

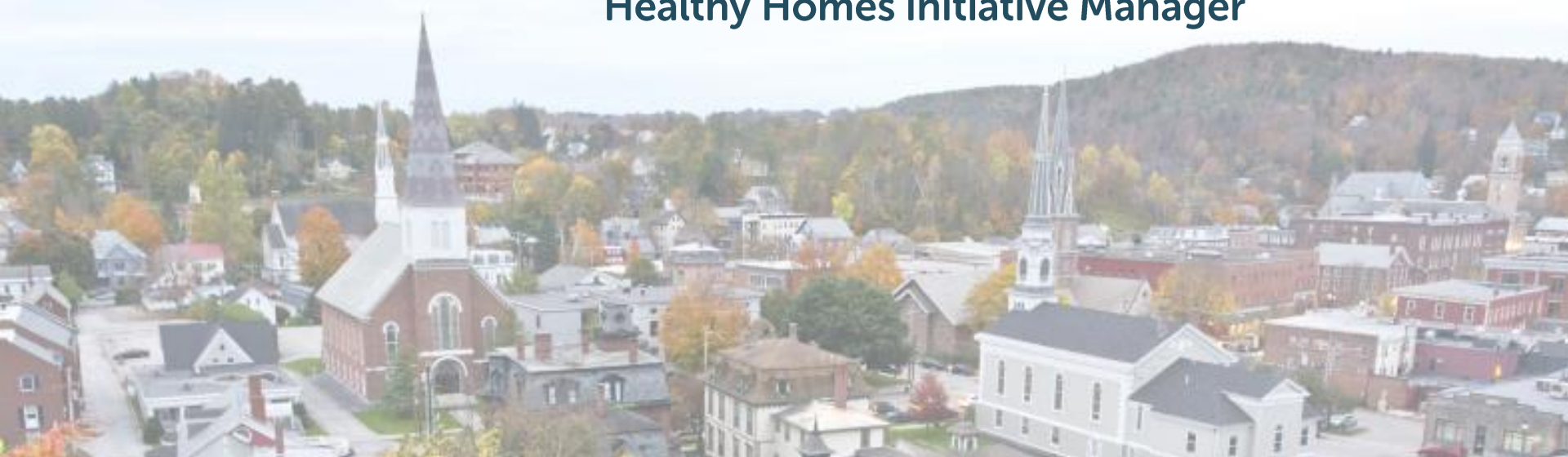


OCTOBER 23, 2018

# Healthy Homes Vermont: A new prescription for wellbeing

Laura Capps

Healthy Homes Initiative Manager





**Q:**

**What is your interest in healthy homes?**

**What percentage of time do you spend indoors?**



# Introduction

- About me
- Overlap with your interest



# Agenda

- A. Is there a problem?
- B. The house as a system
- C. Eight principles of a healthy home
- D. Energy efficiency and healthy homes
- E. How Efficiency Vermont can help
- F. Call to action



# Efficiency Vermont

- Nation's first Efficiency Utility (2000)
- Serve every ratepayer
  - From snowmaking and cheese caves to municipal lighting and high performance homes
- No-cost engineering and education services





# A. Is there a problem?





**Q:**

**What are some known  
health hazards in homes?**





# Asthma



Image: [www.cdc.gov](http://www.cdc.gov)



# Lead paint



Image: [www.cdc.gov](http://www.cdc.gov)



