Healthy Homes: Indoor Air and Children's Respiratory Health

Improving the Respiratory Health of Alaska Native People through Home Based Interventions

Steps

- Identify homes with children that have chronic respiratory illness
  - Children >13yrs with 4 or more clinic visits OR 1 hospitalization in the previous year for respiratory illness
- Assess the home for indoor air quality concerns
- Remediate the home to correct indoor air quality concerns
- Monitor air quality before and after remediation:
  - Particulate Matter 2.5, Volatile Organic Compounds, Carbon Dioxide, Temperature, and Relative Humidity

Home Assessment

- ANTHC, along with Housing Authority Staff Members, walk through each home to assess potential air quality issues
  - Inadequate ventilation, leaky woodstove, moisture problems
- The resident, housing personnel, and ANTHC personnel determine a scope of work for each home to remediate indoor air quality issues

Home Remediation

- Change out woodstoves with EPA-certified low-emission stoves
- Install range exhausts over cooking stoves
- Provide additional ventilation in homes with little or no ventilation
- Replace leaky Toyo stoves

Home Assessments

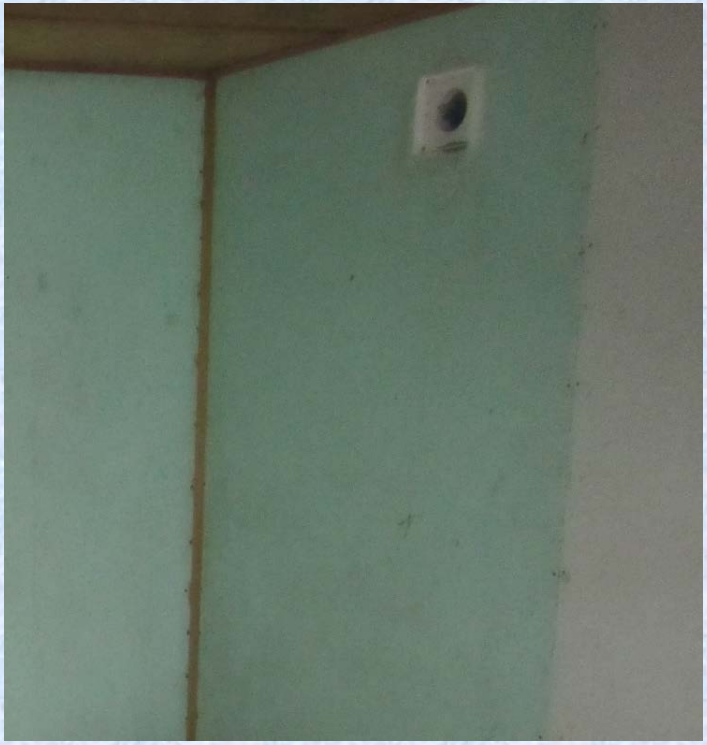
- Average area in homes was 797ft.
- Average number of residents per home was 8
  - HUD defines “extreme overcrowding” at **150ft^2/resident**
  - 15 homes in Year 1 have less than **100ft^2/resident**

Improved Ventilation

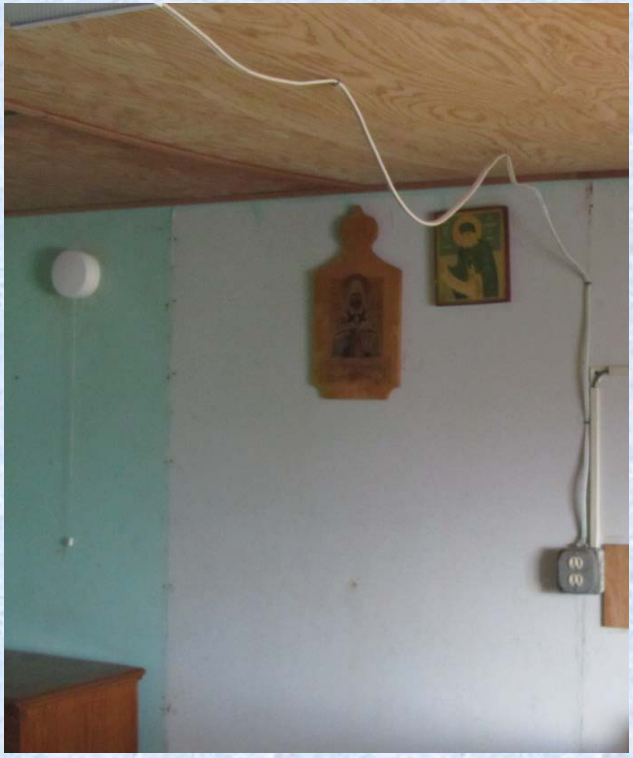
- 40 new vents installed in the 15 homes
- Housing crews installed passive ventilation that residents could open and close

