COMMUNITY PLANNING & DEVELOPMENT

Introducing Health@Home

High-Performance Housing Rehabilitation Guidelines

June 18, 2020

Connection Issues and Chats

Should you have any **technical** issues or concerns:

1. Use the Chat Box on the bottom right (or) make sure the "Chat" icon is lit blue on the top
2. Submit your message to "Host and Presenters" so that all of us can see it.

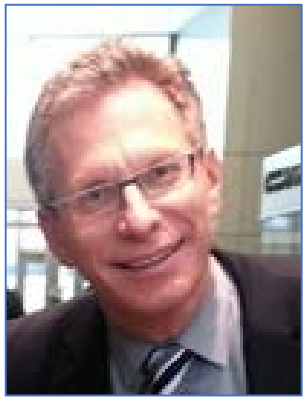
For **Questions** related to the content:

1. Use the Q&A Panel (same area as the chat box)
2. Submit to all as panel members and the host.

Agenda

1. Welcome and Logistics – Lael Holton, AECOM
2. Introduction - Michael Freedberg, U.S. Dept of Housing and Urban Dev.
3. Health@Home Overview -- Ellen Tohn, Tohn Environmental Strategies
4. Keep it Well Ventilated – Nate Price, Indoor Climate Research & Training group, University of Illinois
5. Keep it Clean – Ellen Tohn, Tohn Environmental Strategies
6. Healthy Homes Rehab Case Study - Jill Breysse, National Center for Healthy Housing
7. Questions

Presenters



Michael Freedberg
Office of Economic Development, HUD

Email: Michael.Freedberg@hud.gov

Ellen Tohn
Tohn Environmental Strategies

Email: etohn@tohnenvironmental.com

Nate Price
Indoor Climate Research & Training group, University of Illinois

Email: naprice2@illinois.edu

Jill Breysse
National Center for Healthy Housing

Email: jbreysse@nchh.org

Poll Question #1

What's your role in the healthy housing or rehabilitation space?

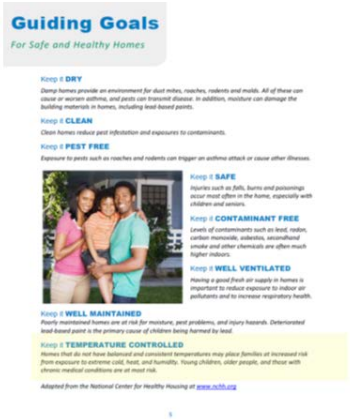
- Rehab program manager
- Rehab specialist
- Supplier or Contractor
- Housing Developer
- Local government
- Non-profit organization
- Building Manager
- Lead Hazard Control
- Weatherization
- Other

Welcome

- Welcome to the Health@Home Journey
- This is a four-part series: we hope you will stick with all four sessions!
- Importance of healthy housing never been clearer:
  - Building more efficient homes, including passive house, with ACH down to almost zero - close to net zero energy.
  - Spending more time in our homes than ever due to Covid-19.
  - Asthma and respiratory ailments identified as risk factor
- We need to be sure that when we rehab our homes, we maximize the indoor experience, minimize hazards.

