

Findings on Lead-Based Paint/Hazards from the American Healthy Homes Survey II

Lead Exposure and Prevention Advisory Committee Meeting
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U.S. Department of Housing and Urban Development



HUD's National Lead Survey History

- National Survey of Lead-Based Paint in Housing (NSLBPH) (1990)
- National Survey of Lead and Allergens in Housing (NSLAH) (2000) (with NIEHS)
- American Healthy Homes Survey I (AHHS or AHHS I) (2006) (with EPA)
- American Healthy Homes Survey II (AHHS II) (2019) (with EPA)

Survey Design

- Target Housing: permanently occupied, non-institutional housing units (HUs) in the U.S. where children can reside
 - This represents ~ **118 million HUs**
- HUs selected randomly via three-stage cluster sampling process:
 - 78 Primary Sampling Units (PSUs) (Metropolitan Statistical Areas, single or grouped counties): selected with probability proportional to Census population (selected from 100 PSUs in AHHS I)
 - 4 - 12 “segments” randomly selected per PSU with selection probability based on number of HUs (e.g., ~ 3 city blocks)
 - 4 – 5 HUs randomly selected from all HUs per segment
 - An additional **longitudinal sample** was selected from the pool of 504 pre-1978 HUs sampled in the AHHS I survey (i.e., resampled 13 yrs. later)

Final AHHS II Sample

- Data Collected from 703 out of a goal of 800 homes
 - 203 HUs in longitudinal sample
 - 500 HUs new to AHHS II
- Samples collected from 37 states
- It was much more difficult to recruit households vs. in AHHS I
 - Response rate was ~ 36% vs. 59% in AHHS I

Data Collection in AHHS II (1)

- Collected by two-person team per PSU (Interviewer and Certified LBP Risk Assessor)
 - Resident Questionnaire
 - HU age, residency period, cleaning habits, heating system, pest problems, musty odor, demographic information for household
 - Visual Assessment
 - Paint condition, water damage stains, musty odor, “level of cleanliness”; presence of working smoke detectors

Data Collection in AHHS II (2)

➤ Environmental Sampling

- **XRF testing for lead in paint**
- **Wipe sampling for lead**
- Wipe sampling for pesticide residue on kitchen floor (EPA component)
- **Soil sampling for lead**
- **Drinking water for lead** (samples collected by resident)
- Vacuum sampling for mold (EPA)
- Collection of resident vacuum bags for analysis (EPA)
- Formaldehyde in air

Room Sampling

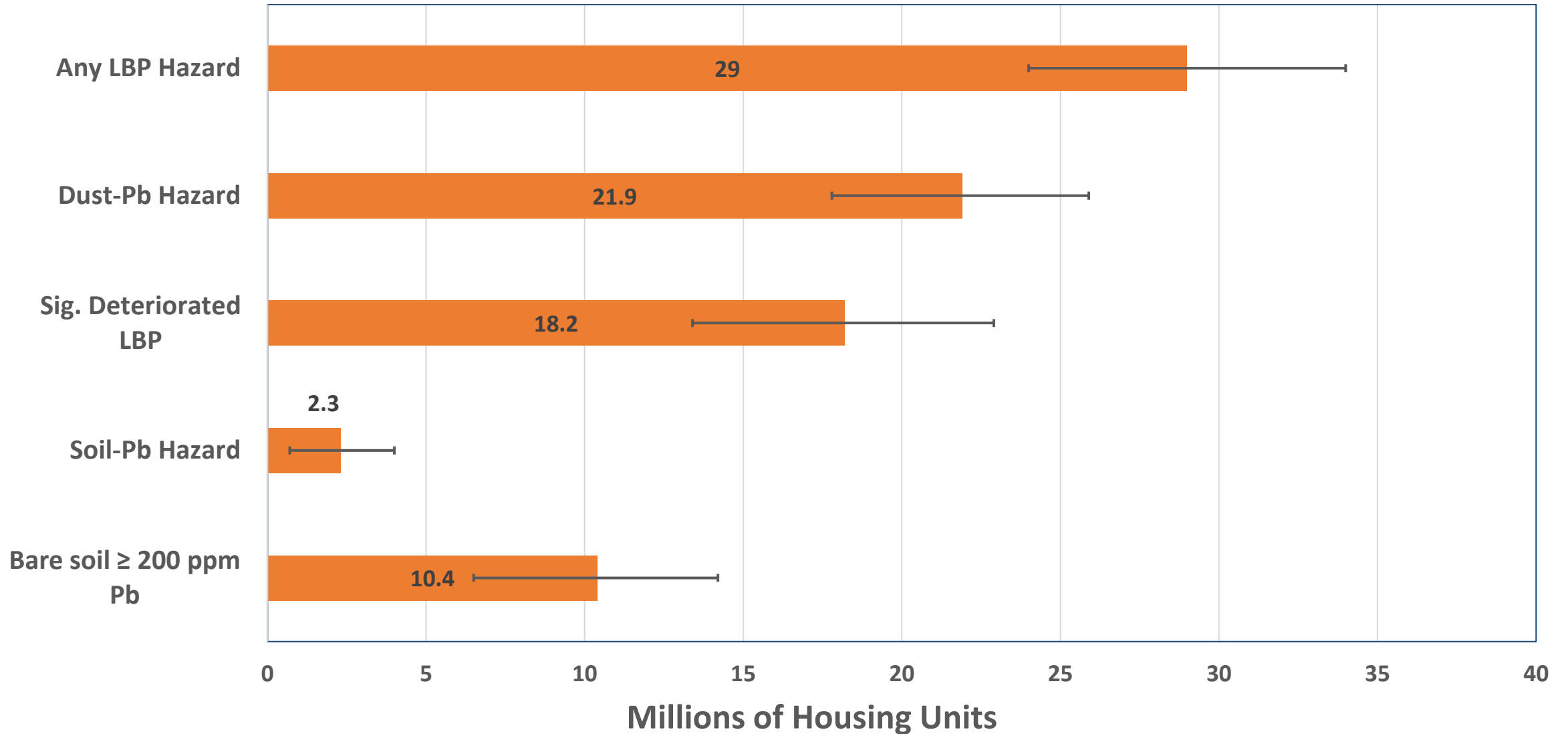
- Inventory of rooms conducted, and 4-5 rooms selected, 1 from each stratum:
 - Kitchens
 - Common living areas
 - Bedrooms (children's only if present)
 - All other rooms
 - Basement (if present, largest room selected)