New and/or Improved Vents

Ventilation intake plugged with a rag



New ventilation intake



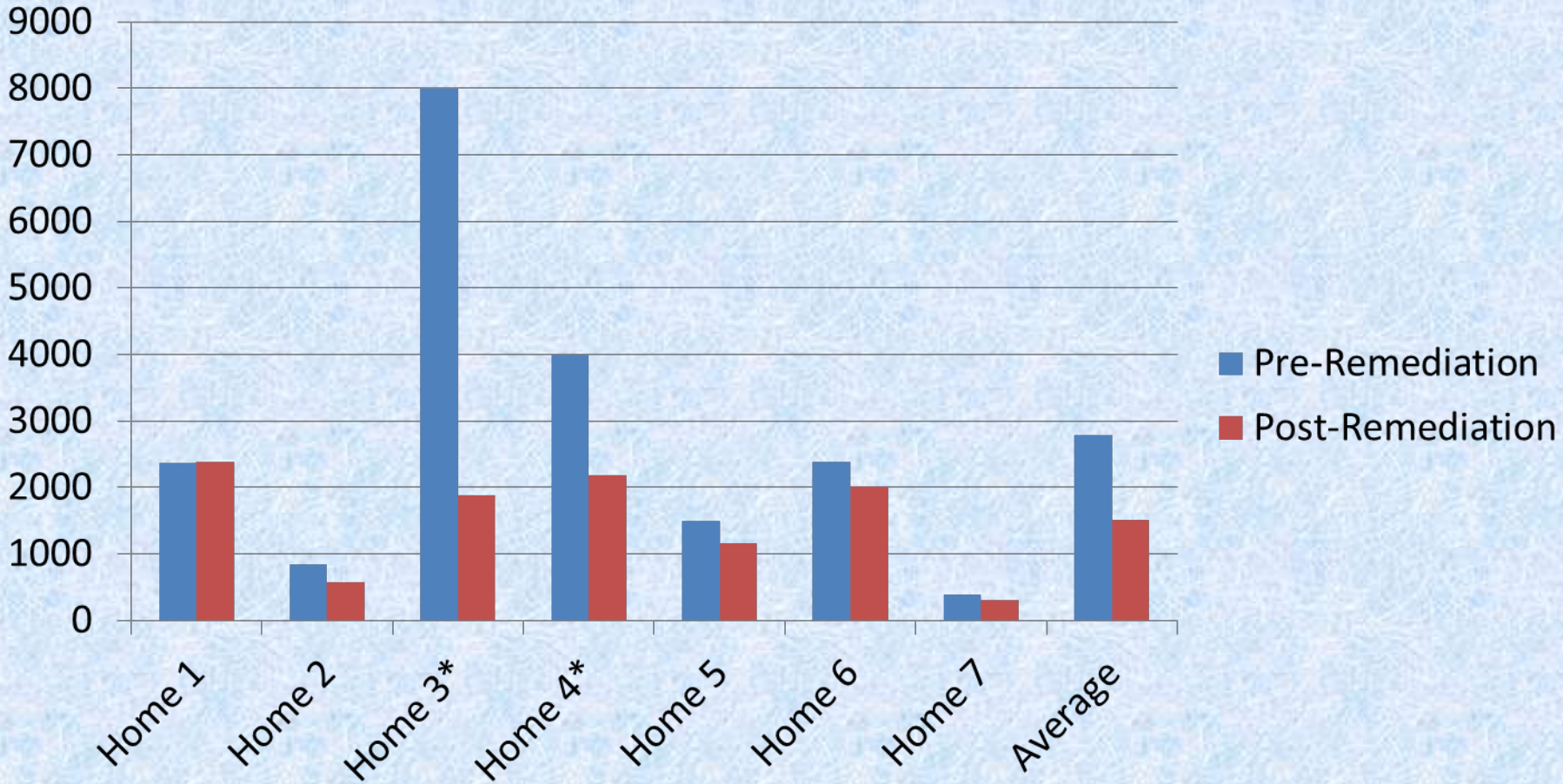
Range Exhaust Installed

Cooking stove with no range exhaust