# Asbestos





# Asbestos





# Radon

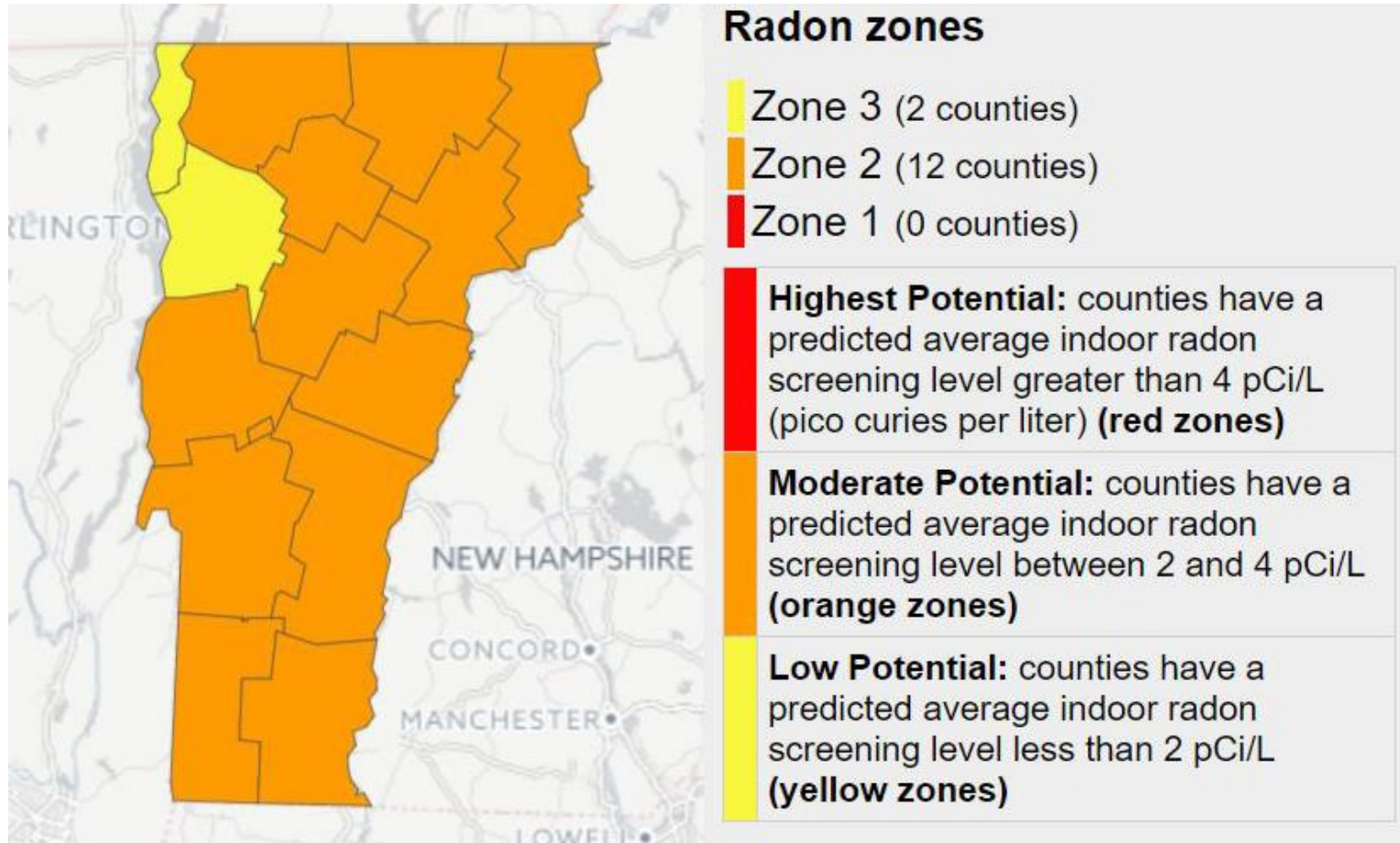


Image: *modified from [www.epa.gov](http://www.epa.gov)*



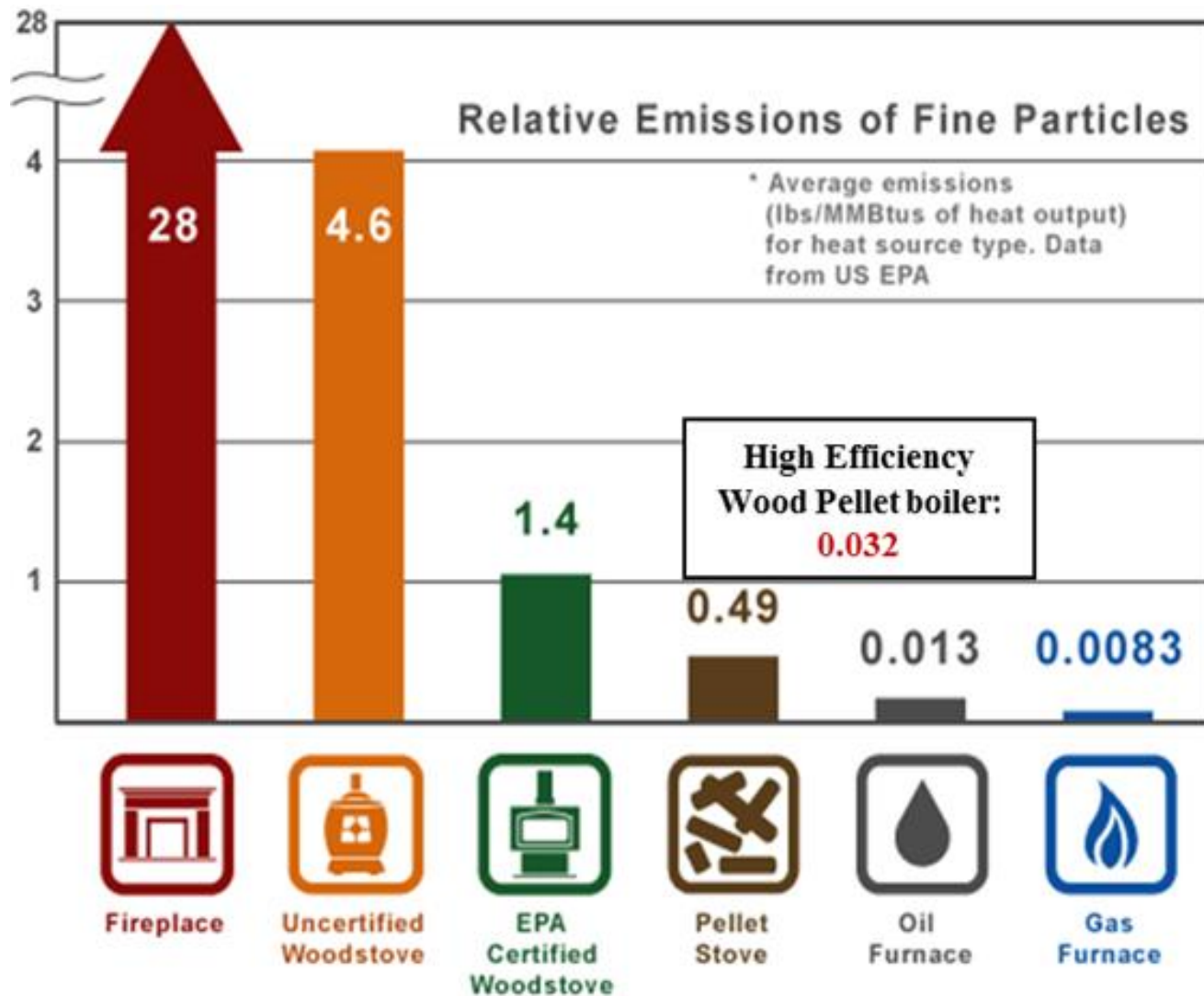
# Combustion equipment



Image: [www.cdc.gov](http://www.cdc.gov)



# Particulate emissions





**But there's more...**  
**(that we're still learning about)**





# Research: 1

- Body burden: The pollution in newborns. Environmental Working Group, July 14, 2005. <http://www.ewg.org/research/body-burden-pollution-newborns>





# Research: 2

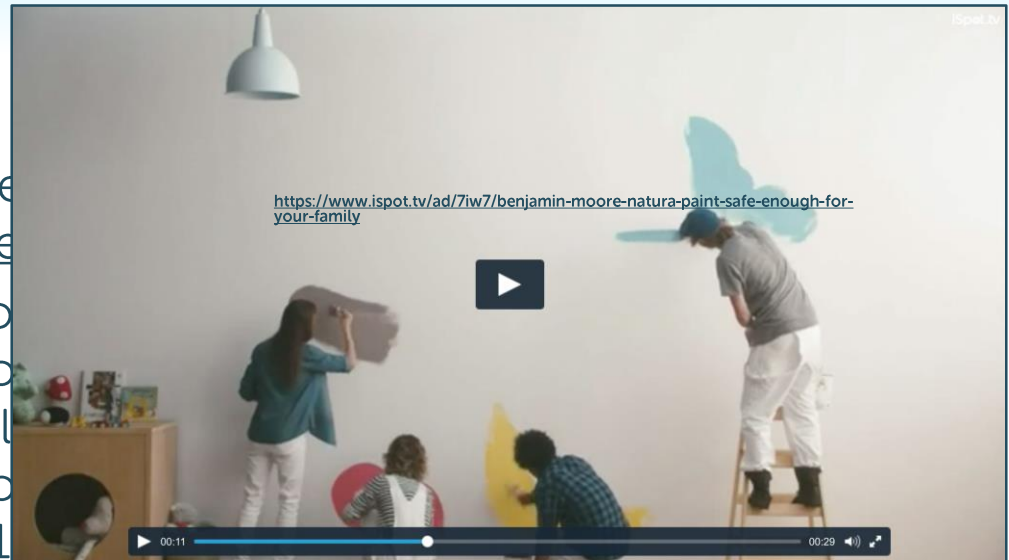
- Body burden: The pollution in newborns. Environmental Working Group, July 14, 2005. <http://www.ewg.org/research/body-burden-pollution-newborns>
- Associations of cognitive function scores with carbon dioxide, ventilation, and volatile organic compound exposures in office workers: a controlled exposure study of green and conventional office environments. Allen JG, MacNaughton P, Satish U, Santanam S, Vallarino J, Spengler JD. 2016. Environ Health Perspect 124:805–812. DOI: [10.1289/ehp.1510037](https://doi.org/10.1289/ehp.1510037)