Federal Definition of LBP and LBP Hazards

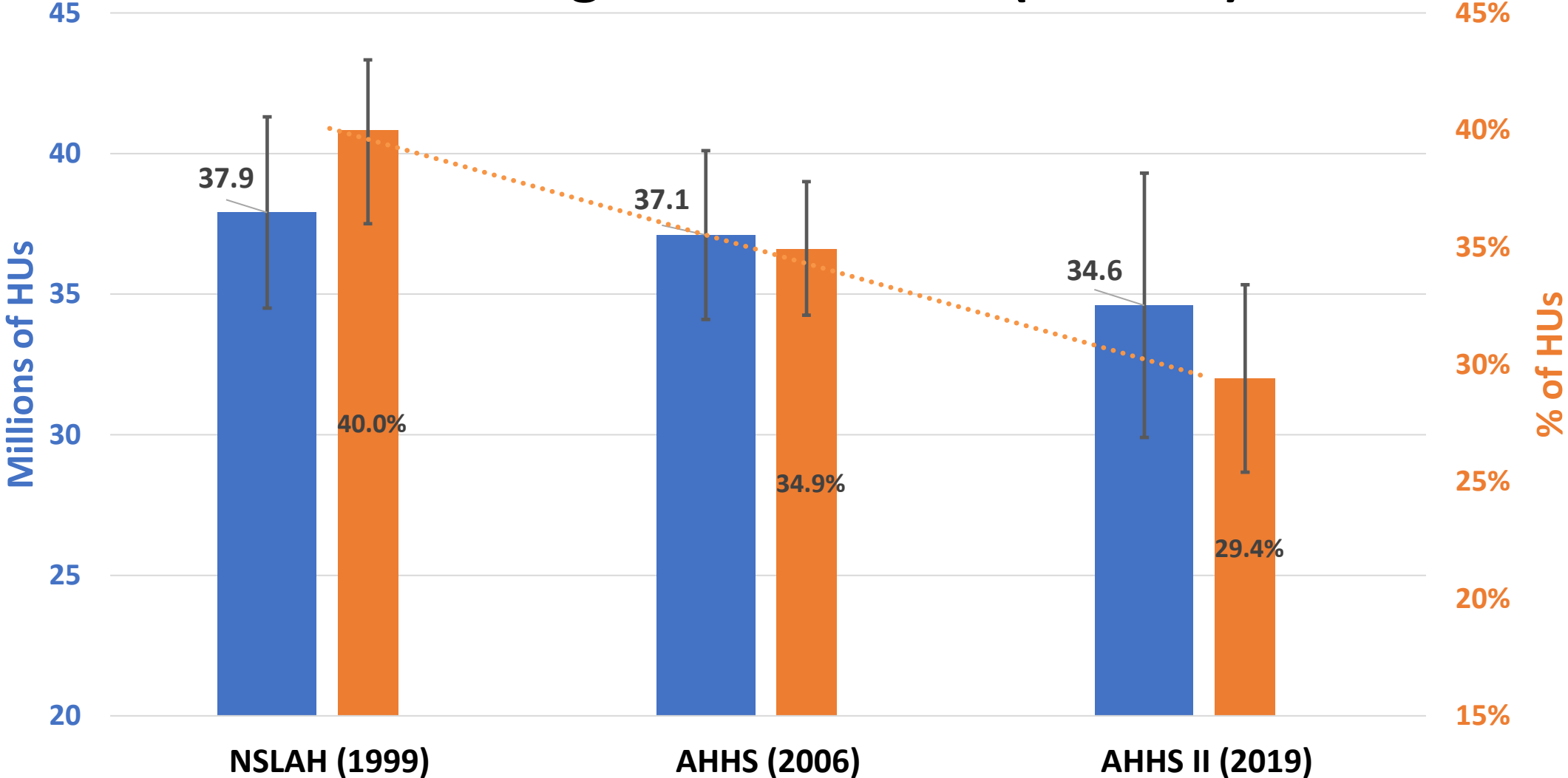
- Lead-based paint (by XRF): $\geq 1.0 \text{ mg Pb/cm}^2$
- Dust-Pb hazard (new standards effective 1/6/20):
 - Floors: $\geq 40 \text{ } \mu\text{g/ft}^2$ (old LDHS) to $\geq 10 \text{ } \mu\text{g/ft}^2$
 - Sill: $\geq 250 \text{ } \mu\text{g/ft}^2$ (old LDHS) to $\geq 100 \text{ } \mu\text{g/ft}^2$
- Soil-Pb hazard :
 - bare soil $\geq 400 \text{ ppm}$ for play areas
 - bare soil $\geq 1,200 \text{ ppm}$ for non-play areas
- Significantly Deteriorated paint: Deterioration of more than 20 ft^2 (exterior) or 2 ft^2 (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 (e.g., windowsills, baseboards, trim). (based on a definition in HUD's Lead Safe Housing Rule)