Cooking stove with a new range exhaust

CO_2 Levels in Homes 1-7**

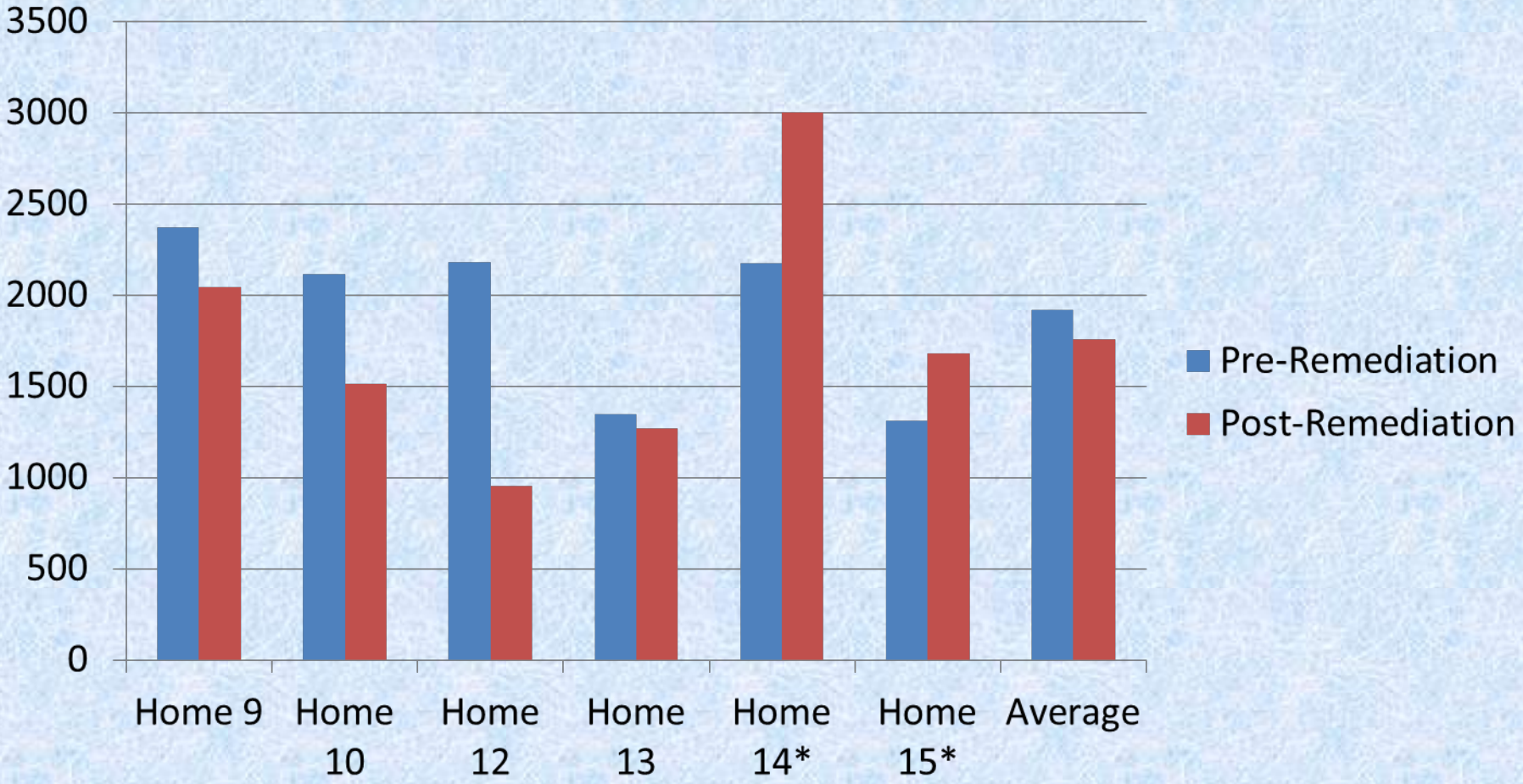
*Indicates visual readings from Telair monitor during Pre-remediation testing



