171	6,111	4,312	7,911	46.4%	38.2%	54.6%	137
	12,096	6,126	4,783	7,470	50.6%	39.1%	62.2%	121
Urbanization								
MSA	49,496	26,155	21,719	30,591	52.8%	47.0%	58.7%	518
	47,850	25,195	21,593	28,798	52.7%	46.9%	58.4%	392
Non-MSA	16,080	8,227	5,338	11,116	51.2%	40.4%	61.9%	137
	11,982	5,659	3,363	7,955	47.2%	34.2%	60.2%	87
Housing Unit Type:								
Single family	56,465	31,131	26,288	35,975	55.1%	49.6%	60.6%	568
	48,405	27,053	23,280	30,827	55.9%	50.1%	61.7%	385
Multi-family	9,111	3,251	1,808	4,694	35.7%	23.7%	47.7%	87
	11,427	3,801	2,386	5,217	33.3%	23.7%	42.8%	94
Tenure:								
Owner-occupied	45,019	22,638	18,442	26,834	50.3%	43.9%	56.7%	445
	36,543	20,605	17,498	23,712	56.4%	49.0%	63.8%	273
Renter-occupied	20,557	11,745	9,489	14,000	57.1%	49.5%	64.8%	210
	23,289	10,249	7,463	13,036	44.0%	35.5%	52.5%	206
Household Income:								
Less than $30,000/year	25,604	14,479	11,655	17,303	56.6%	50.5%	62.6%	259
Less than $35,000/year	25,919	13,869	11,173	16,564	53.5%	46.9%	60.1%	224
$30,000/year or more	39,972	19,903	16,040	23,766	49.8%	42.8%	56.8%	396
$35,000/year or more	33,913	16,986	13,474	20,497	50.1%	42.8%	57.3%	255
One or More Children Under Age 6:								
All Income Categories	8,838	5,300	3,572	7,028	60.0%	48.2%	71.7%	104
	7,721	3,797	2,441	5,153	49.2%	38.1%	60.2%	76
Less than $30,000/year	3,526	1,979	961	2,996	56.1%	38.9%	73.3%	44
Less than $35,000/year	3,306	1,851	805	2,898	56.0%	37.4%	74.6%	36
$30,000/year or more	5,312	3,321	2,017	4,625	62.5%	48.0%	77.0%	60
$35,000/year or more	4,415	1,946	905	2,986	44.1%	30.1%	58.0%	40
One or More Children Under Age 6:								
All Poverty Categories	8,838	5,300	3,572	7,028	60.0%	48.2%	71.7%	104
	7,721	3,797	2,441	5,153	49.2%	38.1%	60.2%	76
In Poverty	2,143	1,019	293	1,745	47.5%	25.6%	69.5%	26
	2,957	1,399	471	2,326	47.3%	26.9%	67.7%	33
Not in Poverty	6,695	4,281	2,813	5,750	63.9%	51.5%	76.4%	78

Table B-1. Comparison of Prevalence of Lead-Based Paint (LBP) in Pre-1978 Housing by Selected Housing Unit (HU) Characteristics between AHHS and (AHHS II in red)								
Characteristic	***All HUs (000)[a]***	***No. of HUs with LBP (000)***			***Percent[b] of HUs with LBP (%)***			**HUs in Sample**
		Estimate	***Lower 95% CI[c]***	***Upper 95% CI***	***Estimate***	***Lower 95% CI***	***Upper 95% CI***	
	4,763	2,398	1,386	3,410	50.3%	36.8%	63.9%	43
Government Support:								
Government support	3,432	1,528	622	2,434	44.5%	29.8%	59.2%	36
	4,668	1,316	641	1,991	28.2%	16.9%	39.5%	45
No government support	61,824	32,562	27,441	37,683	52.7%	47.2%	58.2%	616
	54,548	29,432	25,281	33,583	54.0%	48.4%	59.5%	428
Poverty:								
In Poverty	9,820	5,617	3,839	7,395	57.2%	47.1%	67.3%	105
	11,241	4,112	2,585	5,639	36.6%	26.6%	46.6%	115
Not in Poverty	55,756	28,766	23,443	34,088	51.6%	45.5%	57.7%	550
	48,591	26,743	22,922	30,563	55.0%	49.3%	60.8%	364
Race:								
White	49,879	24,150	19,618	28,682	48.4%	42.6%	54.3%	489
	44,398	24,356	20,673	28,039	54.9%	48.9%	60.8%	338
African American	9,279	5,795	4,007	7,583	62.4%	52.4%	72.5%	99
	9,136	3,816	2,330	5,303	41.8%	29.6%	54.0%	83
Other[g]	6,417	4,437	3,008	5,867	69.1%	60.3%	77.9%	67
	6,299	2,682	1,129	4,235	42.6%	26.1%	59.1%	58
Ethnicity:								
Hispanic/Latino	8,244	4,414	3,096	5,732	53.5%	43.3%	63.8%	92
	8,387	4,416	3,038	5,794	52.7%	43.9%	61.4%	88
Not Hispanic/Latino	57,332	29,968	24,823	35,114	52.3%	46.7%	57.9%	563
	51,445	26,438	22,129	30,748	51.4%	45.3%	57.5%	391

[a] "Housing units" include permanently occupied, noninstitutional housing units in which children are permitted to live.
[b] Estimated percentages are calculated with the "All HUs" column in each row used as the denominator.
[c] CI = confidence interval for the estimated number or percent.
[e] "Other" race includes Asian, American Indian or Alaskan Native, Native Hawaiian or other Pacific Islander, and more than one race.

Table B-2. Comparison of Prevalence of Pre-1978 Housing Units with Significant Lead-Based Paint (LBP) Hazards, by Selected Housing (HU) Characteristics between AHHS and AHHS II (in RED) and Old[a] and New (in BOLD)[b] Dust Hazard Action Levels