# Research: 3

- Body burden: The pollution in ne 14, 2005. <http://www.ewg.org/re>
- Associations of cognitive function volatile organic compound expo study of green and conventional P, Satish U, Santanam S, Vallarino Perspect 124:805–812. DOI: [10.1299](https://doi.org/10.1299)
- Common Household Chemicals and the Allergy Risks in Pre-School Age Children. Choi H, Schmidbauer N, Sundell J, Hasselgren M, Spengler J, et al. (2010). PLoS ONE 5(10): e13423. DOI: [10.1371/journal.pone.0013423](https://doi.org/10.1371/journal.pone.0013423)





# Research: 4

- Body burden: The po 14, 2005. <http://www>
- Associations of cogn volatile organic com study of green and c P, Satish U, Santanam Perspect 124:805–8
- Common Household Children. Choi H, Sc (2010). PLoS ONE 5(10): e15425. DOI: [10.1371/journal.pone.0015425](https://doi.org/10.1371/journal.pone.0015425)
- Cancer incidence among male Massachusetts firefighters, 1987–2003. Kang, Dongmug, et al. American journal of industrial medicine 51.5 (2008): 329-335. DOI: [10.1002/ajim.20549](https://doi.org/10.1002/ajim.20549)





# Research: 5

- Body burden: 14, 2005. <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1471111/>
- Associations of volatile organic compounds in indoor air with health outcomes: a study of green buildings. P, Satish U, Sarma S. Perspect 124:8
- Common Household Chemicals in Children. Choi J, et al. (2010). PLoS ONE 5(12):1-6. DOI: 10.1371/journal.pone.0011111
- Cancer incidence in children and adolescents: a study of environmental factors. Dongmug, et al. DOI: 10.1002/ajim.10023



## PHthalates

Used to make plastic softer and more flexible, especially vinyl (PVC) materials such as vinyl flooring, vinyl blinds, and food packaging. They may also be found in personal care products and fragranced products.

*Total number of chemicals from this class in our study: 8*

*Example chemicals: DEHP (di-2-ethylhexyl phthalate); BBzP (butyl benzyl phthalate)*



## ENVIRONMENTAL PHENOLS

Used as preservatives in personal care products like shampoo, lotions, cosmetics; as part of plastic materials such as reusable water bottles and in cleaning products such as detergents.

*Total number of chemicals from this class in our study: 10*

*Example chemicals: MeP (methyl paraben), BPA (bisphenol A)*



## FLAME RETARDANTS

Used in furniture, baby products, electronics and building insulation in order to meet flammability standards.

*Total number of chemicals from this class in our study: 15*

*Example chemicals: TCEP (tris (2-chloroethyl) phosphate); BEH-TEBP (a tetrabromophthalate)*



## FRAGRANCES

Used as scent in a wide variety of products including personal care products, cleaning products, perfumes, candles, and air fresheners.

*Total number of chemicals from this class in our study: 1*

*Example chemical: HHCB (Galaxolide)*



## FLUORINATED CHEMICALS

Also known as PFCs or PFASs, these chemicals are used as stain and water repellent treatments for upholstery, carpets, clothes and shoes; in non-stick cookware; and to make food papers like pizza boxes and popcorn bags grease proof.

*Total number of chemicals from this class in our study: 11*

*Example chemicals: PFOA (perfluorooctanoic acid); PFOS (perfluorooctane sulfonic acid)*

- Consumer product chemicals in indoor dust: A quantitative meta-analysis of U.S. studies. Mitro, S.D. et al. Environmental Science & Technology. Article ASAP. DOI: [10.1021/acs.est.6b02023](https://doi.org/10.1021/acs.est.6b02023)



# The link between homes and health

*"The connection between health and dwelling is one of the most important that exists."*

Florence Nightingale



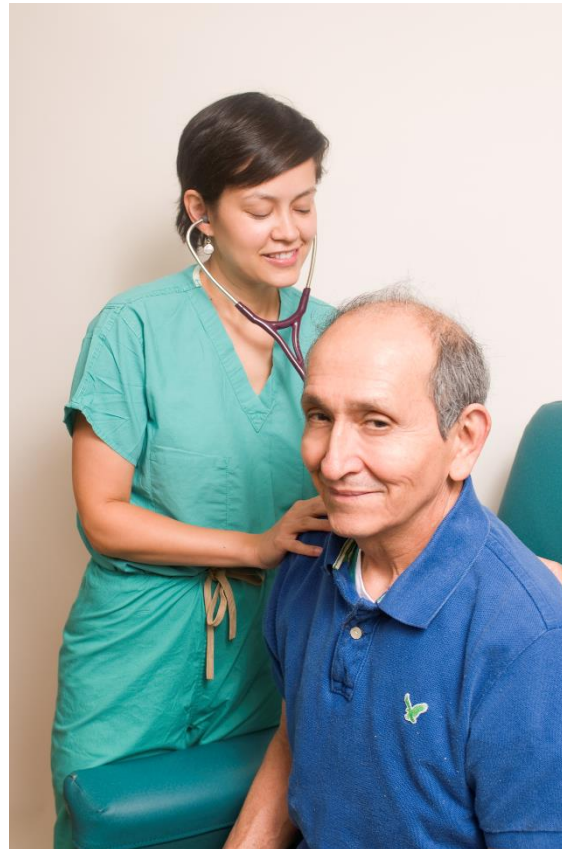
# Conditions and potential remedies

Presenting Health Condition	Source of Condition	Healthy Home Remedy
"Flu-like" symptoms, headache, dizziness, weakness/fatigue	Carbon monoxide from combustion equipment/wood stoves	Equipment repair, pressure balancing of home
Difficulty breathing, eye irritation, skin reaction, headache, nausea, nose and throat discomfort	Chemical/VOC exposure from cleaning supplies, building materials, candles, etc.	<b>Properly store household chemicals, remove/replace building materials, ventilation</b>
Joint, muscle and abdominal pain, nervous system and learning disorders, hypertension	Lead paint (pre-1978 homes), plumbing	<b>Lead abatement (encapsulation or removal)</b>
Allergies, asthma, sinus infection	Excessive relative humidity/moisture from condensation, plumbing leaks, poor site drainage	Air sealing, insulation, ventilation, repair leaks and remedy drainage problems
Allergies, asthma, chronic respiratory illness	Excessive dust, poor ventilation, old/dirty carpets in sleeping and living areas	Air sealing, ventilation, carpet removal
Bacterial and viral infections	Pests	<b>Seal leaks in building, improve insulation</b>
Respiratory disease, cancer	Radon and soil gases	<b>Air sealing, remediation</b>
Hypertension, respiratory and cardiovascular disease	Smoke and emissions from wood stoves and fireplaces	<b>Homeowner education, equipment repair/upgrade, ventilation</b>
Heat stroke, hypothermia, chronic chill, COPD, poor mental health	Poor insulation, drafts, faulty heating and cooling equipment	<b>Air sealing, improve insulation, equipment repair/upgrade</b>
Shortness of breath, chest pain, fatigue, persistent dry cough, enlarged fingertips	Friable asbestos from insulation or other building materials	Asbestos abatement (encapsulation or removal)



# Who's most at risk?

- Children
- Seniors
- Low-income families



Images: [www.cdc.gov](http://www.cdc.gov)





## B. The house as a system

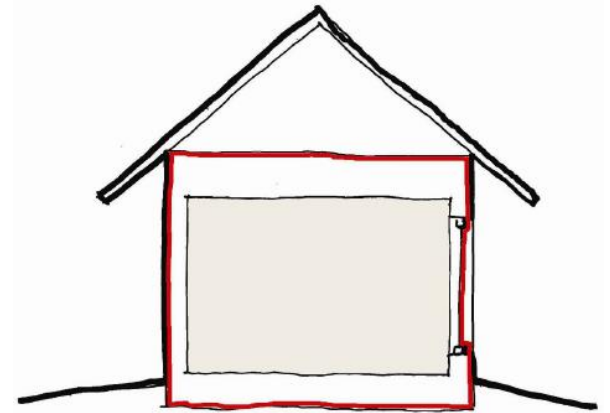




# Make it airtight

January in Vermont

- 3 sweaters, but nothing to keep out wind
- Are you warm outdoors?