Health@Home in Context

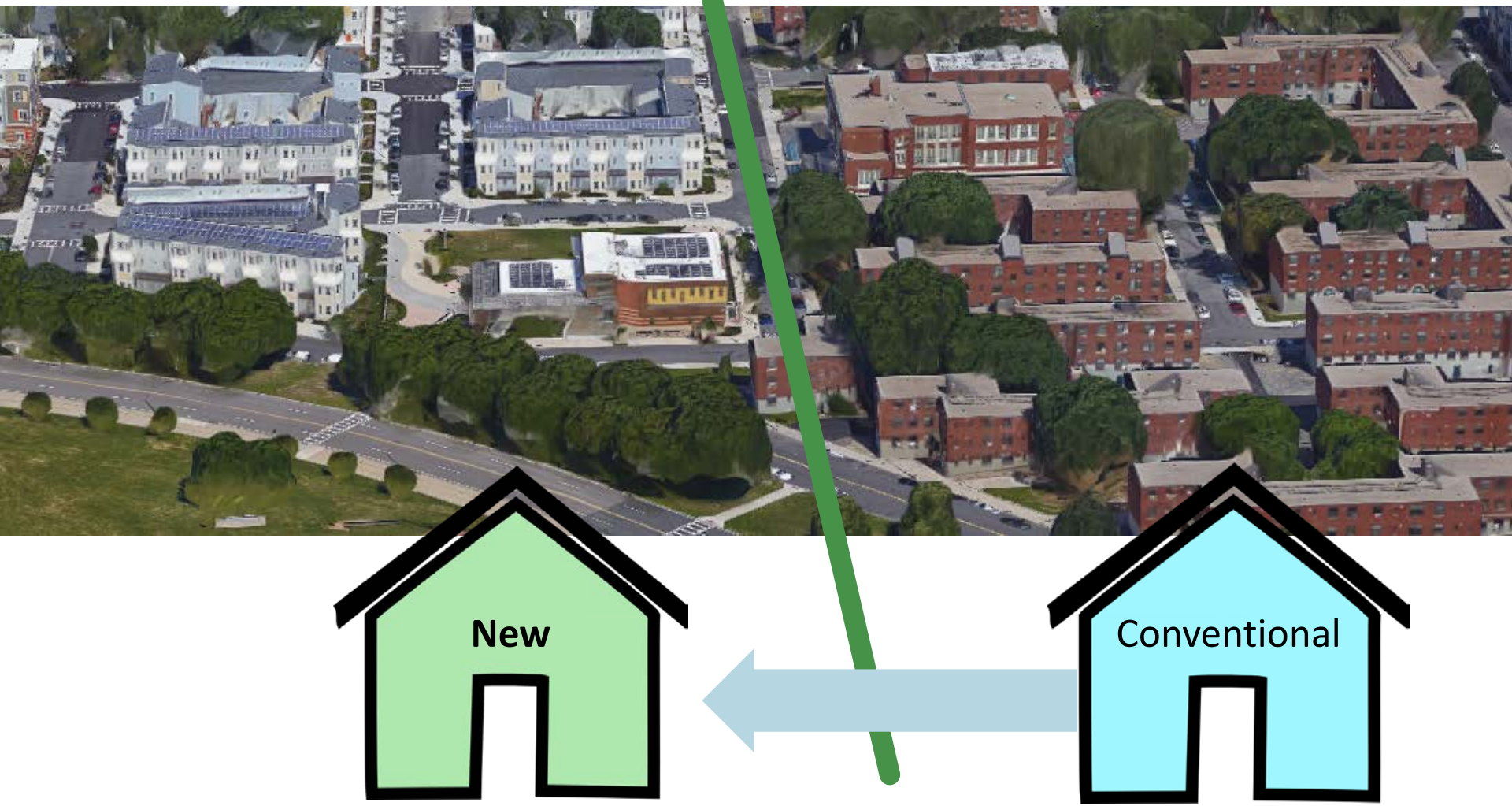
- Health@Home focuses on moderate rehabilitation, home remodeling, or home repair programs
- Steps you can take to address healthy housing through those programs.
- While broadly applicable, focus is on SF and low-rise MF.
- For new, substantial or gut rehab consider a green building standard with STRONG healthy housing criteria:
  - Enterprise Green Communities
  - LEED
  - National Green Building Standard
  - Earthcraft, Earth Advantage
  - Energy Star Indoor Airplus
  - WELL, Fitwell, HH Rewards, Others
- For in-depth discussion, see EPA IAQ Protocols for Existing Buildings