Characteristic	*All HUs (000)*[d]	*No. of HUs with Significant LBP Hazards (000)*			*Percent*[e] *of HUs with Significant LBP Hazards (%)*			HUs in Sample
		Estimate	*Lower 95% CI*[f]	*Upper 95% CI*	*Estimate*	*Lower 95% CI*	*Upper 95% CI*	
	HUD Lead Safe Housing Rule: Significant LBP Hazards[c]							
Total Occupied HUs	65,576	22,103	17,967	26,240	33.7%	28.6%	38.8%	655
	65,576	**27,095**	**22,459**	**31,731**	**41.3%**	**35.8%**	**46.8%**	**655**
	59,832	20,664	16,179	25,148	34.5%	27.6%	41.4%	479
	59,832	**26,235**	**21,722**	**30,749**	**43.8%**	**37.0%**	**50.7%**	**479**
Region:								
Northeast	16,359	7,399	5,036	9,761	45.2%	34.2%	56.3%	161
	16,359	**8,495**	**6,220**	**10,771**	**51.9%**	**40.6%**	**63.2%**	**161**
	14,870	5,811	3,162	8,461	39.1%	22.4%	55.7%	102
	14,870	**7,760**	**5,092**	**10,427**	**52.2%**	**35.7%**	**68.7%**	**102**
Midwest	15,675	6,301	4,231	8,371	40.2%	32.0%	48.4%	138
	15,675	**7,371**	**5,000**	**9,743**	**47.0%**	**37.6%**	**56.4%**	**138**
	14,873	5,970	3,575	8,365	40.1%	29.9%	50.3%	110
	14,873	**7,224**	**4,728**	**9,720**	**48.6%**	**38.1%**	**59.1%**	**110**
South	20,371	5,403	3,005	7,801	26.5%	16.0%	37.0%	219
	20,371	**7,265**	**4,279**	**10,251**	**35.7%**	**23.6%**	**47.7%**	**219**
	17,993	4,985	2,768	7,203	27.7%	15.6%	39.8%	146
	17,993	**6,134**	**3,933**	**8,335**	**34.1%**	**22.7%**	**45.5%**	**146**
West	13,171	3,001	1,778	4,223	22.8%	14.8%	30.8%	137
	13,171	**3,964**	**2,630**	**5,297**	**30.1%**	**21.5%**	**38.7%**	**137**
	12,096	3,897	2,336	5,458	32.2%	17.2%	47.3%	121
	12,096	**5,118**	**3,642**	**6,594**	**42.3%**	**25.9%**	**58.7%**	**121**
Urbanization								
MSA	49,496	16,850	13,248	20,451	34.0%	28.4%	39.7%	518
	49,496	**20,857**	**16,980**	**24,735**	**42.1%**	**36.2%**	**48.1%**	**518**
	47,850	15,953	12,118	19,789	33.3%	25.7%	41.0%	392
	47,850	**21,082**	**17,198**	**24,965**	**44.1%**	**36.4%**	**51.7%**	**392**
Non-MSA	16,080	5,253	3,219	7,288	32.7%	21.5%	43.9%	137
	16,080	**6,238**	**3,696**	**8,779**	**38.8%**	**25.9%**	**51.7%**	**137**
	11,982	4,710	2,388	7,033	39.3%	23.6%	55.1%	87
	11,982	**5,154**	**2,854**	**7,453**	**43.0%**	**27.4%**	**58.6%**	**87**
Housing Unit Type:								
Single family	56,465	20,913	16,987	24,838	37.0%	31.8%	42.2%	568
	56,465	**25,337**	**20,947**	**29,727**	**44.9%**	**39.2%**	**50.6%**	**568**
	48,405	18,799	14,804	22,794	38.8%	31.5%	46.2%	385
	48,405	**23,495**	**19,432**	**27,558**	**48.5%**	**41.2%**	**55.8%**	**385**
Multi-family	9,111	1,191	355	2,026	13.1%	4.3%	21.9%	87
	9,111	**1,758**	**771**	**2,746**	**19.3%**	**9.1%**	**29.5%**	**87**
	11,427	1,865	798	2,931	16.3%	6.9%	25.7%	94
	11,427	**2,740**	**1,384**	**4,097**	**24.0%**	**13.0%**	**34.9%**	**94**

Table B-2. Comparison of Prevalence of Pre-1978 Housing Units with Significant Lead-Based Paint (LBP) Hazards, by Selected Housing (HU) Characteristics between AHHS and AHHS II (in RED) and Old[a] and New (in BOLD)[b] Dust Hazard Action Levels

Characteristic	*All HUs (000)*[d]	*No. of HUs with Significant LBP Hazards (000)*			*Percent*[e] *of HUs with Significant LBP Hazards (%)*			HUs in Sample
		Estimate	*Lower 95% CI*[f]	*Upper 95% CI*	*Estimate*	*Lower 95% CI*	*Upper 95% CI*	
HUD Lead Safe Housing Rule: Significant LBP Hazards[c]								
Tenure:								
Owner-occupied	45,019	14,241	10,674	17,809	31.6%	24.9%	38.4%	445
	45,019	**17,744**	**13,838**	**21,649**	**39.4%**	**32.5%**	**46.4%**	**445**
	36,543	13,864	10,597	17,131	37.9%	29.8%	46.1%	273
	36,543	**16,820**	**13,407**	**20,233**	**46.0%**	**37.4%**	**54.7%**	**273**
Renter-occupied	20,557	7,862	5,887	9,837	38.2%	29.3%	47.2%	210
	20,557	**9,351**	**7,388**	**11,315**	**45.5%**	**37.0%**	**54.0%**	**210**
	23,289	6,800	4,392	9,208	29.2%	19.8%	38.6%	206
	23,289	**9,416**	**6,760**	**12,072**	**40.4%**	**31.4%**	**49.5%**	**206**
Household Income:								
Less than $30,000/year	25,604	10,273	8,158	12,388	40.1%	33.8%	46.5%	259
	25,604	**12,237**	**9,673**	**14,801**	**47.8%**	**40.9%**	**54.7%**	**259**
Less than $35,000/year	25,919	10,014	7,068	12,960	38.6%	29.3%	47.9%	224
	25,919	**12,181**	**9,137**	**15,224**	**47.0%**	**38.2%**	**55.8%**	**224**
$30,000/year or more	39,972	11,830	8,702	14,958	29.6%	22.8%	36.4%	396
	39,972	**14,858**	**11,573**	**18,143**	**37.2%**	**30.1%**	**44.2%**	**396**
$35,000/year or more	33,913	10,650	7,366	13,933	31.4%	22.9%	39.9%	255
	33,913	**14,055**	**10,647**	**17,463**	**41.4%**	**32.4%**	**50.5%**	**255**
One or More Children Under Age 6:								
All Income Categories	8,838	3,416	1,872	4,959	38.6%	25.8%	51.5%	104
	8,838	**4,058**	**2,411**	**5,705**	**45.9%**	**33.4%**	**58.4%**	**104**
	7,721	2,109	1,036	3,183	27.3%	16.1%	38.5%	76
	7,721	**2,555**	**1,532**	**3,579**	**33.1%**	**22.4%**	**43.8%**	**76**
Less than $30,000/year	3,526	1,077	424	1,730	30.5%	14.4%	46.7%	44
	3,526	**1,429**	**684**	**2,173**	**40.5%**	**23.9%**	**57.1%**	**44**
Less than $35,000/year	3,306	1,092	235	1,949	33.0%	13.6%	52.4%	36
	3,306	**1,357**	**503**	**2,210**	**41.0%**	**23.4%**	**58.7%**	**36**
$30,000/year or more	5,312	2,339	1,147	3,530	44.0%	28.9%	59.1%	60
	5,312	**2,629**	**1,356**	**3,903**	**49.5%**	**35.0%**	**64.0%**	**60**
$35,000/year or more	4,415	1,018	238	1,798	23.1%	9.1%	37.1%	40
	4,415	**1,199**	**458**	**1,940**	**27.2%**	**13.7%**	**40.6%**	**40**
One or More Children Under Age 6:								
All Poverty Categories	8,838	3,416	1,872	4,959	38.6%	25.8%	51.5%	104
	8,838	**4,058**	**2,411**	**5,705**	**45.9%**	**33.4%**	**58.4%**	**104**
	7,721	2,109	1,036	3,183	27.3%	16.1%	38.5%	76
	7,721	**2,555**	**1,532**	**3,579**	**33.1%**	**22.4%**	**43.8%**	**76**
In Poverty	2,143	645	13	1,276	30.1%	6.1%	54.0%	26
	2,143	**715**	**68**	**1,362**	**33.4%**	**9.3%**	**57.4%**	**26**
	2,957	639	0	1,316	21.6%	0.0%	41.2%	33
	2,957	**904**	**202**	**1,607**	**30.6%**	**11.9%**	**49.2%**	**33**
Not in Poverty	6,695	2,771	1,469	4,073	41.4%	27.3%	55.4%	78
	6,695	**3,343**	**1,927**	**4,759**	**49.9%**	**36.7%**	**63.1%**	**78**
	4,763	1,470	679	2,261	30.9%	17.0%	44.8%	43
	4,763	**1,651**	**898**	**2,404**	**34.7%**	**20.7%**	**48.6%**	**43**
Government Support:								
Government support	3,432	611	108	1,113	17.8%	4.2%	31.4%	36