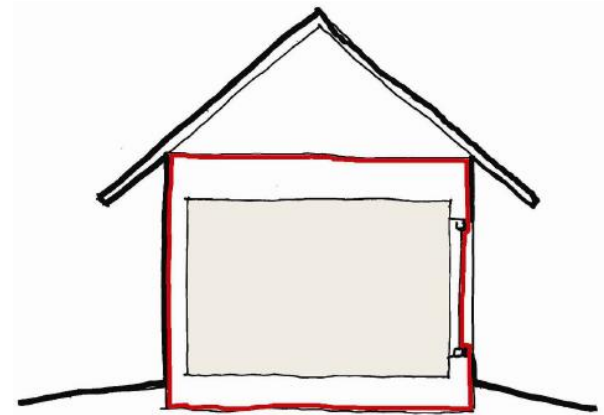




# Insulate it

January in Vermont

- Thin jacket to keep out wind and moisture, but no fleece, wool, or down
- Are you warm outdoors?

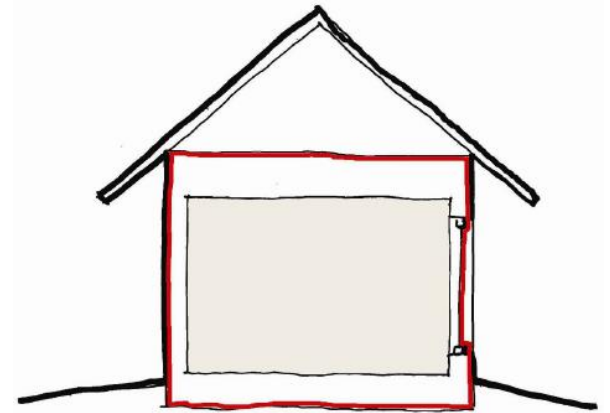




# Control moisture

January in Vermont

- 3 sweaters and a jacket, but the sweaters are wet or damp
- Are you warm outdoors?





# A good combination

- (1) Airtight
- (2) Insulated
- (3) Dry



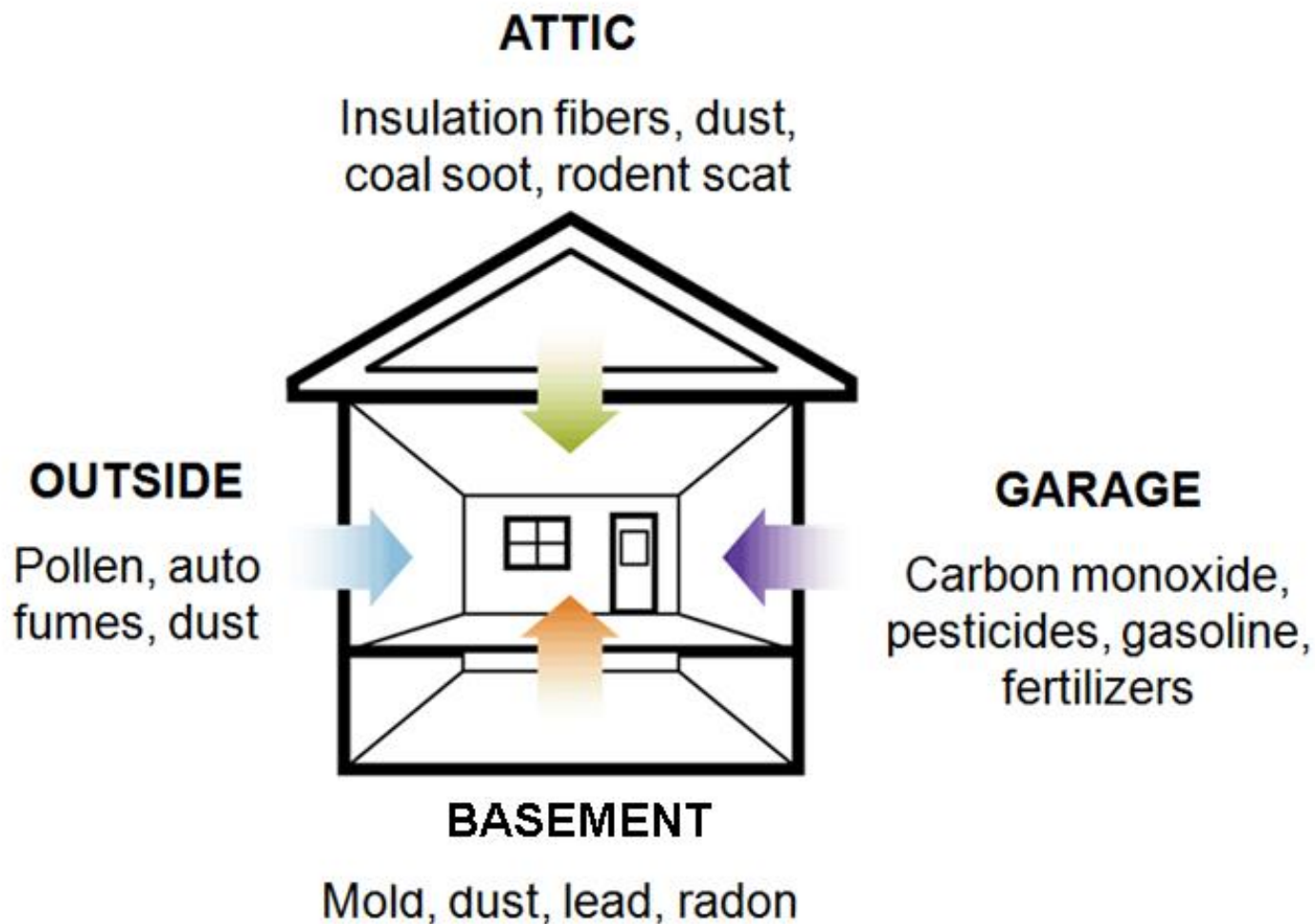


# Heat, air, and moisture





# Indoor air quality (IAQ)





# C. Eight principles of healthy homes



# The healthy home approach

A coordinated, comprehensive, and holistic approach to preventing diseases and injuries that result from housing-related hazards and deficiencies.