CO_2 Measured in Parts Per Million (PPM)
**Home 8 omitted, no test data available from post-remediation testing

CO_2 Levels in Homes 9-15**

*Indicates visual readings from Telair monitor during Post-remediation testing



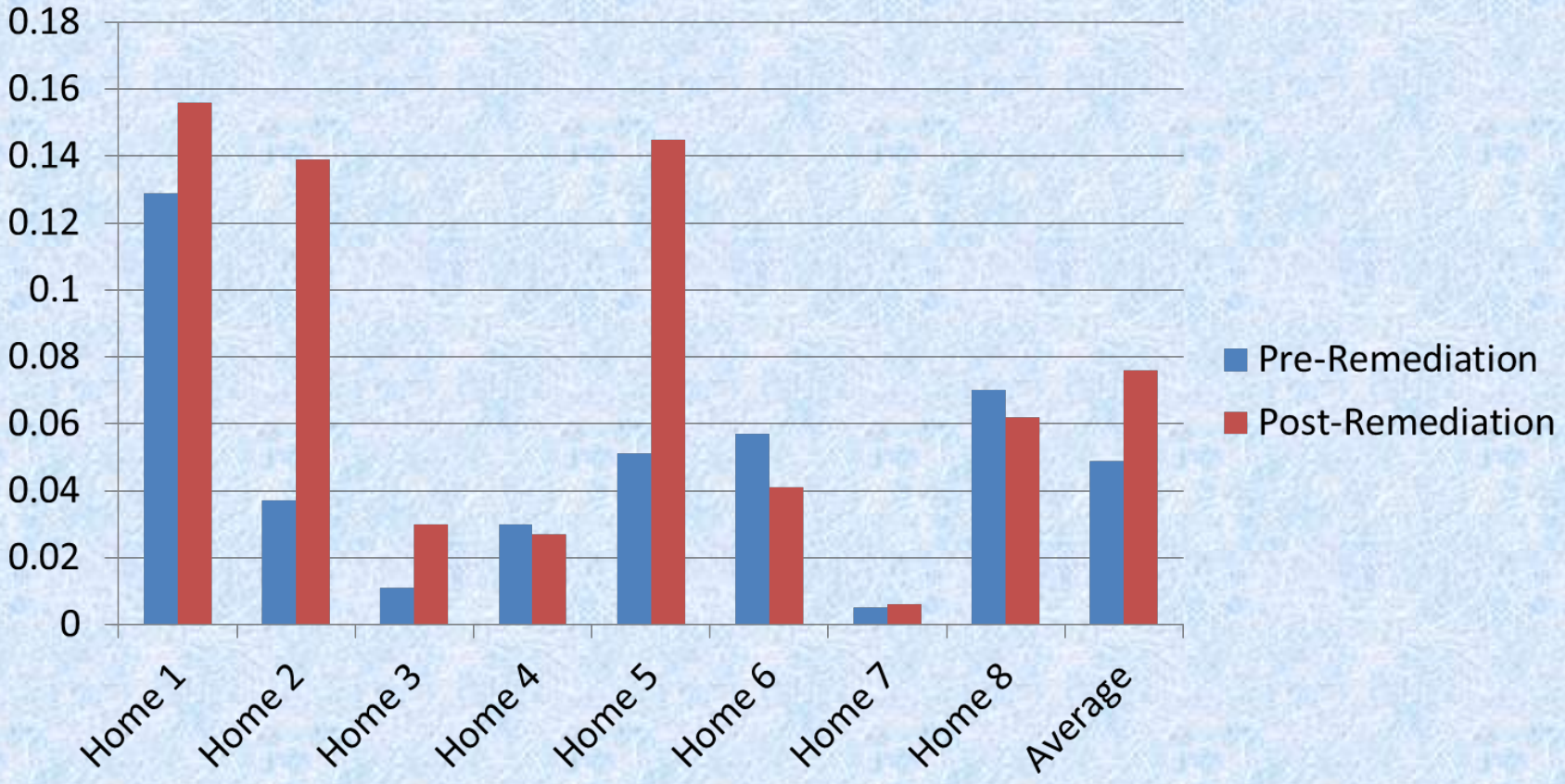
CO_2 Measured in Parts Per Million (PPM)
**Home 11 omitted, no test data available from pre-remediation testing