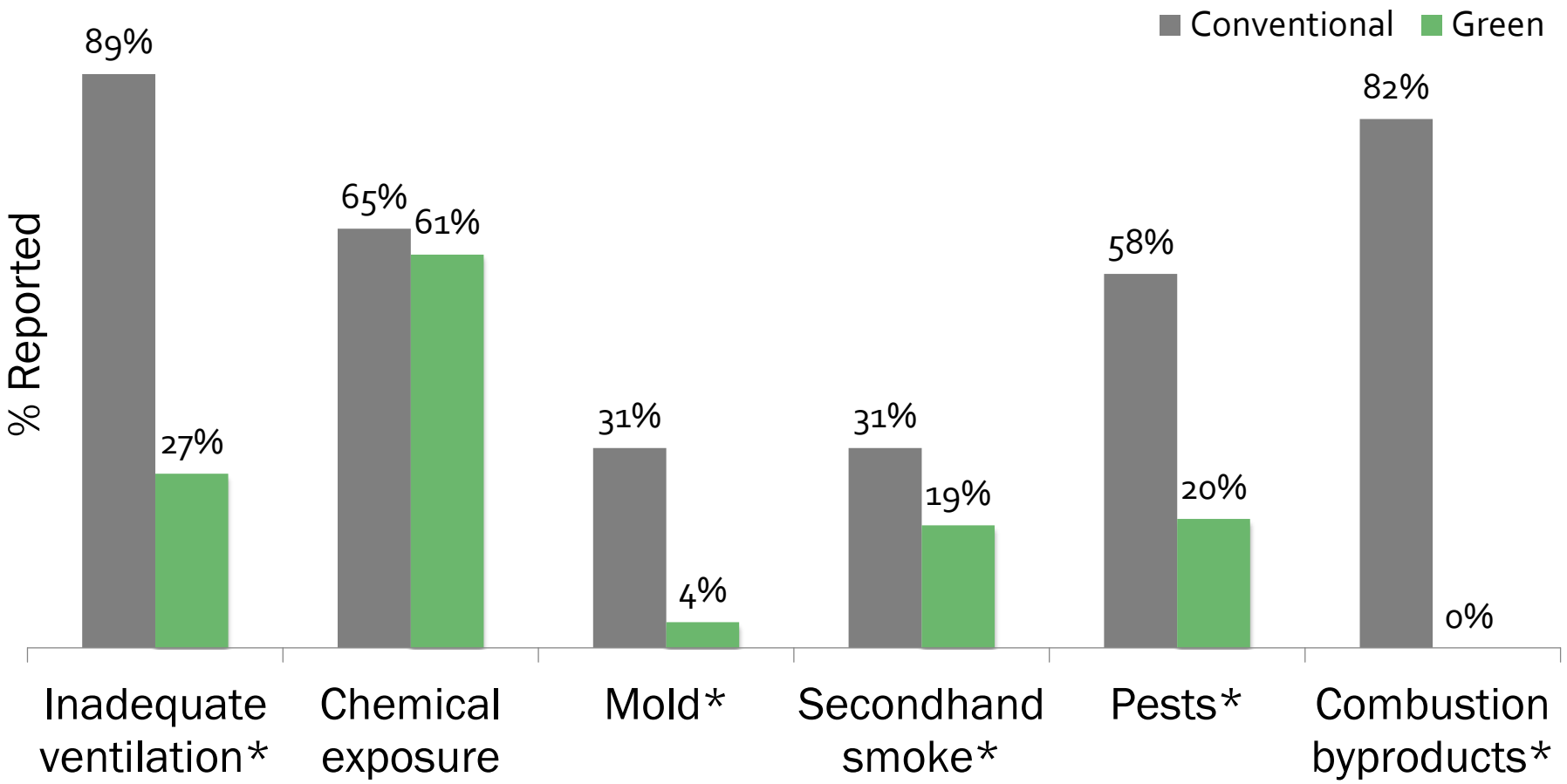
Green Housing – BRIGHT Study

Housing interventions

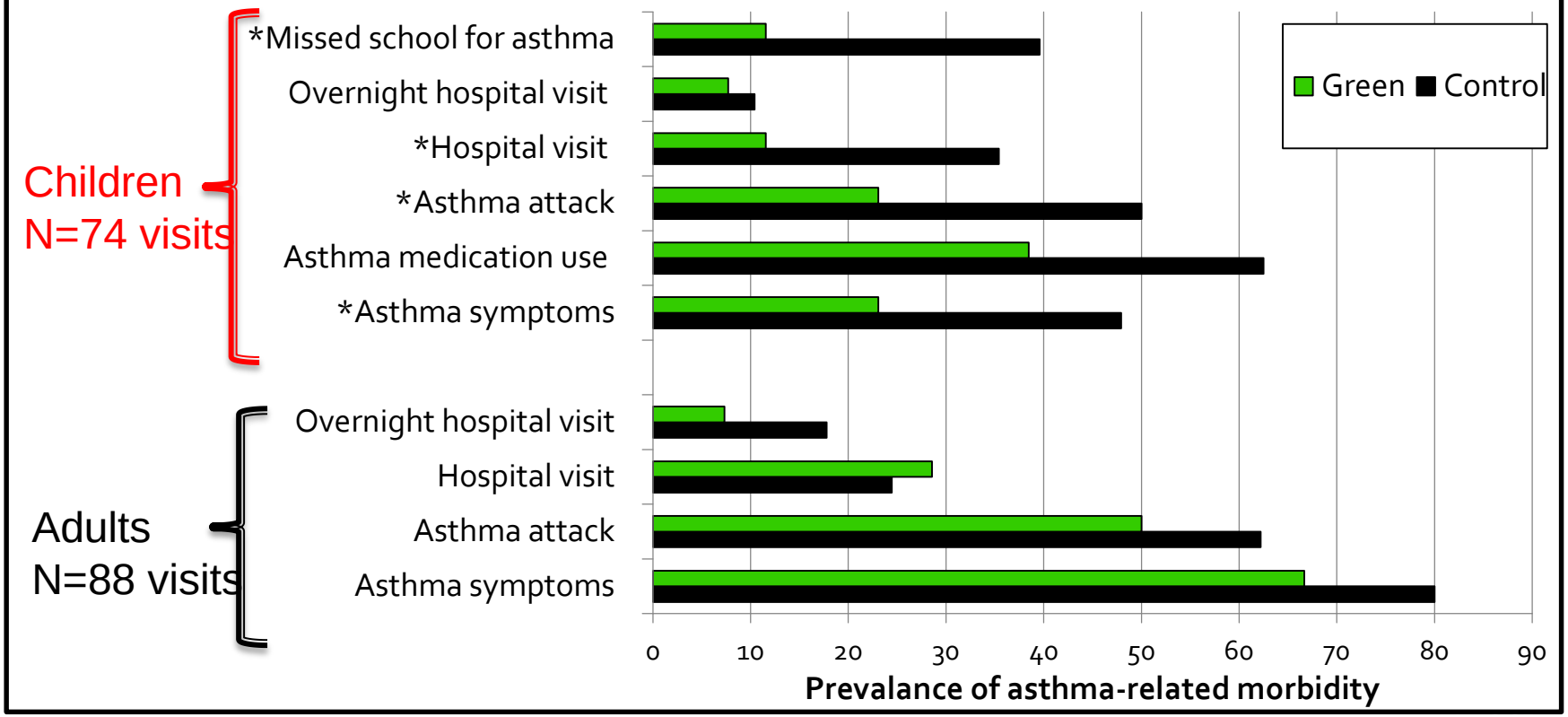
Old Colony (South Boston)