*Centers for Disease Control and Prevention*



# Principles of healthy housing

## 8 Healthy Homes Principles



Dry



Pest-Free



Clean



Contaminant  
-Free



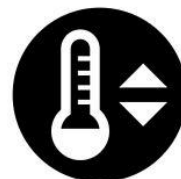
Safe



Maintained



Well  
Ventilated



Thermally  
Controlled

Principles:



U.S. Department of Housing and Urban Development

Graphic:





# 1. Keep it dry



Image: [www.fda.gov](http://www.fda.gov)



Image: [www.cdc.gov](http://www.cdc.gov)



## 2. Keep it clean



Image: [www.cdc.gov](http://www.cdc.gov)



### 3. Keep it safe



Image: [www.usfa.fema.gov](http://www.usfa.fema.gov)



## 4. Keep it well-ventilated



Image: [www.usfa.fema.gov](http://www.usfa.fema.gov)



**Q:**

**How is your home  
ventilated?**

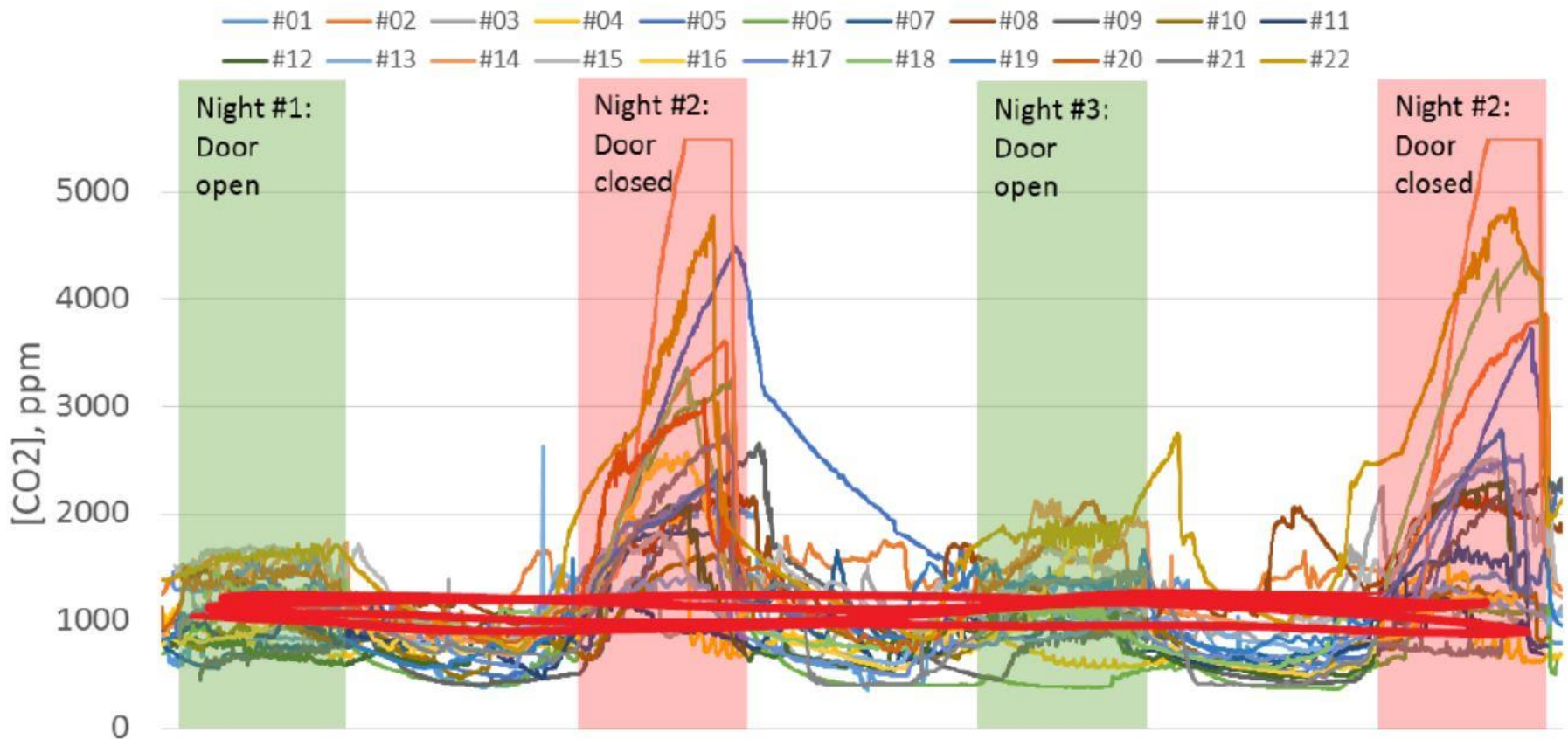
**What about this room?**



# Whole-house ventilation

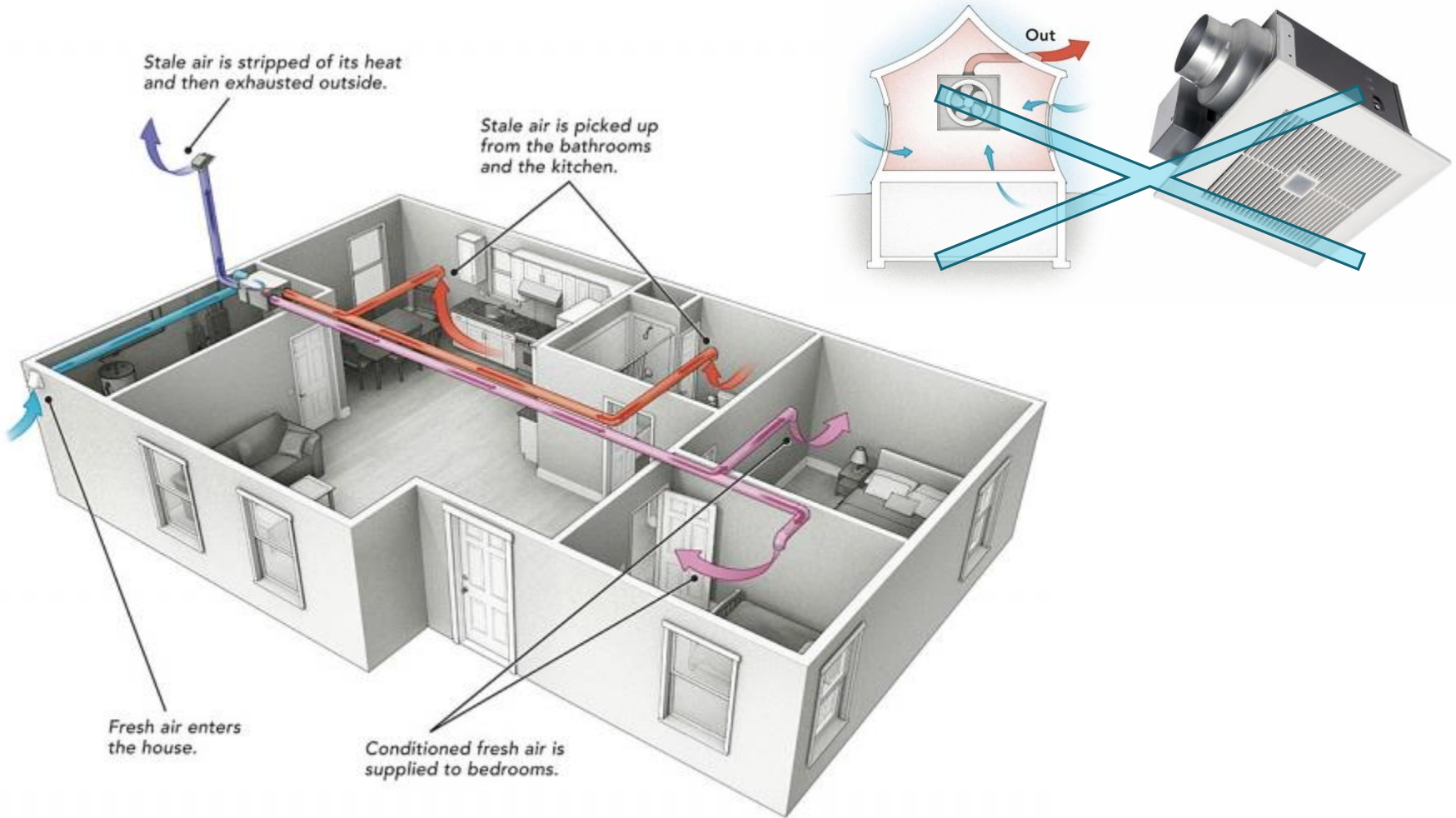
(more than just bath fans!)