Woodstove Change-out

Old woodstove

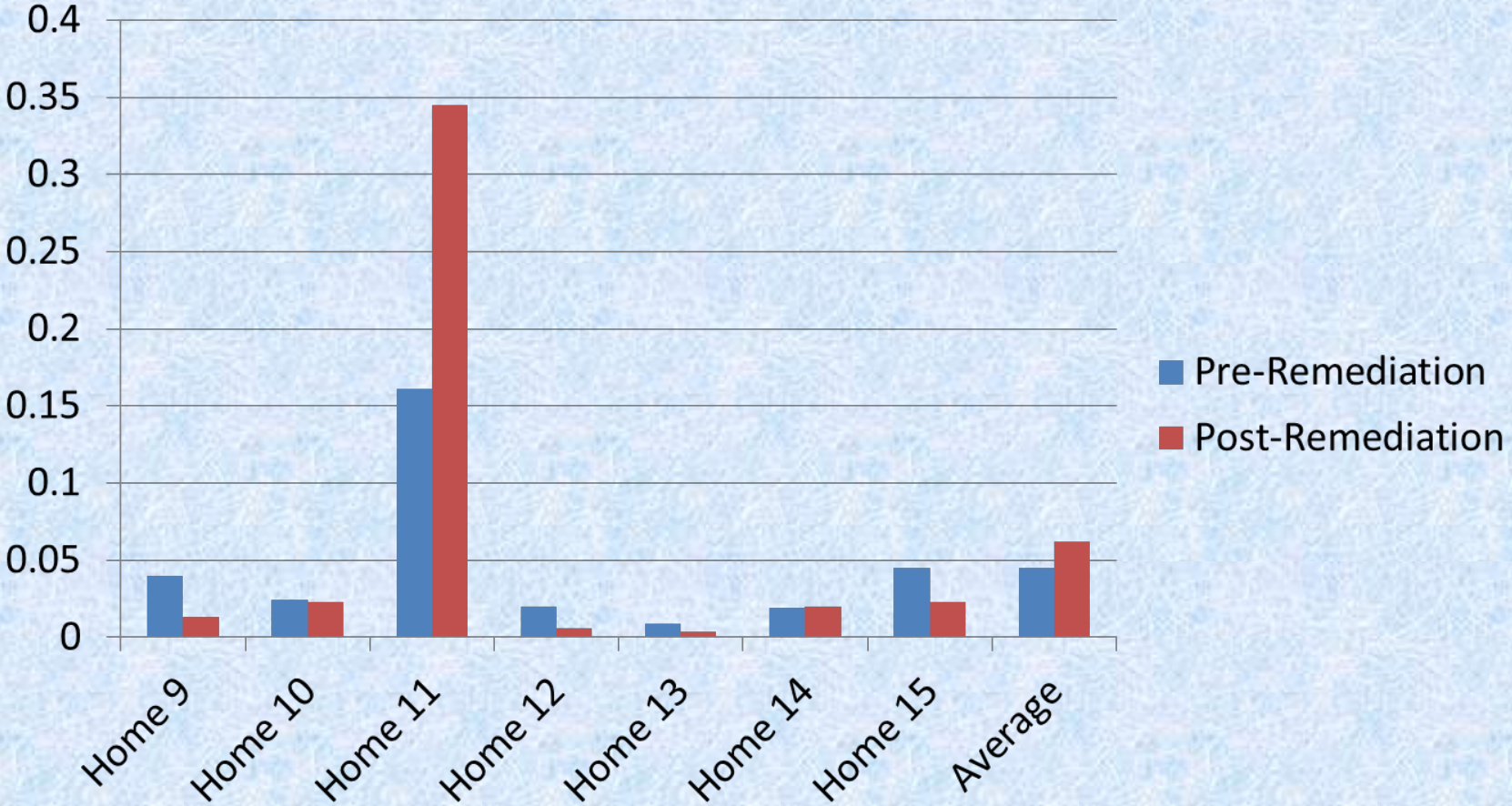
New EPA-certified, low-emission woodstove