Environmental Exposures



Results: Asthma Morbidity



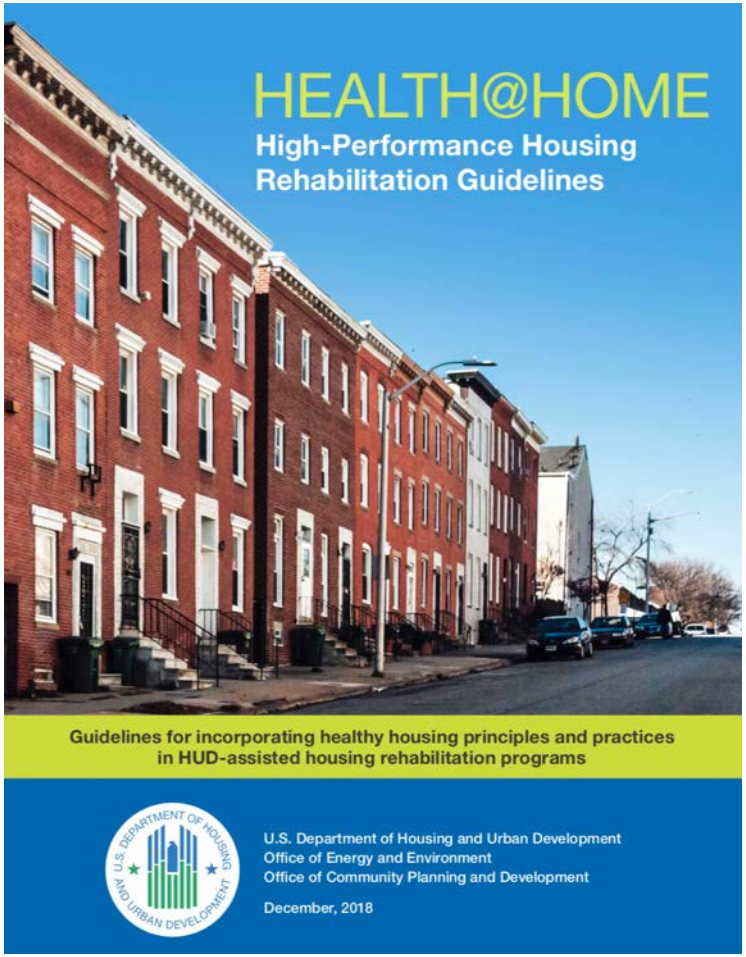
Odds ratios (OR) for **control** children experiencing:

- Asthma symptoms: 2.9 (1.0, 8.3)
- Asthma attack: 3.2 (1.1, 9.1)
- Hospital visit: 4.2 (1.1, 16.6)
- Missed school for asthma: 4.8 (1.4, 16.6)

Technical Assistance Available

- Encourage you to consider incorporating H@H guidelines in your current rehab standards – pick your spots!
- HUD offering a limited amount of "on-call" TA to help review/strengthen your current rehab standards
- If interested contact energyaction@hud.gov; we will send you a TA application form.

Why Health@Home?



- Home conditions can contribute to health issues, including injuries, asthma and respiratory ailments, radon-induced lung cancer, and lead poisoning
- Rehab projects are an opportunity to address housing- based health issues
- Increased attention to indoor environment due to COVID-19
- Health@Home on HUD Exchange: https://www.hudexchange.info/resources/health-at-home/introduction/

Home Conditions Impact Health

A few examples

- **Asthma:** 8% adults and children have asthma AND 20-40% of asthma attacks can be linked to home conditions
- **Radon:** 21,000 annual deaths estimated, over 7 million homes with suspected risks
- **Falls:** 1 in 4 older adults fall each year, over 50% of falls occur in the home.

