

# RESEARCH ON WEATHERIZATION AND HEALTH

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# Presentation Overview

- Examples of studies and reports investigating health benefits of weatherization activities
- Focus on two studies exploring the relationship between interior dust lead levels and weatherization activities
  - Multi-site study conducted by the National Center for Healthy Housing
  - NYC Collaboration between NYU/NCHH/NYC DOH and several NYC Weatherization programs
    - Preliminary results
    - Implications

# Studies and Reports

- **Studies:**
  - **Watts and Well-Being: Do Residential Energy Conservation Upgrades Improve Health?**
    - Ongoing study comparing data on occupant health status in housing before and after energy conservation retrofits.
  - **Effect of insulating existing houses on health inequality: cluster randomized study in the community**
    - Insulating existing houses led to a significantly warmer, drier indoor environment and resulted in improved self rated health, self reported wheezing, days off school and work, and visits to general practitioners as well as a trend for fewer hospital admissions for respiratory conditions.
  - **National Evaluation of DOE's Weatherization Assistance Program & Indoor Air Quality Field Study**
    - Ongoing study investigating non-energy benefits such as energy bill payments, health impacts, job creation, among others
    - Looks at radon, carbon monoxide, formaldehyde, moisture, in conjunction with blower door tests

# Studies and Reports

- Reports:
  - **Healthy Housing Opportunities During Weatherization Work**
    - Wilson and Tohn
  - **Avoiding Health Pitfalls of Home Energy-Efficiency Retrofits**
    - Manuel J.. 2011. Avoiding health pitfalls of home energy-efficiency retrofits. *Environ Health Perspectives* 119:76–79.
  - **Healthy Indoor Environment Protocols for Home Energy Upgrades**
    - practical guidance on improving or maintaining indoor air quality and indoor environments during home energy upgrades, retrofits or remodeling.

# Analysis of Lead-Safe Weatherization Practices in Weatherized Homes

- The National Center for Healthy Homes
  - Funded by DOE, partnering with weatherization programs
  - Effect of weatherization activities on lead dust levels
- Study Group
  - 58 dwellings with at least one component with lead based paint
- Looked at lead dust levels:
  - When cutting holes in walls/ceilings, window repair/replacement, and door weather stripping
  - Blower door testing and dense-packing of walls

# Sampling Protocol

- Dust samples were collected during the following time points:
  - **Stage 1:** Before work site prep and plastic put down
  - **Stage 2:** Immediately after target activity completed but before plastic was removed or cleaned.
  - **Stage 3:** After the plastic sheeting was removed but before the floor was cleaned;
  - **Stage 4:** After final cleaning

# Findings:

- Dust created by typical weatherization work in older housing with lead-based paint is likely to be well above EPA safety standards.
  - Floor samples exceeding EPA standards from Stage 1 to Stage 3
    - Window replacement: 27% increase ( $p=0.020$ )
    - Window repair: 57% increase ( $p=0.046$ )
      - *Weather stripping activities: 13% increase ( $p=0.257$ )*
      - *Blower door/dense-packing walls : 5% increase ( $p=0.317$ )*
- After cleaning, levels are generally the same or lower than prior to the weatherization work.
  - Samples exceed EPA standards from pre-work to post-final cleaning
    - Cut holes walls/ceilings: 27% decrease ( $p=0.083$ )
      - *All dust creation activities, combined: 4% decrease ( $p=0.739$ )*

# Conclusions

- The higher the dust lead loadings remaining on floors after containment is removed but before cleanup is performed (Stage 3), the higher the post-final cleaning floor dust lead loadings.
  - Cleaning is needed!
- Floor dust lead loadings measured after final cleaning (Stage 4) was done were not significantly different from those measured before work began
  - Cleaning works!
- These findings suggest that contractors need to exercise care when removing the plastic sheeting used to collect dust and debris and need to more thoroughly clean areas after the plastic is removed.
- Dust dispersion activities such as blower door tests can increase dust lead loadings, but the change is not large enough to trigger EPA action levels.
  - When EPA action levels were exceeded, the dust lead loadings were generally of concern prior to the test.