$PM_{2.5}$ (mg/m^3) in Homes 1-8



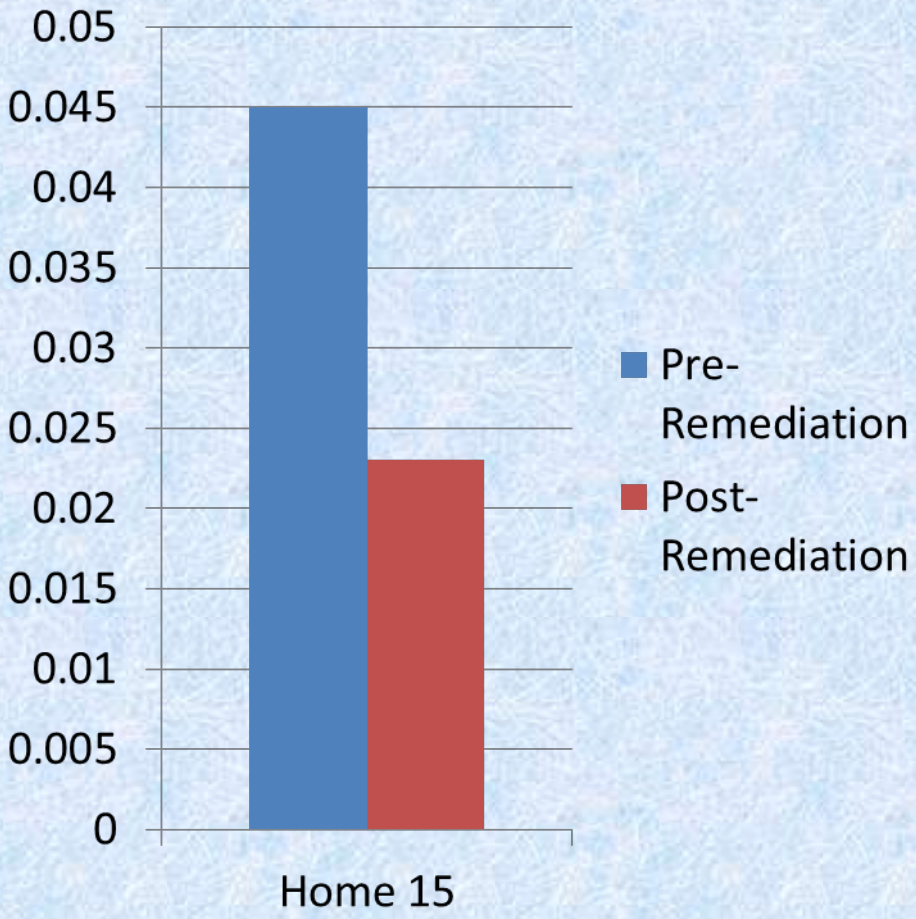
PM2.5 measured in mg/m^3

$PM_{2.5}$ (mg/m^3) in Homes 9-15