Health@Home Webinar Series

Overview and Keep it Well Ventilated and Clean	June 18
Keep it Contaminant Free and Pest Free	July 23
Keep it Dry and Safe	September 10
The Energy + Health Equation, Maintenance and Active Design	October 8

All webinars will be from 3- 4pm EST, 12- 1 pm PST

Target Users

Program Managers & Staff: Define local Healthy Housing Program Standard

Case Managers/Intake Staff/Underwriters: Customize local Healthy Housing Program Standard in conjunction with Participating Jurisdiction and subrecipient staff

Construction/Rehabilitation Specialists: Assist in the implementation of local Healthy Housing Standard, determine appropriate treatments to homes, and communicate guidelines to clients.

Guidelines Provide Practical Advice

Organized by nine healthy homes principles

- Rehab guidelines linked to each principle
- Designed to be easily incorporated into existing programs standards or specifications.

U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT

COMMUNITY PLANNING & DEVELOPMENT

Focused on Relevant Building Components

Guidelines also presented by specific home systems

- Site
- Roof/Exterior
- Foundation
- Insulation & Sealing
- Interior

- Electrical
- Plumbing
- Heating & Cooling
- Ventilation
- Appliances

Keep It Well Ventilated - Example

4 KEEP IT WELL VENTILATED

Pollutants can be found in concentrations 2 to 5 times higher indoors than outdoors. Increasing the supply of fresh air can help reduce exposure to indoor asthma triggers, allergens, and other contaminants. Ventilating local sources of moisture or contaminants from showers, combustion from fireplaces, or cooking appliances can also reduce indoor exposures that can increase respiratory and other health risks. Proper sealing of all exterior ventilation points is also essential to preventing the intrusion of exterior pollutants into the building environment.

4.1 BATHROOMS, KITCHENS, AND DRYERS

Ensure bathrooms, kitchens, and clothes dryers exhaust to the exterior and comply with ASHRAE 62.2 2016 requirements.

- Verify that all bathrooms and kitchens have point source exhaust ventilation ducted to the exterior (not to an attic or crawl space) with ductwork conforming to the manufacturer's requirements.
- Vent clothes dryers to the exterior with ductwork that conforms to the manufacturer's requirements and is free from obstructions and lint accumulation. Apply "Minimum Actions" in the "Source Ventilation" section of the EPA Healthy Indoor Environment Protocols for Home Energy Upgrades. See https://www.epa.gov/indoor-air-quality-iaq/healthy-indoor-environment-protocols-home-energy-upgrades.
- Consider installing exhaust fans in bathrooms with switching mechanisms that increase the likelihood of their use, such as switching the fan and light fixture with the same switch or using a humidistat to automate the operation of the fan relative to humidity level.

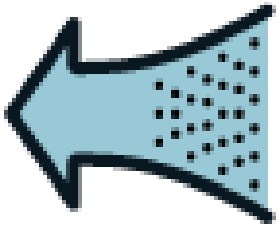
4.2 WHOLE HOUSE VENTILATION

To address significant reductions in air leakage (and subsequent reductions in ventilation) associated with substantial rehabilitation projects and projects with extensive air sealing and insulation work, install ventilation measures that meet ASHRAE Standard 62.2 2016 requirements for whole-building ventilation. Until recently, 62.2 applied only to single-family housing; however, 62.2 now covers all housing.

4.3 HVAC FILTRATION

Ensure that HVAC forced air systems have a leak-free filter housing on the return air ductwork, with a Minimum Efficiency Reporting Value (MERV) 8 filter, and that it is not clogged. Check that a MERV 8 filter is consistent with the manufacturer's instruction.

Rehab Guidelines Highlight Impact



Indoor Air Quality

Other Contaminants

Safety & Falls

Operations & Maintenance

Repair/Replace Recommendations per Building Component

Appliances

11.3 CLOTHES DRYER EXHAUST	Key Principles: Ventilated; Dry
Repair Standard	**Minimum Life: 5 years**

All clothes dryers must be vented to the exterior with smooth metal ductwork and an outlet that seals against air and pest infiltration when the dryer is not operating, without the use of screening (e.g., using a positively sealing flap on the exterior).

Replacement Standard

New dryer ductwork should be smooth metal, either galvanized steel or aluminum, with foil ductwork tape sealing the seams (not duct tape), and exhausted to the exterior with the shortest possible run. It should have an outlet that seals against air and pest infiltration when the dryer is not operating, without the use of screening (e.g., using a positively sealing flap on the exterior). Ductwork installation in unconditioned space should be insulated to a minimum R6.