# NYC Study: Benefits of Window Replacement During Weatherization

- Study currently being conducted by NYU, NCHH, NYC DOHMH and several NYC-based Weatherization programs
- Hypothesis: Replacing windows during weatherization can decrease energy costs AND reduce interior dust lead levels
  - Lead contaminated dust thought to be the main exposure pathway for lead poisoned children in NYC
  - Previous studies<sup>1</sup> suggests that dwellings with window replacement tend to have lower floor dust lead loadings, even 6 years-post window replacement
- Hope to use positive study findings to:
  - Urge federal officials to include a health benefits measure in the SIR equation
  - Increase funding for weatherization activities

<sup>1</sup>Wilson J, Pivetz T, Ashley P, Jacobs D, Strauss W, Menkedick J, et al. 2006. Evaluation of HUD-funded lead hazard control treatments at 6 years post-intervention. Environ Res 102:237–248.

# Study Design

- Focused on buildings undergoing window replacement
  - Oneida County also involved, recruiting homes undergoing window repair (control group 1) or no window treatment (control group 2)
  - All buildings built prior to 1950
  - Convenience sample - any building slated to undergo window replacement in the immediate months after we recruited the weatherization programs
- NYU/NCHH initially wanted to focus only on buildings with single pane windows
  - Hard to find in NYC
- The majority of buildings we recruited were undergoing window replacement of previously replaced (vinyl) windows
  - A total of 80 units in 15 buildings were recruited