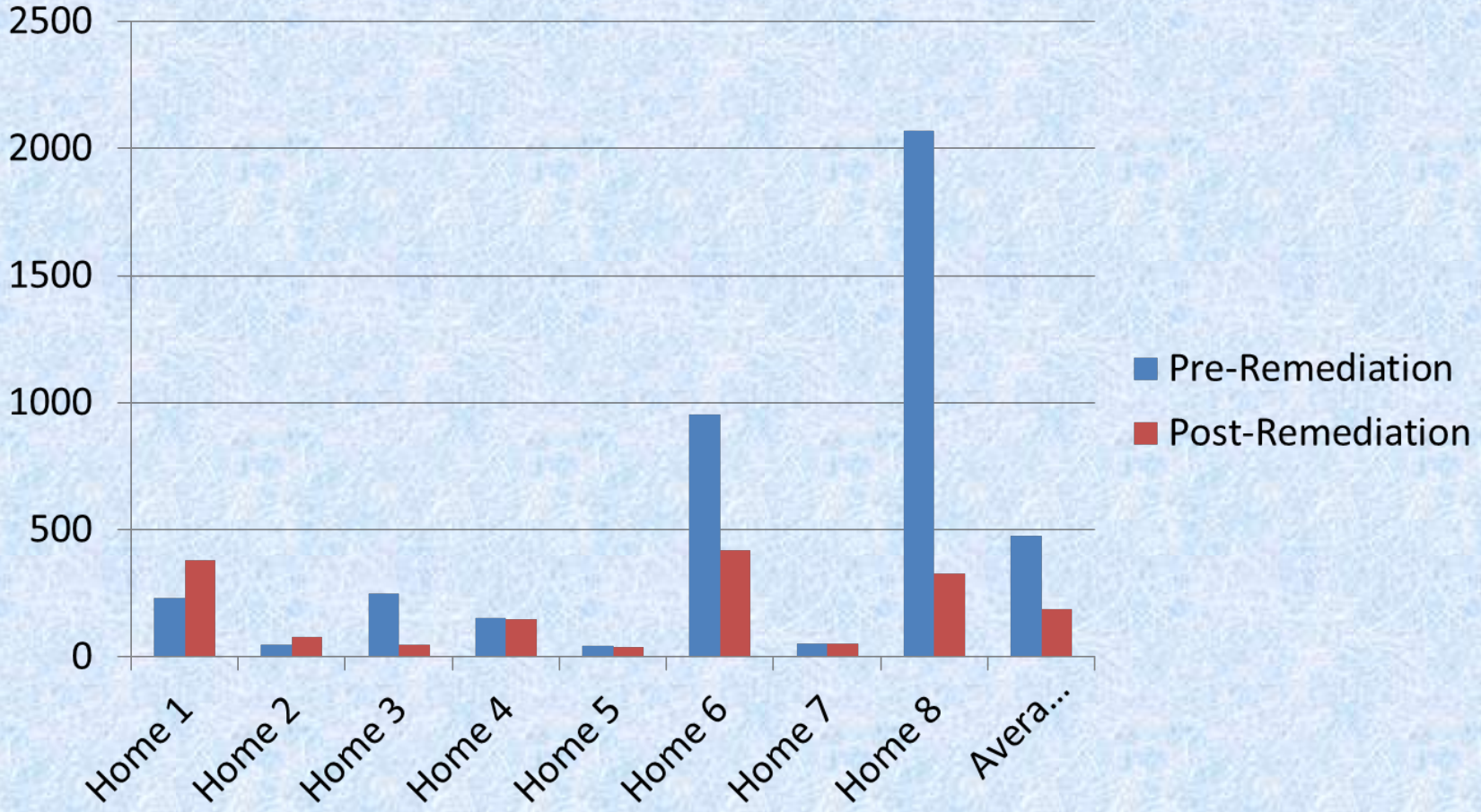
PM2.5 measured in mg/m^3

$PM_{2.5}$ (mg/m^3) In Home That Burned Wood Before and After Receiving a New Stove