RESULTS

U.S. Housing with LBP Hazards (AHHS II)



U.S. Housing Units with LBP (AHHS II)

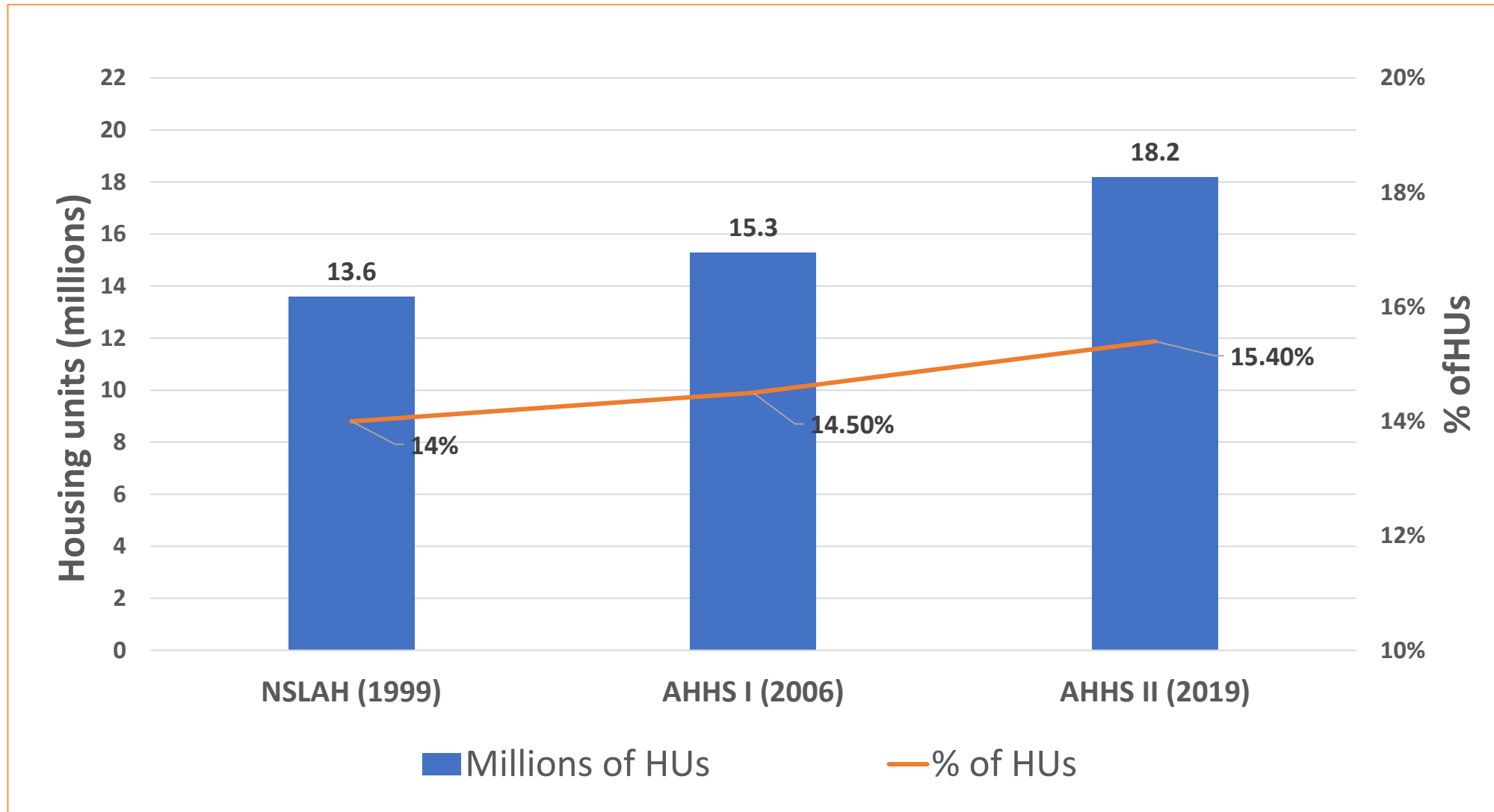


LBP Prevalence – Notable Findings

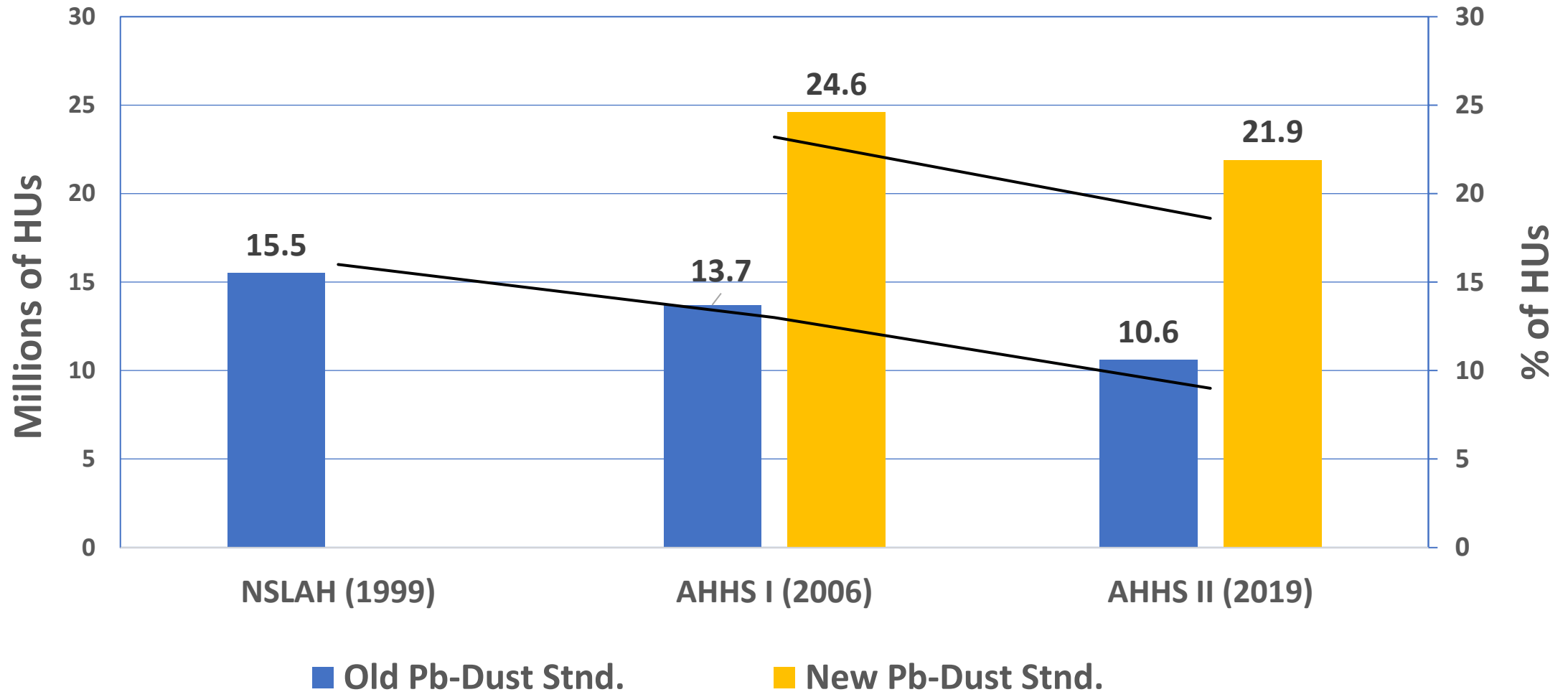
Changes in LBP prevalence from AHHS I to AHHS II:

- statistically significant decline among U.S. housing units: (34.9% to 29.4%)
- significant reduction in prevalence among “government supported” households (26.0% to 12.2%)
- significant reduction in prevalence among households in poverty (39.8% to 22.3%)
- significant reduction in prevalence among African American households (45.3% to 25.2%)