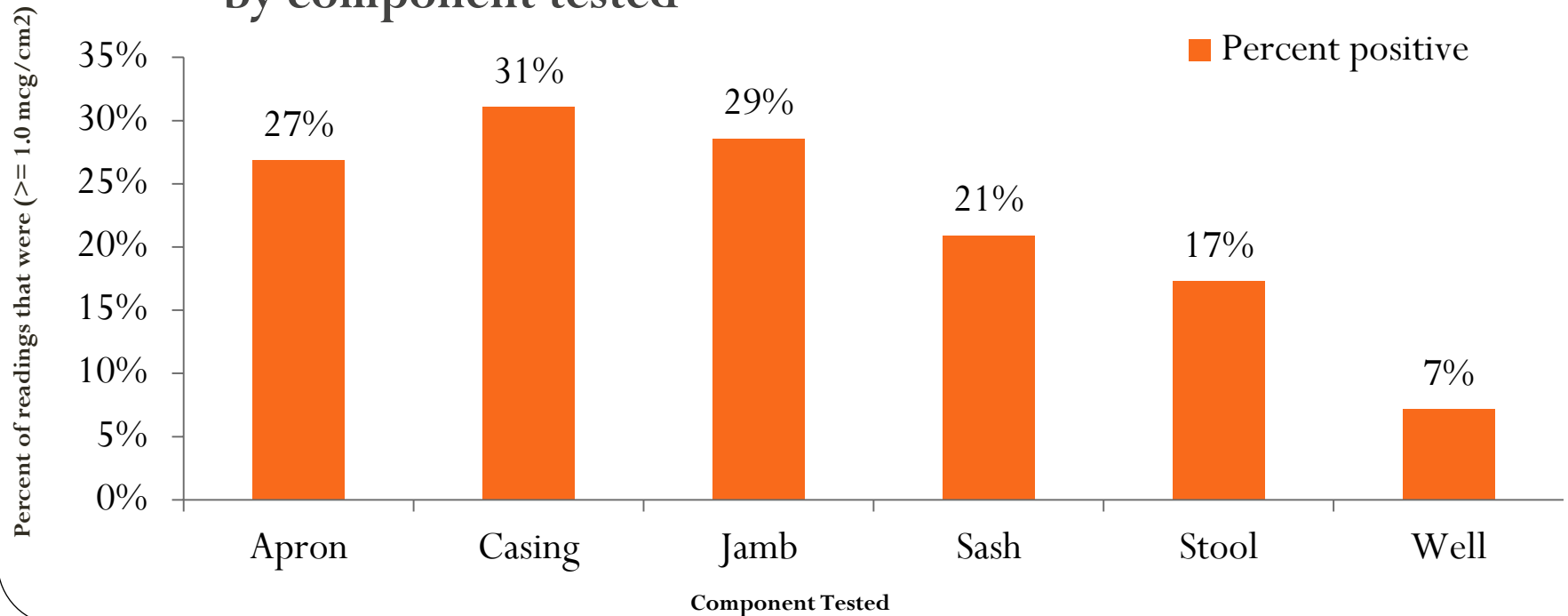
# Sampling Protocol

- **Dust wipes collected at three time points**
  - Prior to window replacement
  - 1-3 weeks post window replacement
  - 1 year post window replacement
- **Dust samples collected near windows that were replaced**
  - Floor underneath window
  - Interior window sill (sash)
  - Window trough (well)
- **Dust samples collected in three rooms**
  - Living room
  - Kitchen
  - Master Bedroom
- **XRF measurements of components that surround the vinyl window**

# Preliminary Results

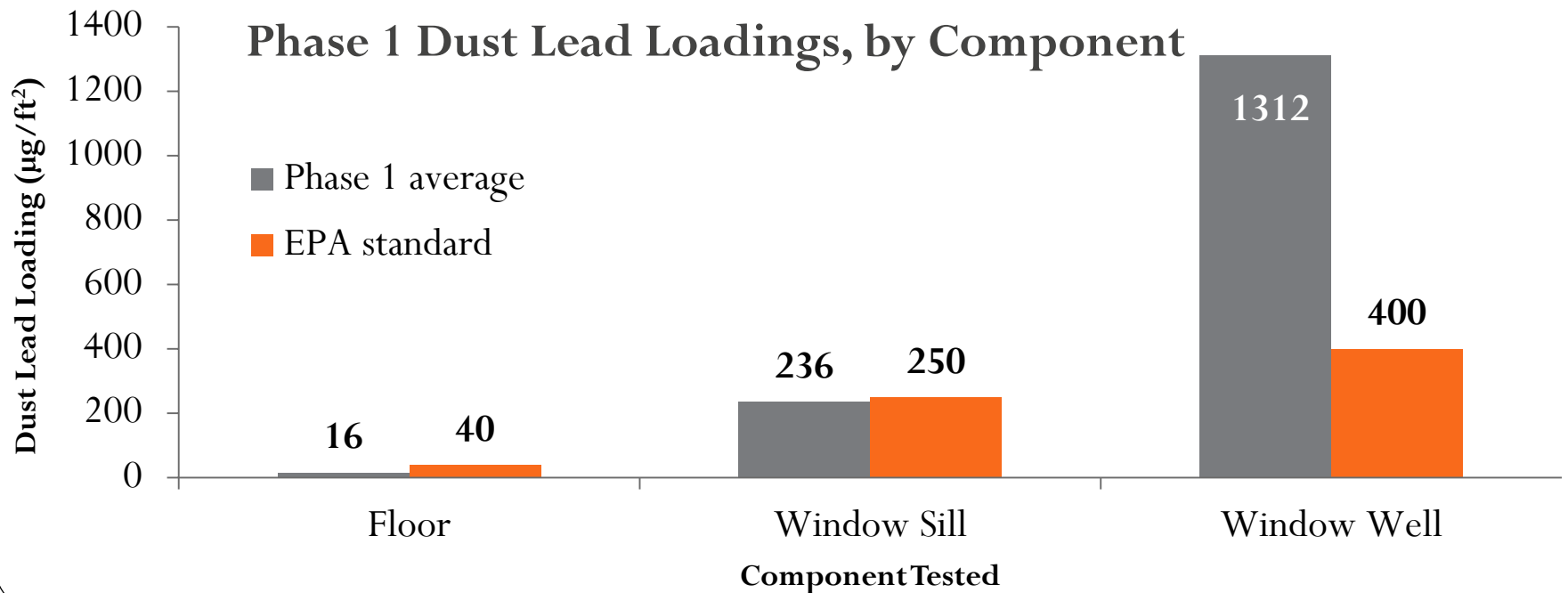
- Phase 1 Results:
  - 22% of the window components surrounding the window tested via XRF had a positive reading ( $\geq 1.0$  mcg/cm<sup>2</sup>)