BTEX VOC (µg/m³)Results in Homes 1-8 Pre-Post Remediation

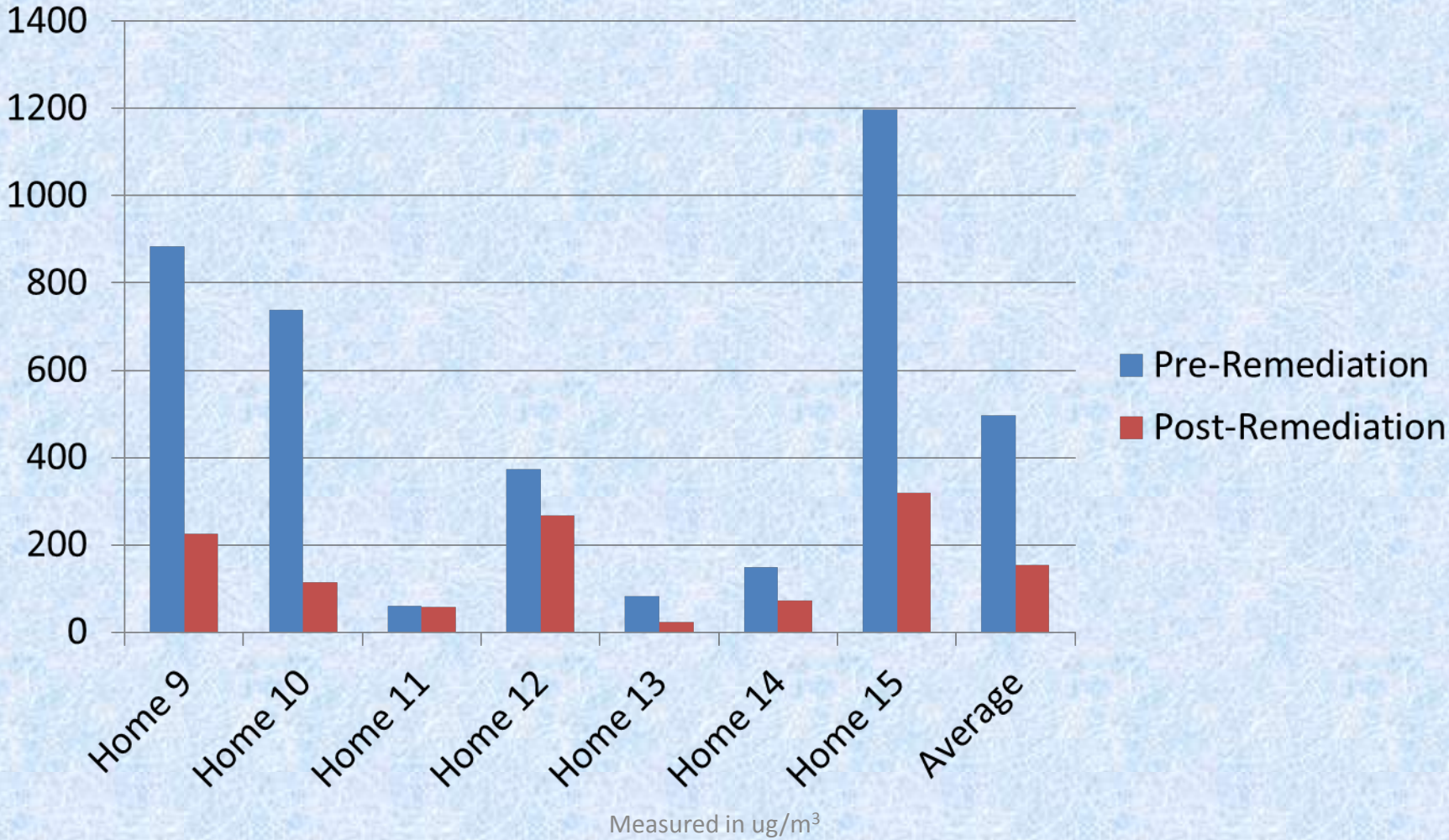
[BTEX =Benzene, Ethyl Benzene, m, p-Xylene, o-Xylene, Toluene]



Measured in ug/m³

BTEX VOC (µg/m³)Results in Homes 9-15 Pre-Post Remediation

[BTEX =Benzene, Ethyl Benzene, m, p-Xylene, o-Xylene, Toluene]



Thoughts on Preliminary Results for BTEX VOCs Data

- On average, BTEX results in homes were more than 30x higher than the 50th percentile of a New York state study from 2005
- Even after 60% lower readings post-remediation, BTEX total averages remained more than 10x higher in these homes than in the New York study
- Some residents worked on engine parts in the homes, which is a behavior than can be addressed to have a positive impact on reducing VOC levels

Baseline Respiratory Health Questionnaires

- 45 of 66 children (68%) reported having a severe respiratory infection before age 2
- 48 of 66 children (72%) reported having a cold, cough, or runny nose in the 2 weeks prior to the initial respiratory health questionnaire

Results of Health Questionnaires

- **Observed Changes:**
  - **Cold or runny nose (-4.7%)**
  - **Wheezing attacks (-3.1%)**
  - **Inhaler or nebulizer use (-3.1%)**
  - **School absence from breathing problems (-7.5%)**
  - **Clinic visits for respiratory (-8.3%)**
  - **Hospitalization for respiratory (-7.8%)**

Conclusions

- Based on the results presented in the previous slides. We can conclude the following:
  - Work was successfully performed in all 15 homes
  - Air quality was generally improved
  - Fewer reported school absences, clinic visits, and hospitalizations from respiratory illness
  - While it is very early in the project and results are only preliminary and based on only 15 homes, initial results from Year 1 are encouraging.