U.S. Housing Units with Sig. Deteriorated LBP



U.S. Housing Units with a Dust-Pb Hazard



Dust-Pb Hazards – Notable Findings

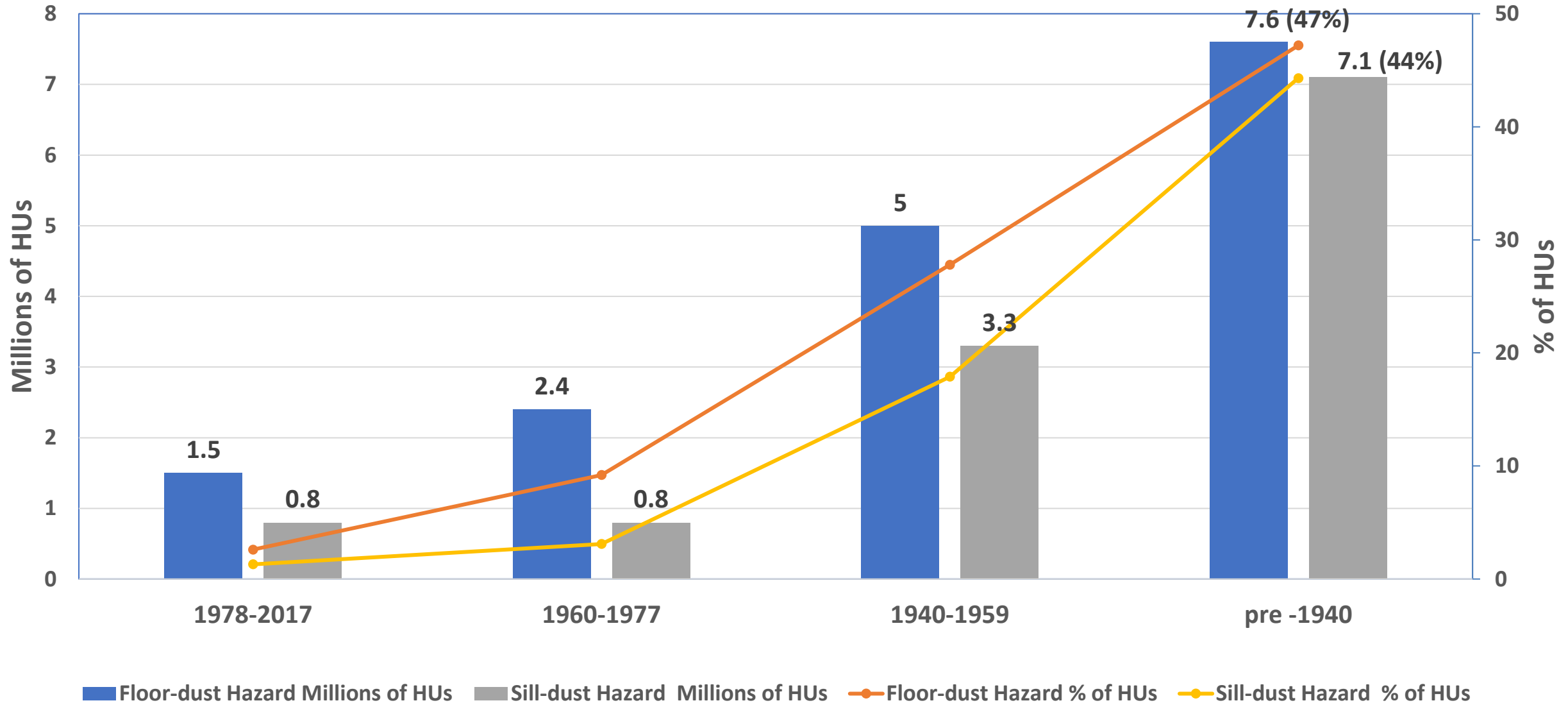
- From AHHS I to AHHS II there was a statistically significant decline in the percentage of U.S. housing units with dust-Pb hazards (old LDHS) (13% to 9%)
 - Non-sig. declines seen using the new LDHS: 23.2% to 18.6%
- There was a stat. significant decline in the number of households in poverty with dust-Pb hazards (old LDHS: 18.6% to 8.4%)
 - Non sig. declines seen using the new LDHS: 29.5% to 19.5%