Table B-2. Comparison of Prevalence of Pre-1978 Housing Units with Significant Lead-Based Paint (LBP) Hazards, by Selected Housing (HU) Characteristics between AHHS and AHHS II (in RED) and Old[a] and New (in BOLD)[b] Dust Hazard Action Levels

Characteristic	*All HUs (000)*[d]	*No. of HUs with Significant LBP Hazards (000)*			*Percent*[e] *of HUs with Significant LBP Hazards (%)*			HUs in Sample
		Estimate	*Lower 95% CI*[f]	*Upper 95% CI*	*Estimate*	*Lower 95% CI*	*Upper 95% CI*	
HUD Lead Safe Housing Rule: Significant LBP Hazards[c]								
	3,432	**1,121**	**433**	**1,809**	**32.7%**	**17.2%**	**48.1%**	**36**
	4,668	970	369	1,571	20.8%	7.9%	33.7%	45
	4,668	**1,610**	**685**	**2,534**	**34.5%**	**18.6%**	**50.4%**	**45**
No government support	61,824	21,348	17,244	25,451	34.5%	29.1%	40.0%	616
	61,824	**25,682**	**21,213**	**30,151**	**41.5%**	**35.8%**	**47.3%**	**616**
	54,548	19,694	15,238	24,149	36.1%	28.8%	43.4%	428
	54,548	**24,626**	**20,230**	**29,022**	**45.1%**	**38.0%**	**52.3%**	**428**
Poverty:								
In Poverty	9,820	4,233	2,853	5,613	43.1%	34.5%	51.8%	105
	9,820	**4,961**	**3,382**	**6,541**	**50.5%**	**41.1%**	**59.9%**	**105**
	11,241	2,905	1,607	4,203	25.8%	16.2%	35.4%	115
	11,241	**4,034**	**2,302**	**5,766**	**35.9%**	**24.4%**	**47.3%**	**115**
Not in Poverty	55,756	17,870	13,928	21,812	32.1%	26.6%	37.5%	550
	55,756	**22,134**	**17,755**	**26,513**	**39.7%**	**33.7%**	**45.7%**	**550**
	48,591	17,759	13,559	21,959	36.5%	28.8%	44.3%	364
	48,591	**22,201**	**18,070**	**26,333**	**45.7%**	**37.9%**	**53.4%**	**364**
Race:								
White	49,879	15,957	12,429	19,484	32.0%	26.5%	37.5%	489
	49,879	**19,185**	**15,253**	**23,117**	**38.5%**	**32.5%**	**44.5%**	**489**
	44,398	16,698	12,849	20,547	37.6%	30.4%	44.8%	338
	44,398	**20,704**	**16,847**	**24,561**	**46.6%**	**39.5%**	**53.8%**	**338**
African American	9,279	3,627	2,261	4,992	39.1%	28.6%	49.6%	99
	9,279	**5,022**	**3,375**	**6,668**	**54.1%**	**43.4%**	**64.8%**	**99**
	9,136	2,214	574	3,853	24.2%	8.9%	39.6%	83
	9,136	**3,091**	**1,205**	**4,978**	**33.8%**	**17.3%**	**50.4%**	**83**
Other[g]	6,417	2,520	1,665	3,374	39.3%	28.4%	50.2%	67
	6,417	**2,889**	**1,920**	**3,858**	**45.0%**	**34.8%**	**55.2%**	**67**
	6,299	1,752	427	3,077	27.8%	9.0%	46.7%	58
	6,299	**2,440**	**957**	**3,923**	**38.7%**	**17.8%**	**59.7%**	**58**
Ethnicity:								
Hispanic/Latino	8,244	2,058	1,330	2,787	25.0%	16.1%	33.8%	92
	8,244	**2,696**	**1,826**	**3,566**	**32.7%**	**23.4%**	**42.1%**	**92**
	8,387	1,846	860	2,831	22.0%	10.7%	33.3%	88
	8,387	**3,001**	**1,961**	**4,041**	**35.8%**	**25.2%**	**46.4%**	**88**
Not Hispanic/Latino	57,332	20,045	16,034	24,055	35.0%	29.5%	40.4%	563
	57,332	**24,399**	**19,938**	**28,860**	**42.6%**	**36.8%**	**48.4%**	**563**
	51,445	18,818	14,443	23,193	36.6%	29.1%	44.0%	391
	51,445	**23,234**	**18,792**	**27,677**	**45.2%**	**37.8%**	**52.6%**	**391**

Table B-2. Comparison of Prevalence of Pre-1978 Housing Units with Significant Lead-Based Paint (LBP) Hazards, by Selected Housing (HU) Characteristics between AHHS and AHHS II (in RED) and Old [a] and New (in BOLD)[b] Dust Hazard Action Levels

Characteristic	*All HUs (000)*[d]	*HUD Lead Safe Housing Rule: Significant LBP Hazards*[c]						HUs in Sample
		No. of HUs with Significant LBP Hazards (000)			*Percent*[e] *of HUs with Significant LBP Hazards (%)*			
		Estimate	*Lower 95% CI*[f]	*Upper 95% CI*	*Estimate*	*Lower 95% CI*	*Upper 95% CI*	

[a] Old dust hazard action level is at least 40 µg/ft^2 for floors and at least 250 µg/ft^2 for windowsills.
[b] New dust hazard action level is at least 10 µg/ft^2 for floors and at least 100 µg/ft^2 for windowsills.
[c] Significant LBP hazard as defined in text and HUD Lead Safe Housing Rule.
[d] "Housing units" include permanently occupied, noninstitutional housing units in which children are permitted to live.
[e] Estimated percentages are calculated with the "All HUs" column in each row used as the denominator.
[f] CI = confidence interval for the estimated number or percent.
[g] "Other" race includes Asian, American Indian or Alaskan Native, Native Hawaiian or other Pacific Islander, and more than one race.

Appendix C: MEDIAN AND 90TH PERCENTILE FLOOR AND WINDOWSILL DUST LEAD LOADINGS

Table C-1. Comparison of Median and 90th Percentile Floor Dust Lead Loadings (µg/ft²) by Various Housing Characteristics between AHHS and AHHS II (in red). Statistically Significant Differences Highlighted.