**Percent of XRF readings that were positive,  
by component tested**



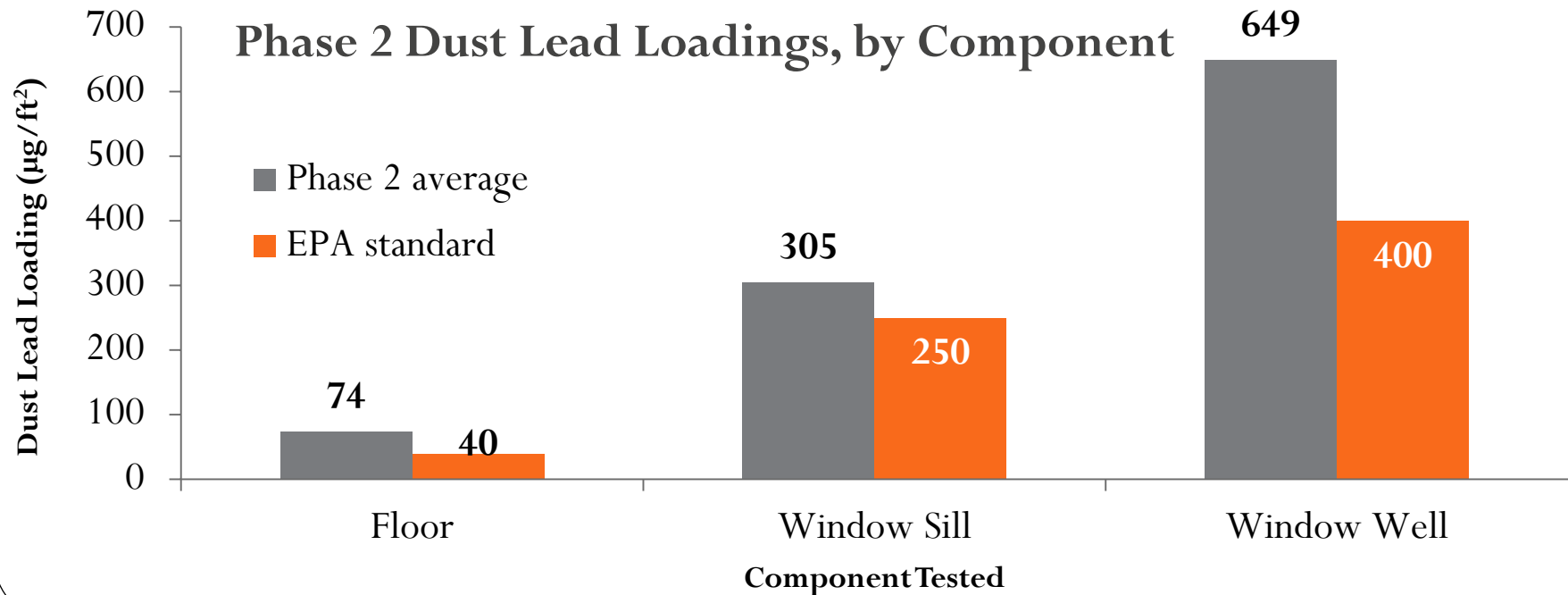
# Preliminary Results

- Phase 1 Results:
  - 41% of units had at least one sample above the EPA safety standard
  - 48 out of 498 samples (10%) were above the EPA safety standard