Post-Rehab O&M Resources

- **Resident Handout**: Green and Healthy Building and Home Products
- **Supplemental Healthy Housing Resident Engagement Resources:** Web links organized by the 8 “Keep it” Principles
- **References**

Keeping a Home Well Ventilated

Nate Price
University of Illinois at Urbana Champaign

Indoor Climate Research & Training
APPLIED RESEARCH INSTITUTE AT ILLINOIS

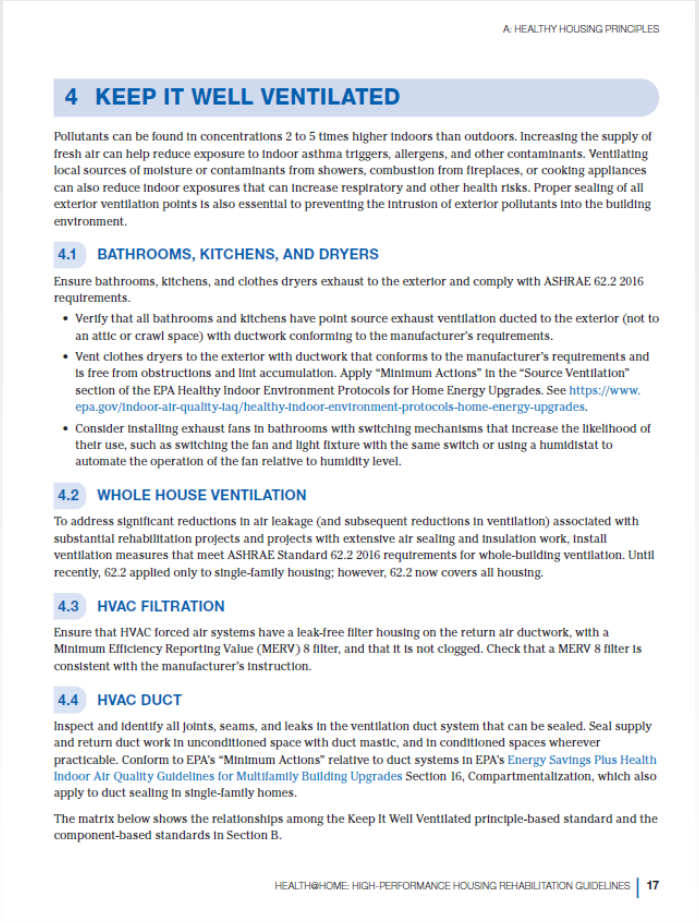
Benefits of Proper Ventilation

- Improved occupant comfort
  - Reduced odors
  - Balanced air distribution
- Reduced energy use
  - Increased air sealing opportunities
  - Improved HVAC performance
- Potential health benefits[1]
  - Reduced concentration of contaminants (formaldehyde, CO_2, VOCs, 1st floor radon)
  - Reduced self-reported health issues (headaches, skin allergies, stress)

[1]Francisco, P. W., Jacobs, D. E., Targos, L., Dixon, S. L., Breysse, J., Rose, W., & Cali, S. (2017). Ventilation, indoor air quality, and health in homes undergoing weatherization. *Indoor Air*, *27*(2), 463–477. https://doi-org.proxy2.library.illinois.edu/10.1111/ina.12325

What is Proper Ventilation?

- Addresses multiple building components
- Requires that retrofits are installed correctly
  - Venting
  - Filters
- Must be evaluated for potential impact on the home
  - Appliance spillage
  - HVAC longevity



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4.4 HVAC DUCT

Inspect and identify all joints, seams, and leaks in the ventilation duct system that can be sealed. Seal supply and return duct work in unconditioned space with duct mastic, and in conditioned spaces wherever practicable. Conform to EPA's "Minimum Actions" relative to duct systems in EPA's Energy Savings Plus Health Indoor Air Quality Guidelines for Multifamily Building Upgrades Section 16, Compartmentalization, which also apply to duct sealing in single-family homes.

The matrix below shows the relationships among the Keep It Well Ventilated principle-based standard and the component-based standards in Section B.

Dryers

- Potential hazards
  - Moisture
  - Fire hazard
  - Carbon Monoxide (gas dryers)
- Things to look for
  - Indoor diffusers
  - Clogged ducts/terminations
  - Broken dampers

HVAC Filtration

- Reduces airborne contaminants
  - Pollen, pet dander, dust
  - Fine particles[2]
    - 6% reduction with MERV-6
    - 39% reduction with MERV-14
- Which filter to use?
  - Cost concerns
  - Increased maintenance
  - Increased wear on furnace motor
  - Manufacturer recommendations

[2]**Logue, J.M., Lunden, M.M., Singer, B.C. Development and application of a physics-based simulation model to investigate residential PM2.5 composition and size distribution across the US (2014)** ***Indoor Air 2014 - 13th International Conference on Indoor Air Quality and Climate*****, pp. 714-721**