Characteristic	*Median*			*90th Percentile*			*HUs in Sample)*
	Estimate	*Lower 95% CI[a]*	*Upper 95% CI*	*Estimate*	*Lower 95% CI*	*Upper 95% CI*	
All Occupied HUs	0.57	0.48	0.65	4.91	3.85	7.11	1131
	0.31	0.24	0.37	4.9	3.31	6.72	703
Region:							
Northeast	1.03	0.83	1.28	9.29	5.26	17.71	196
	0.53	0.30	0.86	6.02	4.14	28.83	139
Midwest	0.57	0.40	0.74	8.00	4.46	19.72	245
	0.33	0.16	0.46	8.02	5.42	23.15	161
South	0.49	0.38	0.66	3.72	3.29	5.70	440
	0.23	0.17	0.34	2.69	1.83	7.38	240
West	0.35	0.23	0.46	2.92	2.27	4.27	250
	0.28	0.15	0.45	2.48	1.55	5.19	163
Construction Year:							
1978-2005	0.21	0.13	0.30	1.34	1.21	1.69	476
1978-2017	0.10	0.04	0.15	1.02	0.65	1.57	224
1960-1977	0.53	0.40	0.66	2.91	2.44	3.55	306
	0.30	0.21	0.34	2.43	1.63	3.34	225
1940-1959	1.11	0.91	1.45	10.01	5.92	23.16	187
	1.01	0.63	1.37	8.80	6.93	10.77	154
Before 1940	2.16	1.66	2.84	26.34	13.76	43.33	162
	2.61	1.83	4.45	42.89	27.56	104.76	100
Urbanization							
MSA	0.60	0.52	0.72	4.57	3.78	7.04	889
	0.32	0.24	0.37	4.48	2.85	6.34	555
Non-MSA	0.44	0.38	0.62	5.50	3.32	13.23	242
	0.29	0.18	0.41	6.51	3.39	21.70	148
Housing Unit Type:							
Single family	0.62	0.52	0.73	6.33	4.57	9.15	950
	0.33	0.23	0.39	5.81	4.17	8.23	571
Multi-family	0.43	0.29	0.55	1.86	1.45	2.94	181
	0.27	0.17	0.34	2.51	1.62	4.12	132
Tenure:							
Owner-occupied	0.49	0.40	0.59	4.29	3.42	7.34	772
	0.22	0.16	0.32	5.61	2.84	8.32	419
Renter-occupied	0.74	0.57	0.94	5.93	4.33	8.48	359
	0.40	0.33	0.50	4.62	3.32	6.40	284
Household Income:							
Less than $30,000/year	0.86	0.66	1.06	7.40	5.42	12.15	401
Less than $35,000/year	0.48	0.39	0.54	6.95	5.60	9.14	308
$30,000/year or more	0.45	0.39	0.57	3.63	3.11	5.16	730
$35,000/year or more	0.16	0.12	0.27	2.95	2.42	4.69	395
Children Under Age 6:							
All Income Categories	0.59	0.34	0.73	4.50	3.43	9.02	207

Table C-1. Comparison of Median and 90th Percentile Floor Dust Lead Loadings (µg/ft²) by Various Housing Characteristics between AHHS and AHHS II (in red). Statistically Significant Differences Highlighted.

Characteristic	*Median*			*90th Percentile*			*HUs in Sample)*
	Estimate	*Lower 95% CI[a]*	*Upper 95% CI*	*Estimate*	*Lower 95% CI*	*Upper 95% CI*	
	0.13	0.01	0.19	2.03	1.27	6.2	108
Less than $30,000/year	0.89	0.62	1.09	4.44	3.62	10.01	74
Less than $35,000/year	0.35	0.17	0.64	6.47	1.88	209.09	47
$30,000/year or more	0.36	0.24	0.60	4.50	2.07	9.54	133
$35,000/year or more	0.01	0	0.14	1.40	0.58	2.74	61
No Children Under Age 6:							
All Income Categories	0.56	0.47	0.66	5.08	3.81	7.45	924
	0.33	0.27	0.39	5.55	3.66	7.4	595
Less than $30,000/year	0.85	0.56	1.11	7.74	5.50	13.09	327
Less than $35,000/year	0.49	0.39	0.54	6.98	5.37	9.11	261
$30,000/year or more	0.46	0.40	0.59	3.54	2.98	5.15	597
$35,000/year or more	0.20	0.14	0.32	3.26	2.56	6.87	334
Government Support:							
Government support	0.61	0.28	0.90	4.01	2.62	7.22	65
	0.47	0.30	0.63	5.60	1.79	11.63	70
No government support	0.56	0.48	0.65	5.11	3.82	7.41	1059
	0.31	0.22	0.36	4.79	3.23	7.05	626
Refusal/Don't Know[b]							7
							7
Poverty:							
In Poverty	1.11	0.72	1.29	6.55	4.71	12.60	166
	0.39	0.31	0.48	5.72	2.8	10.42	157
Not in Poverty	0.52	0.43	0.59	4.35	3.58	6.94	965
	0.27	0.20	0.35	4.62	3.1	7.05	546
Race:							
White	0.52	0.42	0.59	4.45	3.63	6.80	868
	0.31	0.22	0.37	4.85	3.10	7.47	502
African American	0.93	0.54	1.30	10.55	4.62	22.20	151
	0.35	0.20	0.52	5.33	2.75	23.87	126
Other[c]	0.86	0.47	1.12	4.31	2.79	10.56	112
	0.24	0.09	0.42	3.90	1.41	7.40	75
Ethnicity:							
Hispanic/Latino	0.70	0.48	1.02	3.97	2.80	8.22	158
	0.47	0.35	0.70	4.13	2.45	7.72	120
Not Hispanic/Latino	0.55	0.45	0.64	5.21	3.86	7.52	973
	0.27	0.21	0.35	5.13	3.26	7.04	583

No NSLAH values available, only AHHS values shown.
[a] CI = confidence interval.
[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 C-2. Comparison of Median and 90th Percentile Windowsill Dust Lead Loadings (µg/ft²) by Various Housing Characteristics between AHHS and AHHS II (in red). Statistically Significant Differences Highlighted.

Characteristic	*Median*			*90th Percentile*			*HUs in Sample)*
	Estimate	*Lower 95% CI[a]*	*Upper 95% CI*	*Estimate*	*Lower 95% CI*	*Upper 95% CI*	
All Occupied HUs	4.24	3.63	5.01	137	102	190	1043
	1.74	1.35	2.05	46	30	72	672
Region:							
Northeast	9.22	6.56	14.49	334	190	643	189
	3.41	1.95	5.93	157	65	788	136
Midwest	5.54	4.27	7.57	176	131	482	225
	2.26	1.48	3.31	71	38	104	150
South	3.21	2.39	4.18	102	69	186	393
	1.31	0.84	1.60	27	17	66	225
West	2.16	1.34	2.92	42	28	75	236
	1.58	0.96	2.04	27	18	45	161
Construction Year:							
1978-2005	1.20	0.99	1.55	16	11	22	421
1978-2017	0.53	0.42	0.86	9	5	12	209
1960-1977	4.36	3.64	5.28	55	37	107	280
	1.81	1.35	2.24	16	11	21	214
1940-1959	12.42	8.10	22.15	199	156	521	183
	5.42	4.06	7.16	93	67	175	151
Before 1940	33.27	21.43	48.69	736	526	2657	159
	25.02	13.99	48.53	853	223	1536	98
Urbanization							
MSA	3.97	3.19	4.83	158	104	210	835
	1.69	1.33	2.0	46	29	75	542
Non-MSA	5.06	3.76	7.02	82	46	207	208
	1.83	1.26	3.1	41	23	105	130
Housing Unit Type:							
Single family	4.56	3.72	5.39	168	111	228	876
	1.65	1.31	1.99	64	39	91	544
Multi-family	3.24	2.43	4.85	33	18	71	167
	2.06	1.38	3.15	21	12	38	128
Tenure:							
Owner-occupied	3.73	2.88	4.60	110	81	173	712
	1.44	1.22	1.89	64	29	96	398
Renter-occupied	5.37	4.22	7.22	217	102	328	331
	2.22	1.58	3.06	36	28	62	274
Household Income:							
Less than $30,000/year	7.54	5.90	10.52	278	189	487	356
Less than $35,000/year	2.70	2.06	4.29	81	51	167	289
$30,000/year or more	2.91	2.44	3.73	73	50	102	687
$35,000/year or more	1.31	0.93	1.69	29	18	47	383
Children Under Age 6:							
All Income Categories	2.54	1.79	3.85	138	62	368	189
	0.97	0.41	1.89	36	18	127	106
Less than $30,000/year	3.71	1.39	7.54	110	65	859	63
Less than $35,000/year	3.41	1.56	8.92	90	32	391	46

Table C-2. Comparison of Median and 90th Percentile Windowsill Dust Lead Loadings (µg/ft²) by Various Housing Characteristics between AHHS and AHHS II (in red). Statistically Significant Differences Highlighted.