Differences in Dust-lead Loadings across Surveys ($\mu\text{g}/\text{ft}^2$)

Survey	Median Floors	Median Sills	90 th percentile Floor	90 th percentile Sills
NSLAH (1999)	0.9	8.3	6.0	172.8
AHHS I (2006)	0.57	4.2	4.9	132
AHHS II (2019)	*0.31	*1.74	4.9	*46

*Statistically significant difference vs. AHHS I ($p < 0.05$)

Floor and Sill-Dust Hazards by Housing Age (AHHS II – new LDHS)



Presence of a Soil-Pb Hazard/Mean Concentrations

Survey	Millions of HUs	% of HUs	Mean soil-Pb concentrations (ppm) for All Samples	Mean soil-Pb concentrations (ppm) for Bare Soil
AHHS I	3.8 (2.2, 5.5)	3.6 (2.1, 5.2)	169 (132, 207)	184 (127, 240)
AHHS II	2.4 (0.7, 4.0)	2.0 (0.6, 3.4)	*106 (77, 134)	*99 (70, 127)

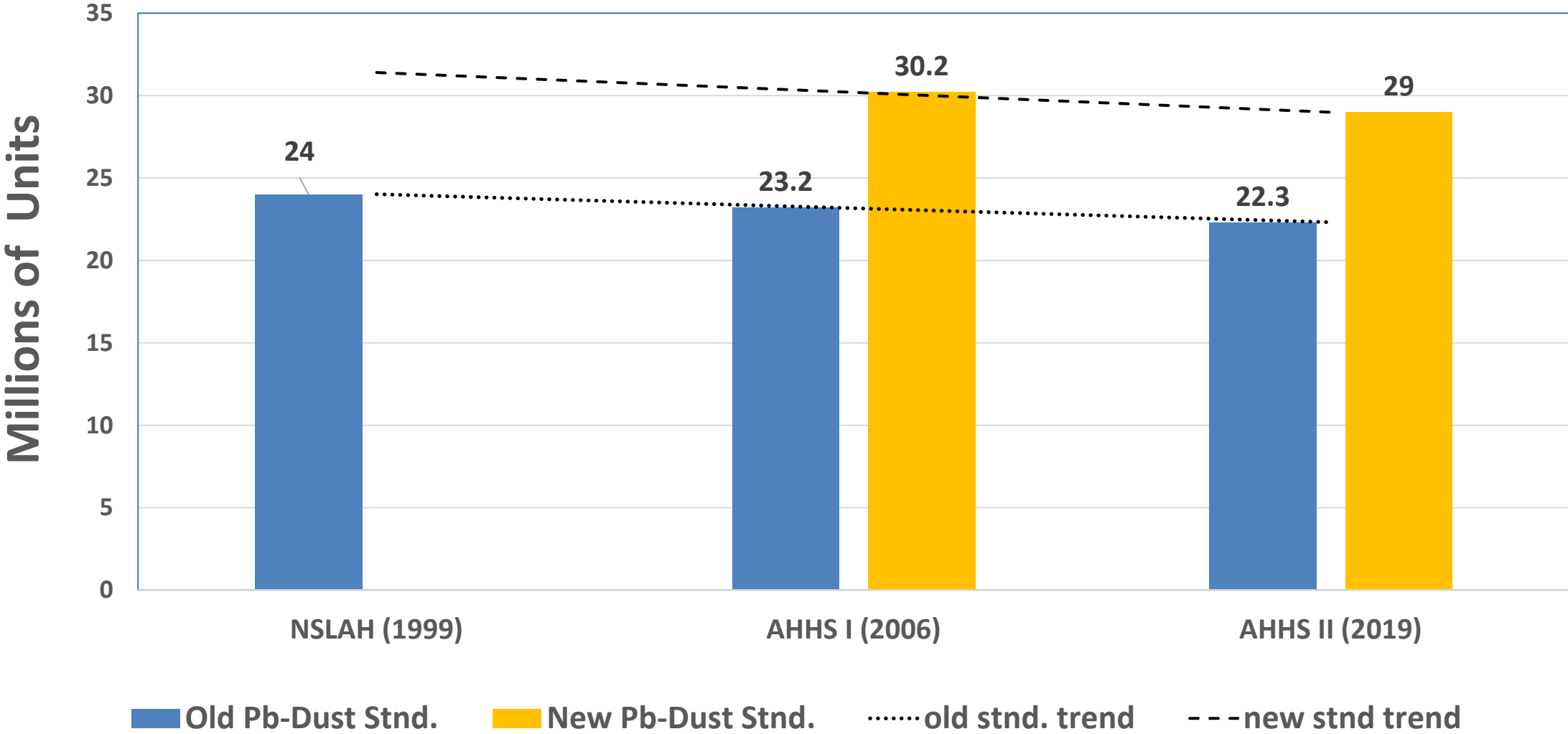
*Statistically significant difference vs. AHHS I ($p < 0.05$)