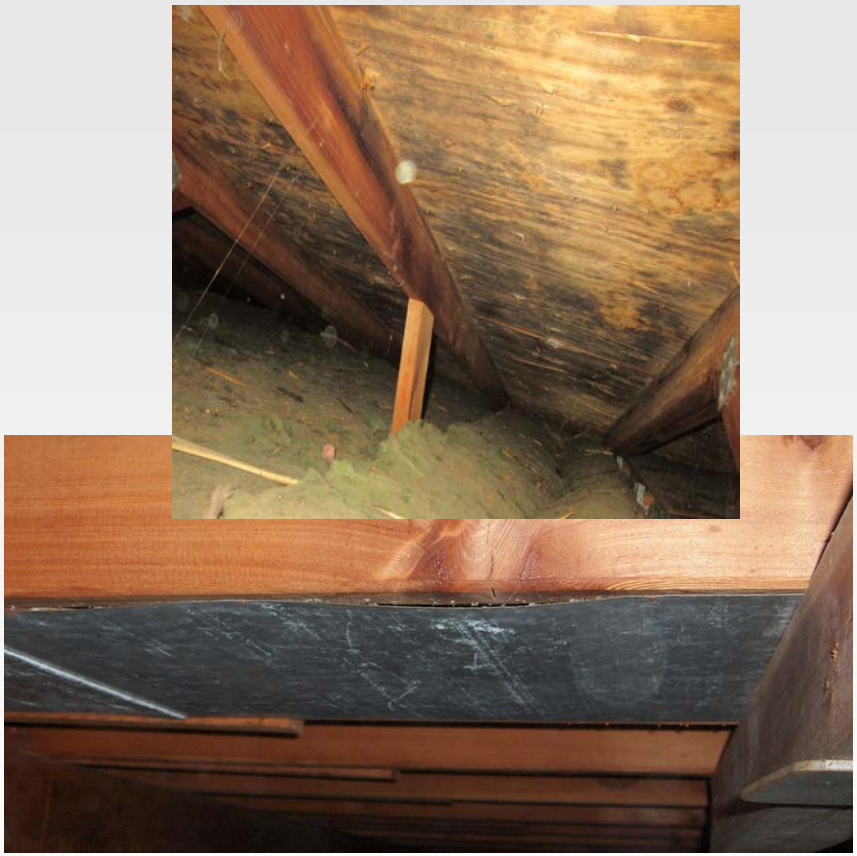
HVAC Ducts

Duct Sealing

- Improves efficiency
- Prevents structural damage
- Can reduce exposure to contaminants

Duct Cleaning?

- Only when major problems occur
  - Pests
  - Mold/Water Damage
- Can increase exposure to contaminants[3]



[3]Zuraimi M. S. Is ventilation duct cleaning useful? A review of the scientific evidence (2010) *Indoor Air, 20*, 445-457.

Bathroom Ventilation[4]

Local Exhaust

- Installed in each full bathroom
  - Not required in ½ baths
- Minimum airflow of 50 CFM
- Sound rating of 3 sones or less
- Vented to the exterior
- Operated as needed

Whole House Exhaust

- Can be used in lieu of on-demand bath fan to satisfy ASHRAE requirements
- Airflow dependent on household
  - Number of residents
  - Building tightness
  - Existing deficits
- Sound rating of no more than 1 sone
- Vented to the exterior
- Continuously or intermittently operated

[4]ASHRAE. 2016. *ASHRAE Standard 62.2: Ventilation and Acceptable Indoor Air Quality in Residential Buildings.*

Bathroom Ventilation

Local Exhaust Options

- Acceptable fans are made by most manufacturers
  - Often stocked by big box stores
  - Typically advertise “ASHRAE Compliant”
  - Verify flow and noise ratings
  - $125 to $200
- Controls
  - ON/OFF client controlled ($15)
  - Passive humidistat switch ($40 to $100)

Standard retail pricing not including venting materials, electrical, or labor

Bathroom Ventilation

Whole House Exhaust Options

- Fewer manufacturers depending on what options you need
  - Must be rated for continuous use
  - May or may not include necessary controls
  - $150 to $300
- Controls
  - Intermittent switch ($50 to $90)
  - Continuous flow switch (Usually included)
    - Motion detector ($25-$50)

Standard retail pricing not including venting materials, electrical, or labor

Kitchen Ventilation[4]

Requirements

- Must be installed in all kitchens
- Minimum airflow of 100 CFM
- Sound rating of no more than 3 sones
- Vented to the exterior

Installation Tips

- Range hoods that conform to standards will be more expensive ($100 and up)
- Proper venting may require additional consideration
  - Is it possible?
  - Additional expense
  - Client preference

[4]**ASHRAE. 2016.** ***ASHRAE Standard 62.2: Ventilation and Acceptable Indoor Air Quality in Residential Buildings.***