Characteristic	*Median*			*90th Percentile*			*HUs in Sample)*
	Estimate	*Lower 95% CI[a]*	*Upper 95% CI*	*Estimate*	*Lower 95% CI*	*Upper 95% CI*	
$30,000/year or more	2.34	1.46	3.55	184	42	487	126
$35,000/year or more	0.35	0.12	1.22	13	5	79	60
No Children Under Age 6:							
All Income Categories	4.71	3.87	5.50	136	101	191	854
	1.84	1.42	2.14	48	29	73	566
Less than $30,000/year	8.23	6.55	12.28	327	213	556	293
Less than $35,000/year	2.61	2.01	4.37	80	48	181	243
$30,000/year or more	3.14	2.44	4.01	67	49	102	561
$35,000/year or more	1.37	1.05	1.86	31	20	63	323
Government Support:							
Government support	3.15	2.18	5.66	49	14	209	63
	1.49	0.47	3.17	27	13	67	67
No government support	4.25	3.63	5.02	154	102	203	974
	1.74	1.35	2.05	50	36	75	598
Refusal/Don't Know[b]							6
							7
Poverty:							
In Poverty	7.6	5.11	14.33	310	155	695	143
	1.82	1.00	2.53	36	21	69	145
Not in Poverty	3.8	3.14	4.61	108	80	172	900
	1.72	1.34	2.03	46	29	75	527
Race:							
White	3.63	2.91	4.25	105	75	173	795
	1.71	1.34	2.07	46	28	76	479
African American	10.02	6.41	17.06	274	162	612	141
	1.74	0.78	2.27	33	19	85	118
Other[c]	7.31	3.79	10.56	155	52	374	107
	1.74	0.99	2.87	36	28	157	75
Ethnicity:							
Hispanic/Latino	5.03	2.54	7.25	56	31	251	147
	2.19	1.46	3.36	21	12	48	117
Not Hispanic/Latino	4.13	3.54	4.98	158	102	203	896
	1.67	1.33	1.99	58	33	81	555

No NSLAH values available, only AHHS values shown.

[a] CI = confidence interval.

[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.

APPENDIX D: LOGISTIC REGRESSION FOR DUST AND SOIL HAZARDS

This Appendix contains results and discussion of logistic regression analyses conducted to explore the impact of various factors on the probability that a housing unit has either lead dust hazards (floor, windowsill and overall), under either the old or new dust hazard standards, or soil lead hazards and/or elevated lead levels in bare soil. The independent (predictor) variables considered are both qualitative and quantitative measures of LBP, both interior and exterior, and the degree of paint deterioration present. For dust hazards, the independent variables also include the lead level in bare soil and the presence of smoking in the home[45].

D.1 Simple Logistic Regression

To start, we consider a simple logistic regression equation that models the natural logarithm of the odds of detecting a hazard as a function of a single predictor. The equation has the following form:

$$\ln\left(\frac{\pi}{1-\pi}\right) = \alpha + \beta_1 x_1.$$

In the above equation, π is the conditional probability of detecting hazardous levels of lead in dust or soil in a home for a given value of the predictor, x_1. The ratio, $\pi/(1-\pi)$ is the odds of detecting a hazard in the home. The intercept, α, is the natural logarithm of the odds of detecting a hazard given that the predictor, x_1, is zero. Finally, the slope, β_1, is the change in the natural logarithm of the odds for detecting a hazard given a one unit increase in the predictor, x_1. We can rearrange the logistic regression equation to calculate π, in terms of α and β_1, to obtain the following formula:

$$\pi = \frac{e^{\alpha+\beta_1 x_1}}{1+e^{\alpha+\beta_1 x_1}}.$$

For the simple logistic regression analysis, we consider three predictors: at least one instance of lead-based paint (*lbp)*, deteriorated lead-based paint (*detlbp*), or significantly deteriorated lead-based paint (*sdetlbp*) in the home. These predictors are categorical variables with a value of 0 or 1. Specifically,

$$lbp = \begin{cases} 0 = No\ lead-based\ paint \\ 1 = Lead-based\ paint\ but\ no\ deteriorated\ lead-based\ paint \end{cases}$$

$$detlbp = \begin{cases} 0 = No\ deteriorated\ lead-based\ paint \\ 1 = Deteriorated\ but\ not\ significantly\ deteriorated\ lead-based\ paint \end{cases}$$

$$sdetlbp = \begin{cases} 0 = No\ signficantly\ deteriorated\ lead-based\ paint \\ 1 = Significantly\ deteriorated\ lead-based\ paint \end{cases}$$

[45]Tobacco plants are known to take up lead and other metals from soil. See https://iubmb.onlinelibrary.wiley.com/doi/pdf/10.1080/15216540500459667.

The variables are defined in this way to allow estimation of the incremental effect of deteriorated LBP vs intact LBP, and significantly deteriorated LBP vs deteriorated LBP[46]. The dependent (response) variables are the presence of at least one overall dust lead hazard in the home, at least one dust hazard on floors, at least one dust hazard on windowsills, and at least one soil lead hazard. We use both the old and new federal government standards to define floor and windowsill dust hazards. The old federal standard for floor dust is lead loadings greater than or equal to 40 μg/ft^2, and the new federal standard is 10 μg/ft^2. Likewise, the old and new federal standards for windowsill dust are, respectively, 250 μg/ft^2 and 100 μg/ft^2. A soil lead hazard is defined as bare soil with a lead concentration of 1200 ppm or greater and 400 ppm for bare soil in an area frequented by children under the age of 6.

The simple logistic regressions were performed using the Logistic Procedure in SAS 9.4. Table D-1 shows the final weighted models[47] and corresponding odds ratios for each combination of response and predictor variables. The odds ratios are the odds of detecting a hazard given the presence of lead-based paint, deteriorated lead-based paint, or significantly deteriorated lead-based paint divided by the odds of detecting a hazard with no lead-based paint, deteriorated lead-based paint, or significantly deteriorated lead-based paint. Models where the slope parameter β_1 was not statistically significantly different from zero are not included in the tables. For example, in Table D-1, the models for overall dust lead hazard under the old dust hazard standard of 40 μg/ft^2 with *lbp* and *detlbp* are not included. This means that presence of intact LBP was not a significant predictor of a dust lead hazard under the old standard, and neither was deteriorated LBP that isn't significantly deteriorated.