Presence of Bare Soil by Lead Concentration

Survey	Bare Soil-Pb ≥ 400 ppm Millions of HUs	Bare Soil-Pb ≥ 400 ppm % of HUs	Bare Soil-Pb ≥ 200 ppm Millions of HUs	Bare Soil-Pb ≥ 200 ppm % of HUs
AHHS I (2006)	10.6 (8.1, 13.0)	10.0 (7.7, 12.3)	14.4 (11.5, 17.3)	13.6 (10.9, 16.4)
AHHS II (2019)	*6.6 (3.5, 9.7)	5.6 (2.9, 8.3)	10.4 (6.5, 14.2)	*8.8 (5.5, 12.1)

*Statistically significant decline ($p < 0.05$)

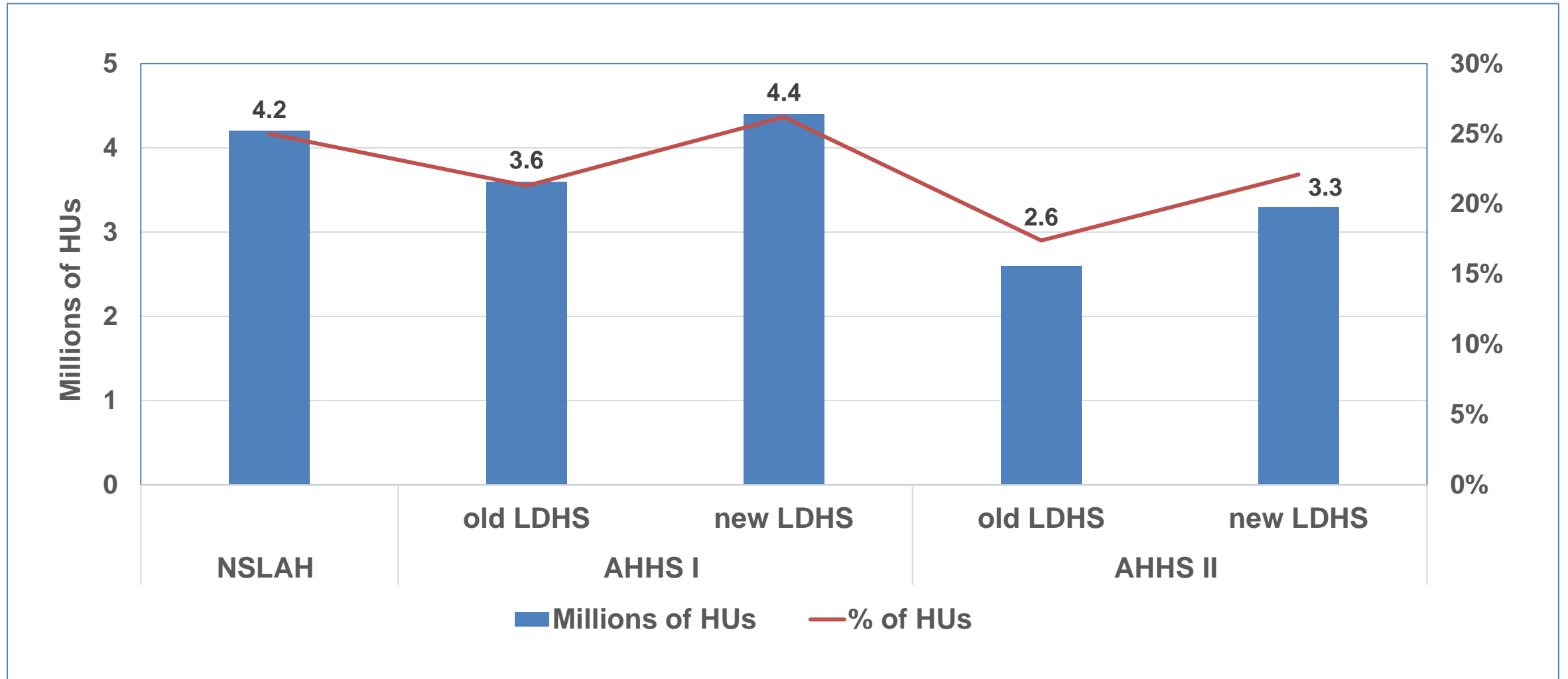
U.S. Housing Units with one or more LBP Hazards