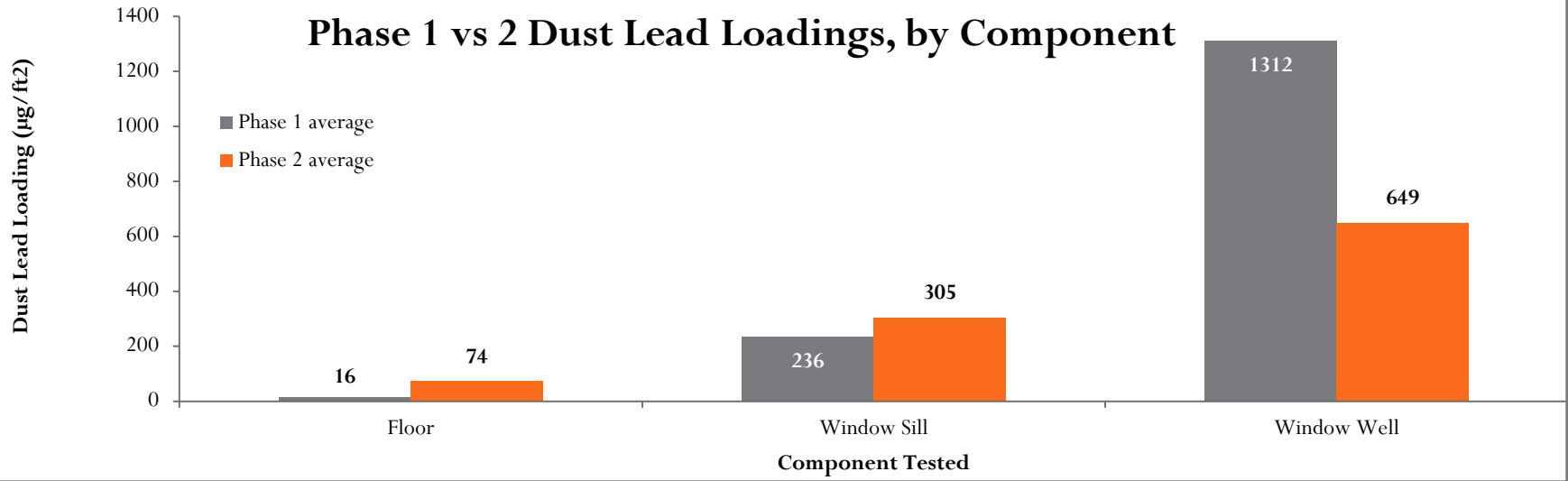
# Preliminary Results

- Phase 2 Results:
  - Mean time between window replacement and phase 2 was 12 days
  - 73% of units had at least one sample above the EPA safety standard