Results

The extent of the impact of significantly deteriorated LBP on the probabilities of dust hazards under the old standard is striking, as exemplified by the large odds ratios in Table D-1. For example, the estimated probability of a floor dust lead hazard when there is no significantly deteriorated LBP is 0.011 but increases to 0.202 when it is present. When significantly deteriorated LBP is not present, a floor dust hazard is very unlikely, but it becomes a definite concern when it is. Overall, not considering presence or deterioration of LBP, the probability of a floor dust lead hazard under the old standard is 0.049 (Table 6-4).

Under the new dust hazard standards, the situation is a little different. Now LBP alone is a significant predictor of overall and floor dust hazards, while deteriorated LBP is significant for a windowsill hazard. Thus, for the lower standards, LBP alone or just deteriorated LBP may trigger a dust hazard, but not for the higher old standard. There is no significant difference between the odds ratios for LBP and deteriorated LBP for overall and floor hazards, but significantly deteriorated LBP has a far larger odds ratio for all three hazard types, statistically significantly greater than for deteriorated LBP. Thus, for the new dust hazard standards also, significantly deteriorated LBP is the main driver of dust hazards.

For soil hazards, the situation is similar. Significantly deteriorated LBP is the only significant predictor among the simple logistic regression models, with a large odds ratio of 14.9. When there is no significantly deteriorated LBP the estimated probability of a soil hazard is 0.0068,

[46] See Chapter 4 for the definition of significantly deteriorated paint. "Deteriorated" paint means paint with any degree of deterioration, i.e., paint that is not completely intact.
[47] All coefficients statistically significant at the 5% level.

increasing to 0.092 when significantly deteriorated LBP is present. Overall, the probability of a soil hazard is 0.02. The odds ratio for significantly deteriorated LBP vs the overall soil hazard is 5.0. As for dust, significantly deteriorated LBP is the main driver of soil hazards compared to intact LBP or deteriorated but not significantly deteriorated LBP.

Table D-1. Dust and Soil Hazards – Statistically Significant Odds of Exceeding Hazard Standards Based on Simple Weighted Logistic Regression Models

Model	Odds Ratio	95% CI
Overall Dust Hazard Old Federal Standard		
$\ln\left(\frac{\pi}{1-\pi}\right) = -3.3289 + 2.9060 sdetlbp$	18.3	[10.2,32.8]
Floor Old Federal Standard		
$\ln\left(\frac{\pi}{1-\pi}\right) = -4.4776 + 3.4012 sdetlbp$	30.0	[12.5,72.1]
Windowsill Old Federal Standard		
$\ln\left(\frac{\pi}{1-\pi}\right) = -3.7331 + 2.6462 sdetlbp$	14.1	[7.1,28.0]
Overall Dust Hazard New Federal Standard		
$\ln\left(\frac{\pi}{1-\pi}\right) = -1.5502 + 0.6906 lbp$	2.0	[1.1,3.6]
$\ln\left(\frac{\pi}{1-\pi}\right) = -1.5582 + 1.1410 detlbp$	3.1	[1.6,6.2]
$\ln\left(\frac{\pi}{1-\pi}\right) = -2.1336 + 2.6333 sdetlbp$	13.9	[8.7,22.2]
Floor New Federal Standard		
$\ln\left(\frac{\pi}{1-\pi}\right) = -1.8939 + 0.7372 lbp$	2.1	[1.1,3.9]
$\ln\left(\frac{\pi}{1-\pi}\right) = -1.8663 + 0.7791 detlbp$	2.2	[1.0,4.7]
$\ln\left(\frac{\pi}{1-\pi}\right) = -2.5037 + 2.4788 sdetlbp$	11.9	[7.4,19.3]
Windowsill New Federal Standard		
$\ln\left(\frac{\pi}{1-\pi}\right) = -2.2577 + 0.9854 detlbp$	2.7	[1.2,6.1]
$\ln\left(\frac{\pi}{1-\pi}\right) = -3.0298 + 2.6367 sdetlbp$	14.0	[8.1,24.0]
Soil		
$\ln\left(\frac{\pi}{1-\pi}\right) = -4.9892 + 2.7014 sdetlbp$	14.0	[4.6,48.3]

$$lbp = \begin{cases} 0 = No\ lead-based\ paint \\ 1 = Lead-based\ paint\ but\ no\ deteriorated\ lead-based\ paint \end{cases}$$

$$detlbp = \begin{cases} 0 = No\ deteriorated\ lead-based\ paint \\ 1 = Deteriorated\ but\ not\ significantly\ deteriorated\ lead-based\ paint \end{cases}$$

$$sdetlbp = \begin{cases} 0 = No\ signficantly\ deteriorated\ lead-based\ paint \\ 1 = Significantly\ deteriorated\ lead-based\ paint \end{cases}$$

D.2 Multiple Logistic Regression

Multiple Categorical Predictors

This section models the conditional probability of dust and soil hazards with respect to multiple categorical predictors. Because we have multiple predictors, the logistic regression model will have the following form:

$$\ln\left(\frac{\pi}{1-\pi}\right) = \alpha + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \cdots + \beta_p x_p.$$

The equation above models the natural logarithm of the odds for having at least one instance of a dust or soil lead hazard in the housing unit. As in the simple logistic regression model, π is the conditional probability of a hazard given the values of $x_1, x_2, x_3, \ldots, x_p$. The intercept, α, is the natural logarithm of the odds of detecting a hazard given the predictors, $x_1, x_2, x_3, \ldots, x_p$ are all zero. Finally, the slopes, $\beta_1, \beta_2, \beta_3, \ldots, \beta_p$ are, respectively, the change in the natural logarithm of the odds for detecting a hazard given a one unit increase in the predictors, $x_1, x_2, x_3, \ldots, x_p$. We can rearrange the logistic regression equation, solving for π, to obtain the following formula:

$$\pi = \frac{e^{\alpha+\beta_1 x_1+\beta_2 x_2+\beta_3 x_3+\cdots+\beta_p x_p}}{1+e^{\alpha+\beta_1 x_1+\beta_2 x_2+\beta_3 x_3+\cdots+\beta_p x_p}}.$$

For floor and windowsill dust lead hazards, we consider the following categorical predictors:

$$lbp = \begin{cases} 0 = No\ lead-based\ paint \\ 1 = Lead-based\ paint\ but\ no\ deteriorated\ lead-based\ paint \end{cases}$$

$$detlbp = \begin{cases} 0 = No\ deteriorated\ lead-based\ paint \\ 1 = Deteriorated\ but\ not\ significantly\ deteriorated\ lead-based\ paint \end{cases}$$

$$sdetlbp = \begin{cases} 0 = No\ signficantly\ deteriorated\ lead-based\ paint \\ 1 = Significanlty\ deteriorated\ lead-based\ paint \end{cases}$$

$$baresoil = \begin{cases} 0 = Bare\ soil\ lead\ less\ than\ or\ equal\ to\ 1000\ ppm \\ 1 = Bare\ soil\ lead\ greater\ than\ 1{,}000\ ppm \end{cases}$$

$$smoke = \begin{cases} 0 = No\ smoking\ present \\ 1 = No\ smoking\ present \end{cases}$$

To determine the most significant predictors, we use stepwise regression in the SAS 9.4 Logistic Procedure. Stepwise regression will build a model by first running a regression of $y=x_1$, $y=x_2$, …, $y=x_p$ for each of the p predictor variables and testing whether the estimated slope is significantly different from zero. If the p-value for this test is less than or equal to 0.06, we consider the estimated slope to be significantly different than zero[48]. If x_1 is the predictor with the smallest p-value that is also less than or equal to 0.06, then the predictor is entered into the model. Next, SAS will regress $y=x_1\ x_2$, $y=x_1\ x_3$, …, $y=x_1\ x_p$ and assess the p-values for x_2, …, x_p. If x_2 has the smallest p-value less than or equal to 0.06, then the predictor is entered into the model. Once x_2

[48] The choice of 0.06 for the significance level both to enter and to exit the model is somewhat arbitrary. SAS has a default of 0.15, which generally results in more variables in the final model. We chose 0.06 in order to develop the simplest models showing the dominant influences on dust and soil hazards.

is entered into the model, SAS will re-test the significance of the estimated slope for x_1. If the p-value is now greater than or equal to 0.06, then the predictor will be removed from the model and the process will terminate; otherwise, the process will continue until there are no more predictors with a p-value less than or equal to 0.06.