CO<sub>2</sub> concentrations vs. time for 22 homes





# Ventilation done well



Images: [www.greenbuildingadvisor.com/articles/dept/green-building-blog/breathe-easy-balanced-ventilation](http://www.greenbuildingadvisor.com/articles/dept/green-building-blog/breathe-easy-balanced-ventilation)



## 5. Keep it pest-free



Image: [www.cdc.gov](http://www.cdc.gov)

Image: [www.epa.gov](http://www.epa.gov)



## 6. Keep it contaminant-free



Image: [www.cdc.gov](http://www.cdc.gov)



# 7. Keep it well-maintained



Image: [www.energy.gov](http://www.energy.gov)



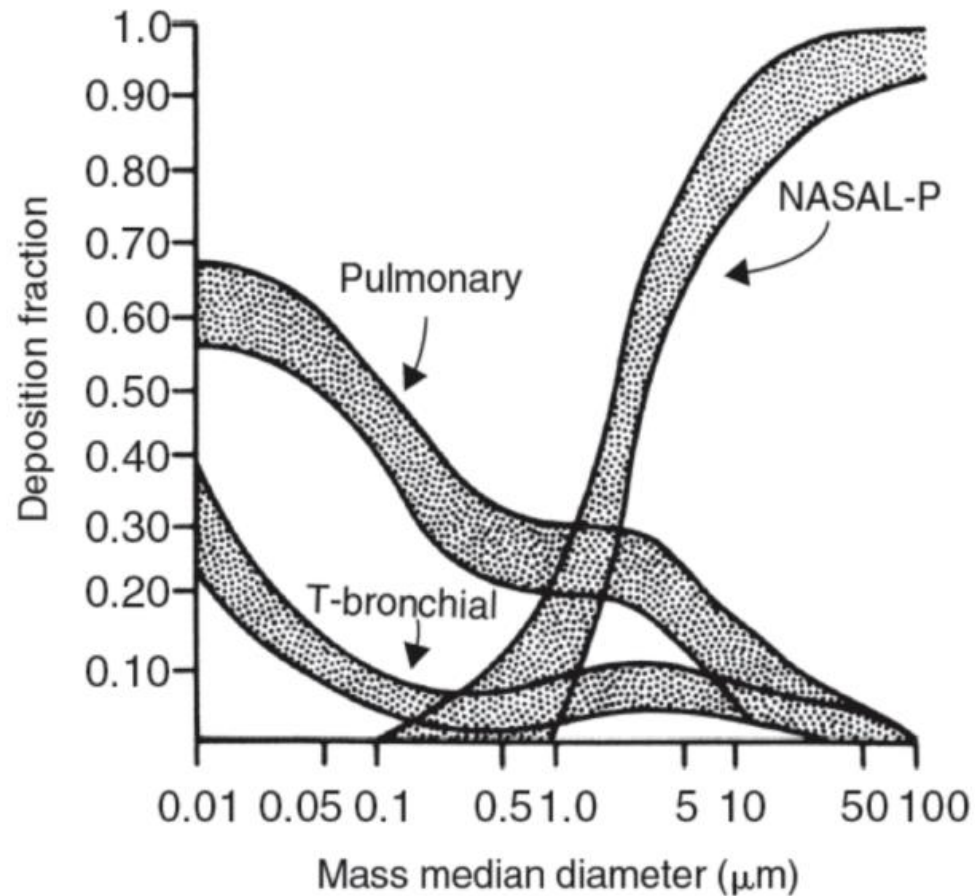
Image: [www.energy.gov](http://www.energy.gov)

Image: [www.usfa.fema.gov](http://www.usfa.fema.gov)





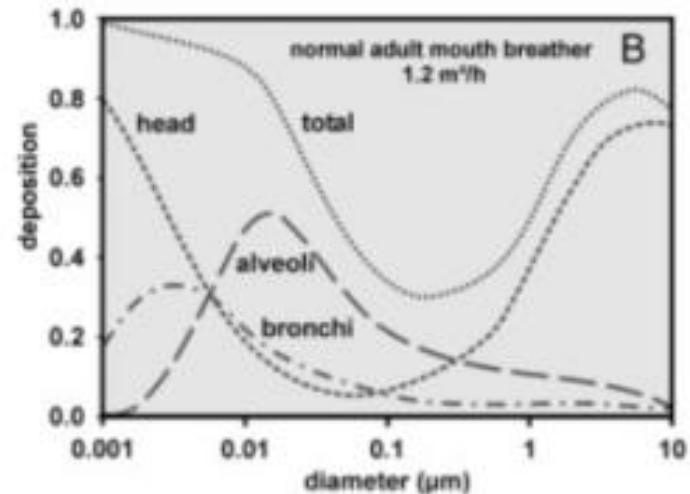
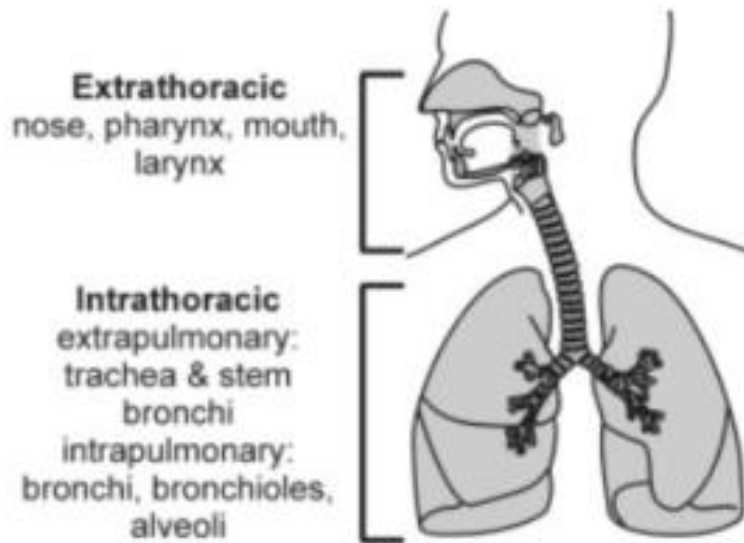
# Human filters



Task Group on Lung Dynamics (1996). *Health Physics*. 12: 173.