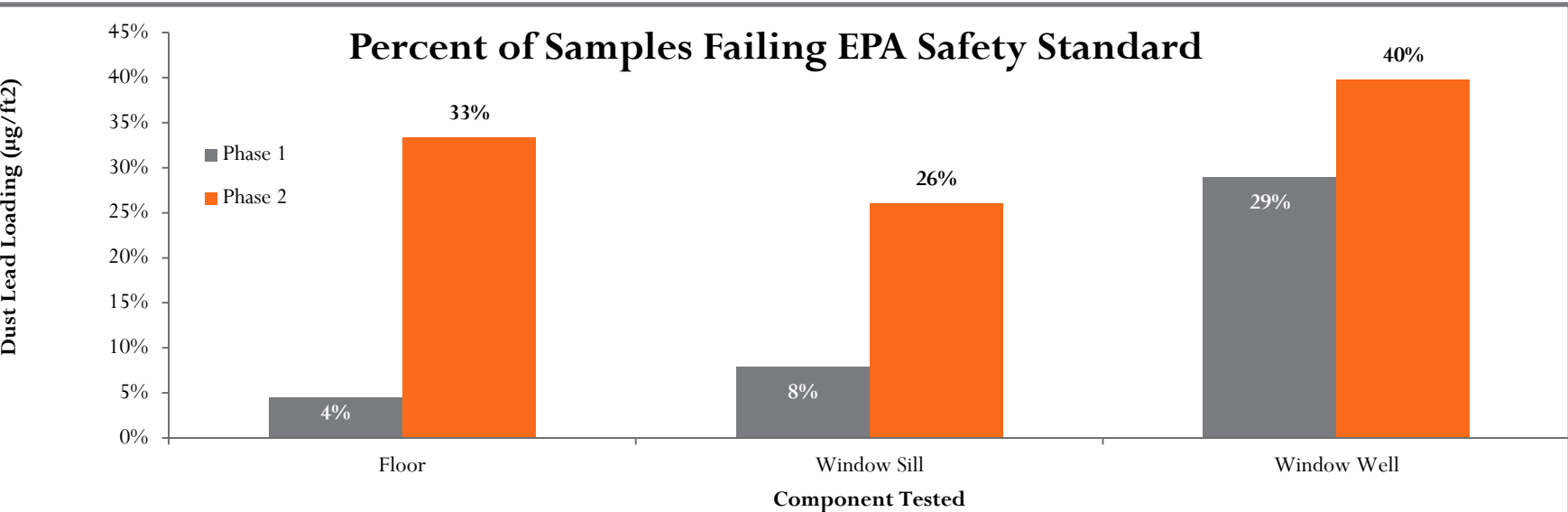


# Preliminary Results

## Phase 1 vs 2 Dust Lead Loadings, by Component



## Percent of Samples Failing EPA Safety Standard



# Implications

- Study assumed lead-safe work practices (LSWP) would be employed in all units
  - Pre-1950 buildings
  - Most buildings, unless gut rehabbed, still have some components that have lead-based paint
  - DOE guidelines and HCR protocols require LSWP in buildings
  - Window replacement companies in NYC should be EPA-certified abatement firms and employ trained workers
  - Local Law 1 of 2004 requires LSWP and clearance dust wipes if a child  $< 6$  resides in the unit with 2 or more window replacements
  - The EPA Renovation, Repair, and Painting Rule (RRP) requires LSWP when you disturb  $> 6 \text{ ft}^2$  of paint (interior) or replace one or more window



# Implications

- After discussing preliminary results with weatherization groups, it was determined LSWP was not employed in the vast majority of units. Reasons include:
  - Owners provided evidence that the windows didn't have lead
    - XRF inspection reports from environmental testing companies
    - Dust wipe clearance results used to clear violations
  - Owners indicated that they previously received a grant from HPD to address lead hazards and that their building was “lead free”
  - Language included in contract with window replacement firm requiring LSWP was included

# Lessons Learned

- Previously replaced window does not mean the surrounding components are lead free
- Environmental testing companies cannot certify a building as “lead free”, only HPD can.
  - Very few buildings (<1,000) have been certified by HPD
  - Some of our XRF results do not match to theirs
- HPD Lead Grant program does not remove all lead hazards, it just reduces existing hazards
  - Abating all lead-paint areas is too costly
  - HUD does not allow grant funds to be used for abatement alone
- Window contractors are required to follow NYC and federal requirements
  - They need to use LSWP at all times, not just weatherization jobs

# Recommendations

- Assume all pre-1960 units have lead-based paint and employ LSWP
- Have the owner use their match money on clearance dust wipes in lieu of using the money to show they don't have a lead issue
  - It will ultimately be cost neutral, as dust wipes are relatively inexpensive (~\$10 per wipe)
- Confirm window replacement firm is EPA certified
  - Confirm that the firm's workers have been trained in LSWP
- Continue to use language requiring LSWP in contracts with window firms, but also monitor LSWP early on in the job
  - Key things to look for is the use of poly and how much debris they are generating and tracking

# We are here to help

- NYC DOHMH holds FREE classes on LSWP, and can certify window contractors and other individuals involved in construction/maintenance
  - Workers can become RRP certified
- We can offer weatherization programs training on:
  - How to monitor for LSWP
  - How to collect a clearance dust wipe
    - Need to be certified before you can collect
  - The various laws that apply to lead-based paint

# Special Thanks

- All DOHMH staff involved in the project, especially
  - Leslyn Daligadu
  - Morahina Rodriguez
  - Vanessa Santiago
  - Elena Ochoa
  - Deborah Nagin
- Partners
  - NYU:
    - Dr. Michael Weitzman, Principal Investigator
    - Sonali Tawdekar
  - NCHH:
    - Dave Jacobs, Principal Investigator
    - Rick Nevins, Principal Investigator
  - NYC Weatherization Programs

Questions?