Results

We use the same dust hazard response variables as in the previous section. Table D-2 shows the final weighted models. In the stepwise multiple regression model for the overall dust hazard under the old standard, all three LBP variables are present, but with significantly deteriorated LBP still the dominant contributor. In addition, the bare soil variable, i.e., maximum bare soil lead level in the unit of 1000 ppm or greater, is in the model although it is the least important contributor, i.e., has the smallest coefficient in the model. When there is no LBP in the unit and the maximum soil lead level is less than 1000 ppm, the estimated probability of an overall dust lead hazard under the old standard is 0.017, rising to 0.697 when there is significantly deteriorated LBP AND a high soil lead level of 1000 ppm or greater. This compares to an overall probability of a dust hazard under the old standard of only 0.09, showing the large impact of significantly deteriorated LBP combined with high soil lead levels. For a floor dust hazard under the old standard, the stepwise multiple regression does not add any new predictors compared to the simple model based only on significantly deteriorated LBP.

The smoking variable remains in the final model in only one case, a floor hazard under the new standard. Moreover, its coefficient is negative, indicating that presence of smoking in the home tends to decrease the likelihood of a floor dust hazard even though cigarette and cigar smoke may contain lead. For example, if there is no LBP in the home and the maximum bare soil lead level is below 1,000 ppm, the probability of a floor dust lead hazard under the new standard is 0.074 if there is no smoking in the home, but only 0.037 if there is. A possible explanation is that smoking is more common in lower income homes[49], which are also more likely to have floor dust hazards under the new standard (Table 6-7). It should also be noted[50] that "*associations between second-hand smoke and blood lead levels were similar before and after adjustment for lead dust concentrations… Lead dust does not appear to mediate this association, suggesting inhalation as a major pathway of exposure*". Overall, the regressions do not suggest that smoking contributes to elevated dust lead levels.

[49] https://www.cdc.gov/tobacco/data_statistics/fact_sheets/adult_data/
[50] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3489360/

Table D-2. Weighted Dust Hazard Multiple Logistic Regression Models: Categorical Predictors Only

Overall Dust Hazard - Old Federal Standard

$$\ln\left(\frac{\pi}{1-\pi}\right) = -4.0875 + 1.8087lbp + 2.5182detlbp + 3.5223sdetlbp + 1.3976baresoil$$

Floor - Old Federal Standard

$$\ln\left(\frac{\pi}{1-\pi}\right) = -4.4776 + 3.4012sdetlbp$$

Windowsill - Old Federal Standard

$$\ln\left(\frac{\pi}{1-\pi}\right) = -4.1160 + 2.2452detlbp + 3.0291sdetlbp$$

Overall Dust Hazard - New Federal Standard

$$\ln\left(\frac{\pi}{1-\pi}\right) = -2.7714 + 1.9119lbp + 2.3149detlbp + 3.1248sdetlbp + 2.3464baresoil$$

Floor - New Federal Standard

$$\ln\left(\frac{\pi}{1-\pi}\right) = -2.5251 + 2.0343lbp + 2.1229detlbp + 3.0439sdetlbp + 1.9313baresoil - 0.8317smoke$$

Windowsill - New Federal Standard

$$\ln\left(\frac{\pi}{1-\pi}\right) = -3.6315 + 1.5051lbp + 2.3589detlbp + 3.2384sdetlbp$$

$$lbp = \begin{cases} 0 = No\ lead-based\ paint \\ 1 = Lead-based\ paint\ but\ no\ deteriorated\ lead-based\ paint \end{cases}$$

$$detlbp = \begin{cases} 0 = No\ deteriorated\ lead-based\ paint \\ 1 = Deteriorated\ but\ not\ significantly\ deteriorated\ lead-based\ paint \end{cases}$$

$$sdetlbp = \begin{cases} 0 = No\ signficantly\ deteriorated\ lead-based\ paint \\ 1 = Significanlty\ deteriorated\ lead-based\ paint \end{cases}$$

$$baresoil = \begin{cases} 0 = Bare\ soil\ lead\ less\ than\ or\ equal\ to\ 1000\ ppm \\ 1 = Bare\ soil\ lead\ greater\ than\ 1{,}000\ ppm \end{cases}$$

$$smoke = \begin{cases} 0 = No\ smoking\ present \\ 1 = No\ smoking\ present \end{cases}$$

For the bare soil models, we have four different response variables: overall soil hazard for the DUID, bare soil lead levels greater than 200 ppm, bare soil lead levels greater than 400 ppm, and bare soil lead levels greater than 1,000 ppm. The response variables are categorical with a value of 1 if a soil hazard is present or the lead levels are greater than or equal to the specified level and zero in all other cases. For soil, we consider only the lead-based paint predictor variables.

Again, we use stepwise logistic regression with the same p-value threshold of 0.06 to create the models. Table D-3 shows the final weighted models for the soil response variables. Significantly deteriorated LBP is again the main driver of soil hazards, and also of elevated lead levels in bare soil below the current standard. For the 400 ppm and 1,000 ppm levels, significantly deteriorated LBP is the only predictor remaining in the final stepwise model. When there is no significantly deteriorated LBP, the probability of a soil lead level $\geq$ 1,000 ppm is only 0.006 but increases to 0.100 in the presence of significantly deteriorated LBP.

Table D-3. Weighted Soil Hazard and Elevated Bare Soil Lead Levels Multiple Logistic Regression Models: Categorical Predictors Only

Overall Soil Hazard

$$\ln\left(\frac{\pi}{1-\pi}\right) = -5.3719 + 2.1673detlbp + 3.0841sdetlbp$$

Bare soil lead concentrations greater than 200 ppm

$$\ln\left(\frac{\pi}{1-\pi}\right) = -3.4136 + 1.1095lbp + 1.7522detlbp + 2.6534sdetlbp$$

Bare soil lead concentrations greater than 400 ppm

$$\ln\left(\frac{\pi}{1-\pi}\right) = -3.6520 + 2.4147sdetlbp$$

Bare soil lead concentrations greater than 1,000 ppm

$$\ln\left(\frac{\pi}{1-\pi}\right) = -5.1884 + 2.9913sdetlbp$$

$$lbp = \begin{cases} 0 = No\ lead-based\ paint \\ 1 = Lead-based\ paint\ but\ no\ deteriorated\ lead-based\ paint \end{cases}$$

$$detlbp = \begin{cases} 0 = No\ deteriorated\ lead-based\ paint \\ 1 = Deteriorated\ but\ not\ significantly\ deteriorated\ lead-based\ paint \end{cases}$$

$$sdetlbp = \begin{cases} 0 = No\ signficantly\ deteriorated\ lead-based\ paint \\ 1 = Significanlty\ deteriorated\ lead-based\ paint \end{cases}$$

D.3 Categorical and Quantitative Predictors

The last step in building our logistic regression models is to consider the same response variables as the previous section with categorical and quantitative predictors.