Presence of any LBP Hazard – Notable Findings

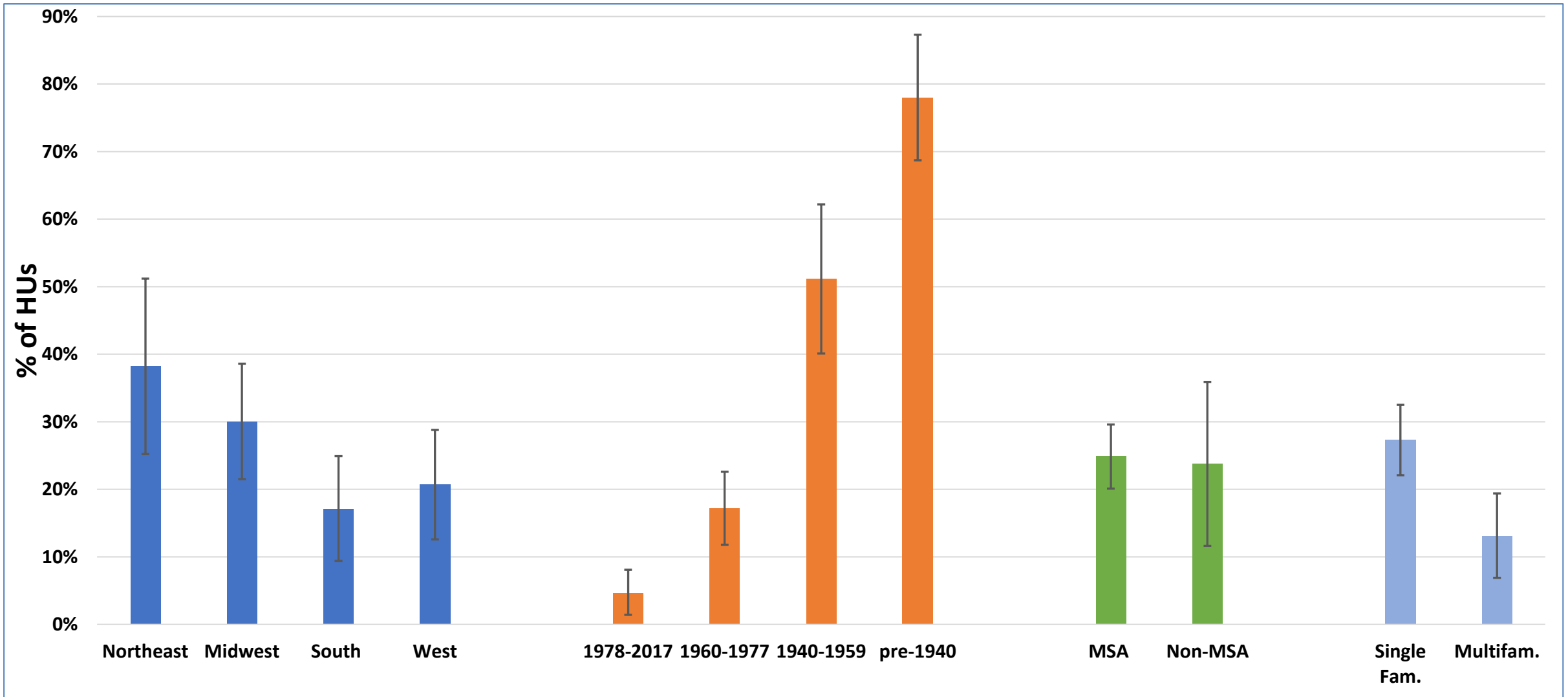
- Since NSLAH (~ 20 yrs) there has been a modest decrease (1.7M) in the overall number of HUs with LBP hazards (24M → 22.7M), with different patterns by hazard type:
 - **decrease** of 4.9 M HUs with dust-Pb hazards
 - **decrease** of 4.1 M HUs with soil-Pb hazards
 - **increase** of 4.6 M HUs with sig. deteriorated LBP
- There was a stat. sig. decline in the number of households in poverty with a LBP hazard (both PbD stnds.): new LDHS: 36.1% to 23.6%)
- There was a stat. sig. decline in the number of African American households with a LBP hazard (both stnds.): new LDHS: 42% to 21.6%)

U.S. Housing Units with a LBP Hazard and Child < 6 yrs.