# Human filters, cont.



Geiser and Kreyling, *Deposition and biokinetics of inhaled nanoparticles*, 2010, DOI: 10.1186/1743-8977-7-2

MERV Filter Models, National Air Filtration Association, <https://www.nafahq.org/merv-filter-models/>



# Store-bought filters (cheaper)

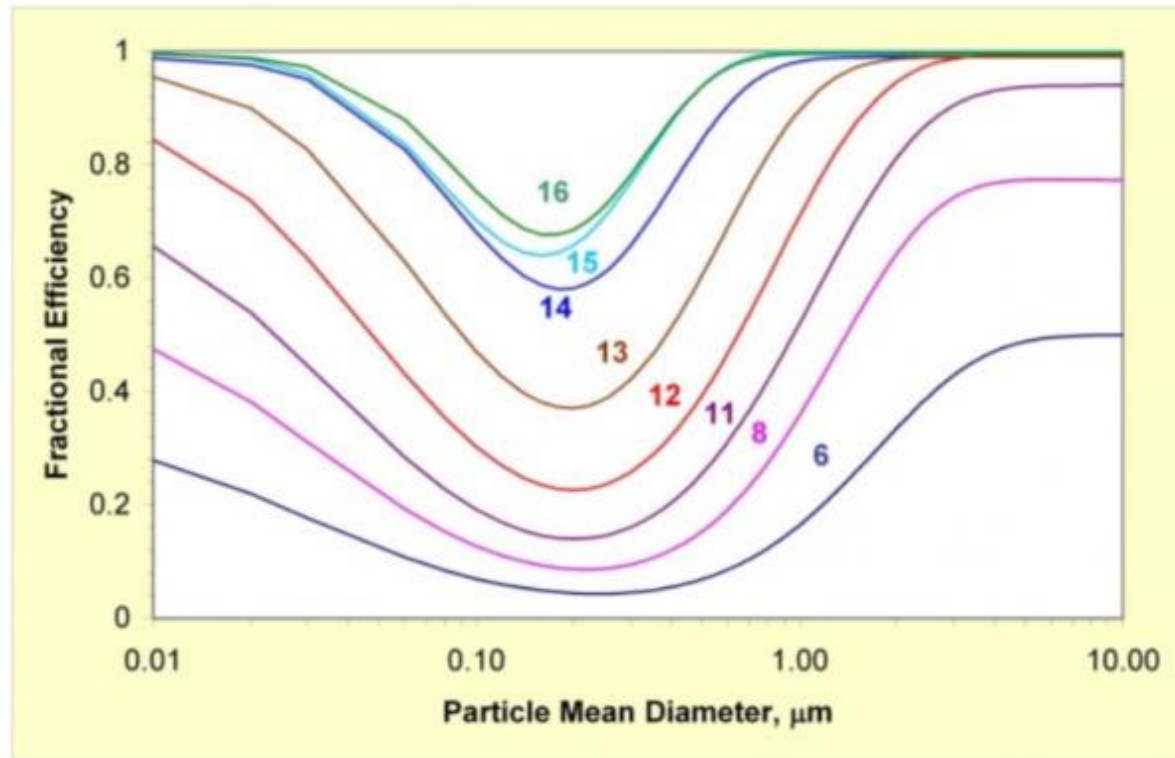
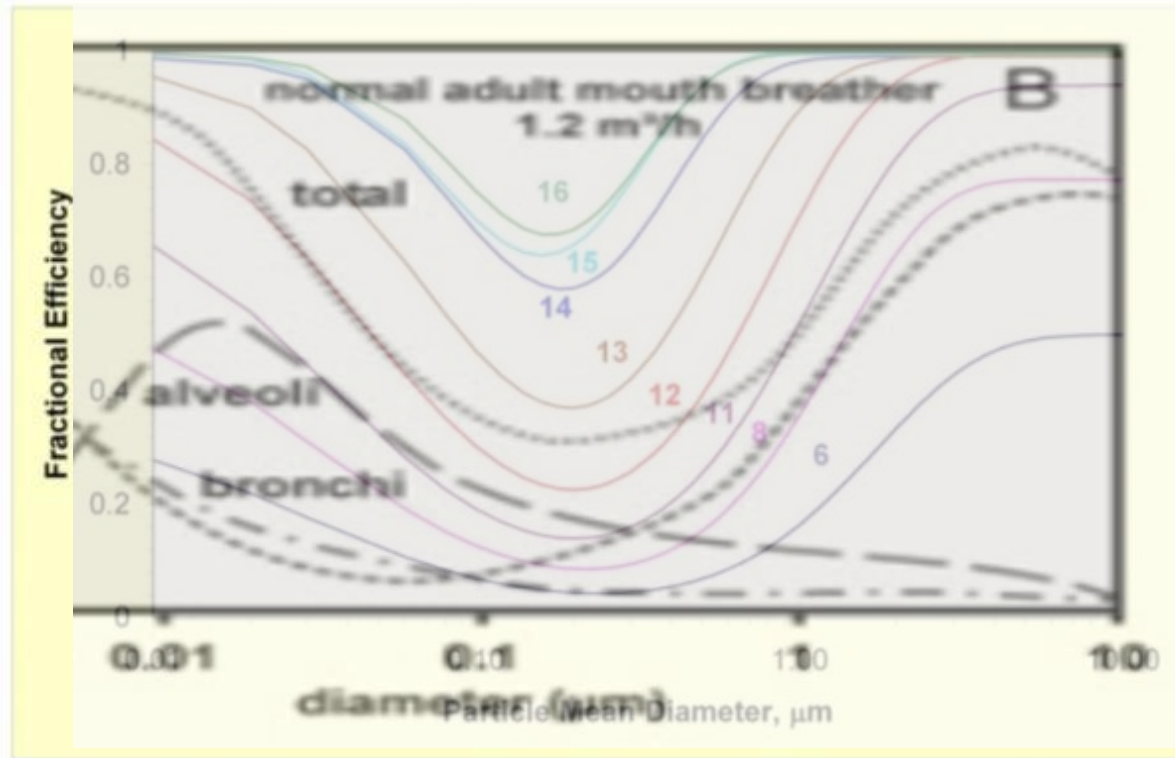


Figure 4 Composite of all MERV filter models, based on initial conditions.