For the categorical predictors, we consider the same variables as in the previous section – *lbp, detlbp, sdetlbp* and *smoke*, with the addition of the variable *clean*, denoting whether the interviewer evaluated the home as "Appears clean", "Some evidence of cleaning" or "No evidence of cleaning", for the dust models. It was believed that clean homes might be less likely to have dust hazards. The quantitative predictors for dust hazards are the natural logarithm of the maximum exterior *logext_pbl* and interior paint lead levels *logint_pbl*, in mg/cm^2, measured by the XRF, the median exterior *medext_pbl* and interior lead concentrations *medint_pbl*, and the natural logarithm of the maximum bare soil lead concentration *logmax_baresoil* in parts per million (ppm). For soil hazards, the response variables are the probability of a soil hazard and the probabilities of bare soil lead levels exceeding 200, 400 and 1,000 ppm. For the soil responses, *logmax_baresoil* is for obvious reasons not included as a predictor. We transformed the maximum lead and bare soil concentrations using the natural logarithm because each variable has a small number of large outliers. The natural logarithm spreads out small values that are close together and compresses large values that are spread apart creating a less skewed distribution. Slope estimates in the regression equation from these less skewed distributions will provide a more accurate change in the natural logarithm of the odds of a hazard for each one unit increase in the predictors.

In these model runs several interaction terms were also considered. For dust hazards, the interactions considered are *logext_pbl*logmax_baresoil, medext_pbl*logmax_baresoil,* and *smoke*logint_pbl*. For the soil response variables, only *smoke*logint_pbl* is included.

We use stepwise logistic regression in SAS 9.4 with a p-value threshold of 0.06 to create our models. Table D-4 shows the final fitted models.

Results

For dust hazards under the old standard, only *logint_pbl* and *logext_pbl* remain in the final stepwise regression model. Dust hazards under the old standard are therefore primarily driven by high interior and exterior levels of lead in paint even more than deteriorated LBP which was found important in the single variable models in Section D.1. Thus, it appears that high lead levels in paint, irrespective of deterioration, are the most important driver of dust hazards under the old standard. As an example, if a housing unit has a maximum interior paint lead level of 5 mg/cm^2 and a maximum exterior paint lead level of 15 mg/cm^2, whether deteriorated or not, the probability of a dust hazard under the old standard is estimated by the model as 0.59, compared to a probability of only 0.09 overall. Importantly, soil lead levels do not seem to be an important predictor of windowsill dust hazards under the old standard.

Under the new dust standard, the picture is a little different. For overall dust hazard, *logmax_baresoil* now enters the model in addition to *logint_pbl* and *logext_pbl*, suggesting that the soil lead level is a more significant contributor to lower dust lead levels rather than higher, in which paint-lead appears to be the dominant contributor. This is also borne out by the models for floor dust and windowsill dust hazards under the new standard. The final model for floor dust hazards under the new standard is more complicated than the windowsill model, which includes only the variables *logint_pbl* and *logext_pbl*. The additional variables in the floor dust model, *logmax_baresoil* and the interaction term between *logext_pbl* and *logmax_baresoil*, are more difficult to interpret. Presumably, it is easier for lead in soil to be tracked onto the floor of a home rather than to be blown in to contaminate windowsills.

Interestingly, the *clean* variable was not included in any of the dust models for either standard. While it may seem intuitive that, since clean surfaces have less dust than dirty ones, they are less likely to have lead levels above either standard, experience in clearance testing shows that visibly clean surfaces can still have lead levels above the standards. In fact, clearance testing is performed only after a surface passes a visual inspection showing no dust present.

For soil lead hazards and soil lead levels exceeding 200, 400 and 1,000 ppm, the predominant predictor is the log of the maximum exterior lead level. None of the other independent variables enter into the final model, with the exception of the log of the maximum interior lead level for the 200 ppm model. For example, with a maximum exterior paint lead level of 15 mg/cm^2, the model estimates the probability of a soil lead level greater than 400 ppm at 0.46, compared to 0.056 overall (Table 7-3). The fact that deterioration of the LBP does not enter the model is less surprising for soil than for dust, since exterior LBP weathered by “chalking” to preserve a clean appearance, thereby leaching lead into soil. Also, scraping and repainting of exterior paint with higher levels of lead will tend to increase soil lead levels more than for exterior paint with lower lead levels..

We also ran stepwise logistic regressions to estimate the impact of considering the qualitative predictors LBP, deteriorated LBP and significantly deteriorated LBP separately for interior and exterior paint, as well as the impact of significantly deteriorated paint, whether LBP or not. These models were fit with the same quantitative predictors. The final models generally did not

change, and when they did, the changes were minor. This reinforces the finding that the level of lead in paint, both interior and exterior, is the most important driver of dust hazards, irrespective of deterioration. For soil hazards and elevated lead levels in soil, the exterior paint lead level is the most important factor.

Table D-4. Weighted Multiple Logistic Regression Models: Categorical and Quantitative Predictors (Overall Lead-Based Paint)

Response Variable	Model
Overall Dust Hazard Old Standard	$\ln\left(\frac{\pi}{1-\pi}\right) = -2.1682 + 0.6025 logint\_pbl + 0.5741 logext\_pbl$
Overall Dust Hazard New Standard	$\ln\left(\frac{\pi}{1-\pi}\right) = -3.8435 + 0.5194 logint\_pbl + 0.6385 logmax\_baresoil + 0.2839 logext\_pbl$
Floor Dust Hazard Old Standard	$\ln\left(\frac{\pi}{1-\pi}\right) = -4.0645 + 1.9132 sdetlbp + 0.6628 logext\_pbl$
Floor Dust Hazard New Standard	$\ln\left(\frac{\pi}{1-\pi}\right) = -3.1174 + 0.3302 logint\_pbl + 0.4261 logmax\_baresoil + 1.4957 logext\_pbl - 0.2228 logext\_pbl * logmax\_baresoil$
Windowsill Dust Hazard Old Standard	$\ln\left(\frac{\pi}{1-\pi}\right) = -2.6902 + 0.6513 logint\_pbl + 0.3870 logext\_pbl$
Windowsill Dust Hazard New Standard	$\ln\left(\frac{\pi}{1-\pi}\right) = -4.1582 + 0.7937 logint\_pbl + 0.4436 logmax\_baresoil$
Overall Soil Hazard	$\ln\left(\frac{\pi}{1-\pi}\right) = -4.2193 + 0.8910 logext\_pbl$
Bare Soil Greater than 200 ppm	$\ln\left(\frac{\pi}{1-\pi}\right) = -2.1545 + 0.3361 logint\_pbl + 0.4502 logext\_pbl$
Bare Soil Greater than 400 ppm	$\ln\left(\frac{\pi}{1-\pi}\right) = -2.7447 + 0.7382 logext\_pbl$
Bare Soil Greater than 1,000 ppm	$\ln\left(\frac{\pi}{1-\pi}\right) = -4.2807 + 0.9346 logext\_pbl$