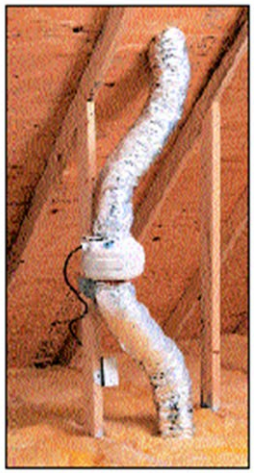
Ventilation Ductwork

- Should be correctly sized to accommodate airflow
- Ducts should be as short as possible and avoid sharp turns
- Must be ran to an appropriate exterior termination
- Should be insulated outside conditioned space

Additional Options

Continuous Flow Range Hoods

Through Wall Fans



In-Line Exhaust Fans

HRV and ERV Systems

Balanced Ventilation Systems

Keep it Clean

Why? Cleanable surfaces make it easier for residents to reduce exposure to contaminants (including lead dust), allergens, pest droppings, pesticides, and eliminate pest harborage. For example, exposure to dust mites and pest droppings can increase asthma risks.

Appendix A provides guidance on cleaning practices, using green products.

Keep it Clean: Rehab Guidelines

Rehab:

- Use durable and cleanable surfaces in high use areas, e.g., floors, entry ways, countertops - e.g., nalfa.com rating laminate flooring.
- Use products with lower VOC emissions e.g., FloorScore.

Job site cleaning: Vacuum at the end of the work day, HEPA vacuums are preferred.

O&M: Keep countertops in good shape, cleanable. More information on cleaning in future session.

GREAT Case Study

HUD Health@Home Webinar: Keeping a Home Ventilated and Clean

June 18, 2020

Orness photo: Blumentals Architects

National Center for HEALTHY HOUSING

Southwest Minnesota Housing Partnership

CSBR Center for Sustainable Building Research

City of Mankato

Case Western Reserve University EST. 1826

Questions & Solutions Engineering

Older Adults Susceptible to Housing Conditions

- Spend 80% to 90% time indoors at home
- More likely to live in older homes:
  - Older heating/cooling systems
  - Damp, noisy, stuffy, dark
  - Built prior to ADA, Fair Housing, or visitability legislation

National Center for HEALTHY HOUSING

PRE-RENOVATION

Hydronic heating system

Individual through-wall ACs

Exhaust-only ventilation strategy

No mechanical fresh air ventilation

Operable windows

POST-RENOVATION

Geothermal heating & cooling

Apt heat pumps

Fresh air ducted to apartments

Continuous bathroom exhaust

Dryers vented to outside

No smoking policy

Source: Blumental Architects

National Center for HEALTHY HOUSING

National Center for
HEALTHY HOUSING

Building Performance

- Fresh Air Ventilation
  - 1-BR: 53 cfm (ASHRAE 20 cfm)
  - 2-BR: 23 cfm (ASHRAE 45 cfm)
- Bathroom Exhaust Testing

  29 cfm (ASHRAE 25 cfm)
- Energy Use

  44% reduction in energy use

National Center for HEALTHY HOUSING

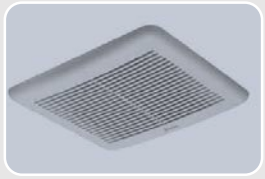
Environmental Monitoring

- Temperature
  Met summer & winter design criteria, consistent
- CO_2 levels
  Significantly improved
- Indoor air quality
  No significant change in TVOC, formaldehyde, most allergens

National Center for HEALTHY HOUSING

Housing Condition

Kitchen fan use increased



Bathroom fan use increased

Water/dampness reports decreased

Tobacco smoke inside home decreased

National Center for HEALTHY HOUSING

Health Outcomes

- Mental Health
  - Significant improvement
- Physical Health
  - Fewer falls
  - Improved general physical health

National Center for HEALTHY HOUSING

Conclusions

- Greatly improved building and apartments
- Improved mental health and reduced falls
- Substantially less indoor smoking

National Center for HEALTHY HOUSING

Questions?

For any questions, please type them into the "Q&A" box in the lower right

We will answer as many as we have time to answer

Website and Next Steps

A recording of this (and all future presentations) will be available on the Health@Home website:

https://www.hudexchange.info/resources/health-at-home/introduction/

Next Session:

Keep it Contaminant and Pest Free – **July 23, 3:00 – 4:00 PM ET**

For questions or information contact:
Lael Holton
communitycompasstraining@aecom.com

Poll Question #2

What are the Healthy Housing issues that you are most concerned about? (Pick 3)

- Ventilation
- Pest control
- Mold and moisture
- Indoor Air Quality generally
- Lead
- Radon
- Contaminants
- Safety and falls
- Resident involvement and engagement
- Covid-19 related cleaning or education

Poll Question #3

What are the top two barriers to implementing HH measures? (Choose 2)

- Financing
- Good sources of Information
- Competing priorities
- Additional costs
- Lack of organizational support
- Missing technical knowledge