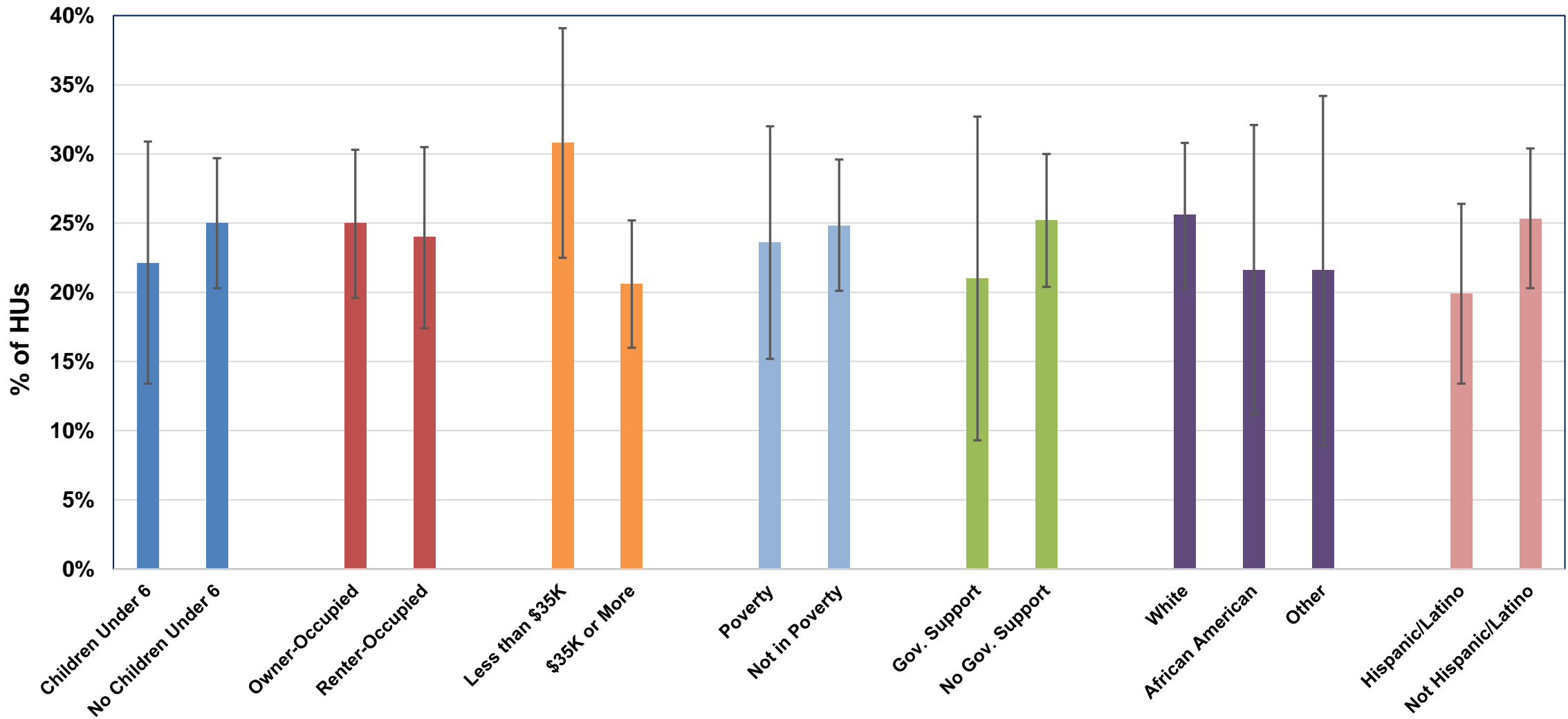


Prevalence of LPB Hazards by Housing and Occupant Characteristics

Prevalence of Sig. LBP Hazards by Housing Unit Characteristics (AHHS II: New LDHS)



Prevalence of Sig. LBP Hazards by Occupant Characteristics (AHHS II: New LDHS)



Summary of Findings

Key Metrics (AHHS II)

Characteristics	Number of Housing Units (Millions)	% of Housing Units in Category
Homes with LBP	34.6 (29.9, 39.3)	29.4% (25.4, 33.4)
≥ 1 LBP Hazard	29 (24, 34)	24.6% (20, 29.2)
Hazard + Child < 6 yrs.	3.3 (1.8, 4.8)	22.1% (13.4, 30.9)
Hazard + Child < 6 yrs. (in poverty)	1.3 (0.4, 2.1)	30.1% (14.8, 45.3)

Risk Factors for the Presence of a LBP Hazard

- Housing Factors - significantly higher prevalence of LBP hazards for:
 - Older housing (especially pre-1960)
 - Single family housing
 - Housing in the Northeast or Midwest
- Occupant Factors – higher risk (not stat. sig.) for:
 - Lower income households (< \$35K/yr)
 - Households **not** receiving government assistance
 - Non-Hispanic households

Statistically Sig. Changes: AHHS I to AHHS II (13 yrs.) (1)

Reduction in:

- The % of overall housing units with LBP
- The % with LBP among “government supported” households
- The % of African American households with LBP and with LBP hazards (both LDHSs)
- The % households in poverty LBP and with LBP hazards (both LDHSs)
- The % of households earning \geq \$35K/yr with a LBP hazard (both LDHSs)

Statistically Sig. Changes: AHHS I to AHHS II (2)

Significant reductions in:

- The median dust-Pb loading for floors and sills
- The 90th percentile dust-Pb loading for sills
- Mean soil-Pb concentrations for both all soil samples and bare soil
- The number of HUs with bare soil \geq 200 ppm
- The % of HUs with bare soil \geq 400 ppm

Changes from NSLAH to AHHS II (20 yrs.)

- HUs with LBP decreased by 3.3M homes (9% relative decrease)
- HUs with a LBP hazard decreased by 1.7M homes (7%)
(old DLHS)
- HUs with sig. deteriorated LBP increased by 4.6M (34%)
- HUs with a dust-Pb hazard (old LDHS) decreased by 4.9M (32%)
- HUs with a LBP hazard and child < 6 decreased by 1.6M (38%)
(old DLHS)

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