MERV Filter Models, National Air Filtration Association, <https://www.nafahq.org/merv-filter-models/>



# Human vs. store-bought





## 8. Keep it thermally controlled





# 8 Healthy Homes Principles



Dry



Pest-Free



Clean



Contaminant  
-Free



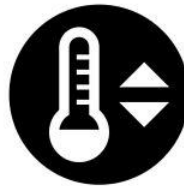
Safe



Maintained



Well  
Ventilated



Thermally  
Controlled

Principles:



U.S. Department of Housing and Urban Development

Graphic:



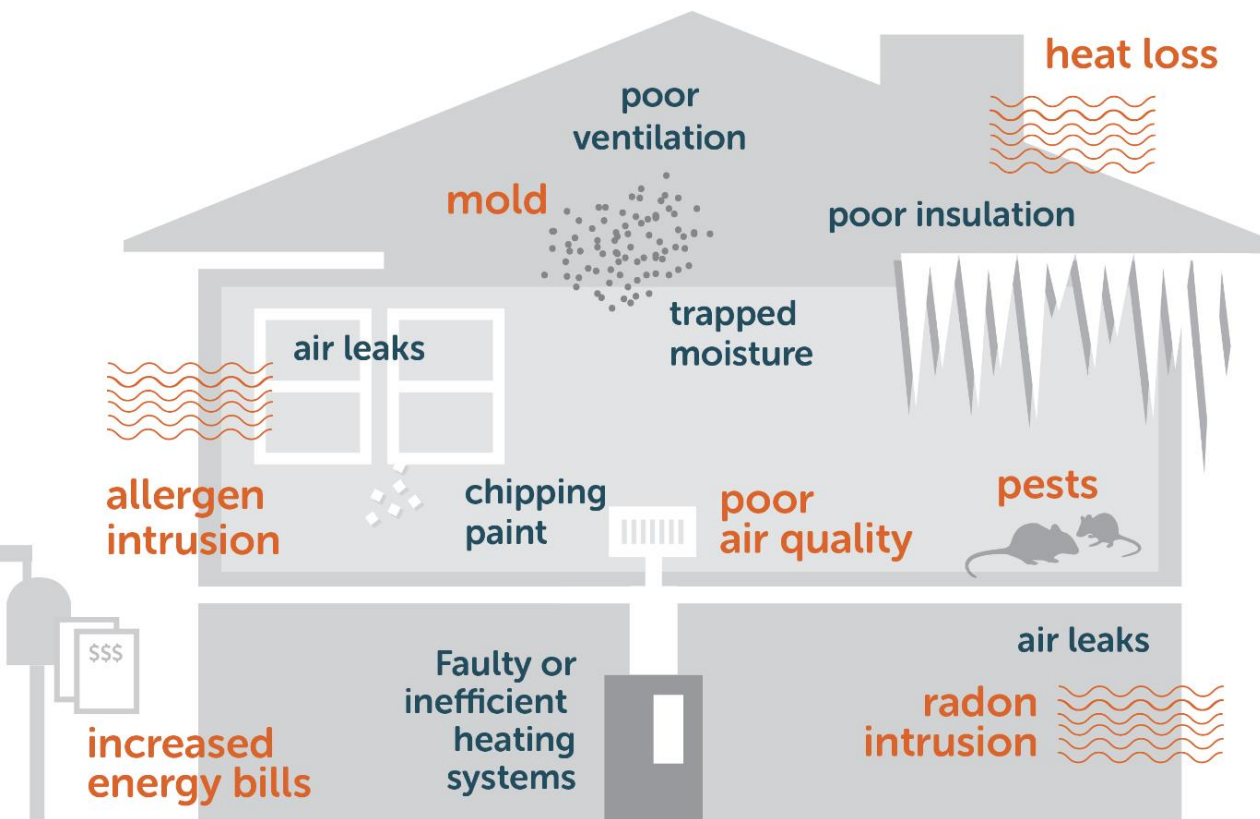


# D. Energy efficiency and healthy homes





# Efficiency + Health:



Chronic  
Asthma



Mental  
Stress



Chronic  
Chill



Increased  
Emergency  
Dept. Visits



Increased  
Incidents  
of Illness



# Energy efficiency upgrades can...



Image: [www.energystar.gov](http://www.energystar.gov)

- Improve comfort
- Reduce energy bills
- Create a healthier space

Leading to:

- Better quality of life
- Reduced healthcare costs
- Reduced utility and maintenance costs
- More money available for medication and preventative healthcare



# Energy efficiency and health

- Many studies → Improvements in overall health after efficiency measures
- Many studies → Improvements in indoor environmental conditions (IAQ)
- However → One study documented increases in radon and formaldehyde after efficiency measures were installed



**Q:**

**If you needed help today,  
who would you turn to?**





# E. How Efficiency Vermont can help





# Efficiency Vermont resources



**VERMONT'S  
WEATHERIZATION  
PROGRAM**



# Qualified contractors



Efficiency  
Excellence  
Network

Efficiency  
Vermont



SM

Efficiency  
Vermont



# Healthy Homes VT Pilot



Choosing Health

NORTHEASTERN VERMONT  
REGIONAL HOSPITAL

Efficiency  
Vermont



VERMONT'S  
WEATHERIZATION  
PROGRAM

## Your **Healthy Home** Energy Visit

Efficiency  
Vermont

### Home Information

LOCATION: \_\_\_\_\_

RESIDENT NAME: \_\_\_\_\_

HOME ENERGY VISIT DATE: \_\_\_\_\_ YEAR BUILT: \_\_\_\_\_

**Information is power!** Your Healthy Home Energy Visit can inform the next steps to improve your home's energy efficiency, comfort, and the quality of your indoor environment.

While we work out a full scope of work for your home, here is a short list of things you can do today:

### Recommended Next Steps

1. \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
  2. \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
  3. \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
- Additional Comments: \_\_\_\_\_  
\_\_\_\_\_

Efficiency Vermont Contact

[www.efficiencyvermont.com](http://www.efficiencyvermont.com)

NAME: \_\_\_\_\_

CONTACT INFORMATION: \_\_\_\_\_ NEXT VISIT DATE: \_\_\_\_\_

VERMONT



# Course Activity





# Healthy home assessment



Image: [www.usfa.fema.gov](http://www.usfa.fema.gov)



# Healthy home assessment





# Healthy home assessment





# Healthy home assessment





# Healthy home assessment





# F. Call to action





# It starts with the people!



Image: [www.cdc.gov](http://www.cdc.gov)

- Homes and health are linked
- Research your purchases
- Additional training, resources, and opportunities are available



# Resources for Product Selection

- Environmental Working Group Skin Deep and Cleaning Product Databases
- Int. Living Future Institute Red List & Declare Label





**Q:**

**What are 2-3 things you  
plan to do differently in  
your own home or office?**

(Take two minutes to brainstorm  
with the person next to you)



# Closing



Image: [www.cdc.gov](http://www.cdc.gov)

- Homes affect health
- A holistic approach can improve the healthfulness and efficiency of a home
- Healthy homes concepts can be used to help people you work with
- Efficiency Vermont is here to help!



[lcapps@efficiencyvermont.org](mailto:lcapps@efficiencyvermont.org)

*"The connection between health and dwelling  
is one of the most important that exists."*

Florence Nightingale