Health Benefits of Energy Efficiency and Electrification

May 2021
Ellen Tohn
Tohn Environmental Strategies
etohn@tohnenvironmental.com
Housing focused climate solutions can improve health

- Fuel assistance to lower bills
- Home energy upgrades in low income households
- Replacing gas stoves with electric options
Rx Child Health: Fuel assistance & lower bills

Young children receiving fuel assistance are healthier than their peers who do not get fuel assistance

- Healthier babies - 20% less likely to be underweight for age or length
- Reduced hospital stays in colder months - 30% less likely to require admission after visiting emergency room.

Energy efficiency can improve health

<table>
<thead>
<tr>
<th>Reduced Respiratory &amp; Allergy Symptoms</th>
<th>Other Health Improvements</th>
<th>Reduced Emergency Dept. Visits or Hospitalizations</th>
<th>Indoor Environmental Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allergies</td>
<td>Headaches</td>
<td>Asthma</td>
<td>Moisture</td>
</tr>
<tr>
<td>Asthma*</td>
<td>Hypertension</td>
<td>Other respiratory</td>
<td>Condensation</td>
</tr>
<tr>
<td>Colds</td>
<td>Thermal stress</td>
<td></td>
<td>VOCs</td>
</tr>
<tr>
<td>Sinusitis</td>
<td>Overall health</td>
<td></td>
<td>Formaldehyde</td>
</tr>
<tr>
<td>Throat irritation</td>
<td>Mental health</td>
<td></td>
<td>Radon</td>
</tr>
<tr>
<td>Wheeze</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* The majority of studies reported asthma improvements; one study documented mixed results

Energy efficiency can reduce health risks

- Insulation Air Sealing: Warmer drier air, improved indoor temperatures & relative humidity
  - Fewer heat or cold related deaths
  - Less hypertension, heart disease

- Heating System Upgrades: Less moisture, mold, particulates, pollutants, combustion by-products, allergens
  - Fewer asthma, respiratory, Chronic Obstructive Pulmonary Disease risks
  - Fewer heart disease risks, headaches
  - Fewer cancer risks due to radon, formaldehyde, other sources
  - Less stress, better mental health

- Ventilation Vent Dryers: Lower bills, better comfort

- Efficient Cooking Appliances

Source: Occupant Health Benefits of Energy Efficiency, e4TheFuture
Improved health outcomes after energy efficiency

• Fewer respiratory-related Emergency Department visits - single family
  • 12% fewer asthma ED visits & 9% fewer cold symptoms for 14+ days
  • Fewer asthma triggers: moisture, mold, cockroaches and mice

• Better controlled asthma – single family
  • 71% of children had improved asthma, 23% attributable to energy upgrades

• Reduced arthritis symptoms & thermal stress - multi family
  • 9% fewer symptoms past 30 days
  • Fewer urgent care visit due to cold

• Better physical & mental health - single family
  • 48% reduction in poor mental health; similar improvement in physical health

Weatherization “Plus”
Highline Communities, King County, WA

STUDY GROUP:
WEATHERIZATION PLUS
COMMUNITY HEALTH WORKER

COMPARISON GROUP:
COMMUNITY HEALTH WORKER ONLY

Weatherization: Insulation, air sealing, heating system upgrades
PLUS bath/kitchen fans, carpet removal, moisture repairs

Bryesse, Weatherization Combined With Community Health Worker In-Home Education on Asthma Control, *APHA*, 2013
Weatherization Plus Health: Reduced moisture/mold

- Mold: -47%
- Moisture: -37%
Asthma better controlled for children

Baseline for both groups: 0%

71% 23% 48%

1 Year Added Benefit

Baseline for both groups: 0%
Green Renovation: Boston Public Housing

- **IAQ**
- **Health**
- **Utilities / Work Orders**
- **Sleep**

**Benefits**:
- General Symptoms ↓ 47%
- Asthma hospital visits ↓ 67%
- Asthma symptoms ↓ 52%
- Missed school ↓ 71%
- NO₂ ↓ 41.1%
- PM₂.₅ ↓ 66.1%

**Cost Savings**:
- $108k
- $297k
- $179k
- $584k

**Additional Improvements**:
- More control + comfort
- Some discomfort (cold)
- Reduced extreme responses
- Some spot heating
- Increased sleep duration

Differentiating Pollutants from Cooking Food vs. Gas Fuel

https://rmi.org/insight/gas-stoves-pollution-health/
Indoor Air Quality is Often Worse than Outdoor Air Quality

We spend up to 90% of our time indoors.

Indoor pollutant levels may be 2 to 5 and as much as 100 times higher indoors than outdoors (EPA).

Homes with gas stoves have 50 - 400% higher NO₂ emissions than homes with electric stoves.

[Link: https://rmi.org/insight/gas-stoves-pollution-health/]
Nitrogen Dioxide and Asthma Severity

1300+ children in CT and MA

Children at the greatest risk for more severe asthma are the ones living in homes with the highest levels of nitrogen dioxide.

Yale STAR Study
Epidemiology. 24(2): 320.
Programs that can advance this work

**Federal Level**
- Low Income Heating Energy Assistance Program (LIHEAP) - HHS
- Weatherization/energy efficiency with funds for health and safety - DOE
- Public Housing, housing rehab, and energy upgrades - HUD
- American Jobs Act – retrofit affordable housing to be healthy, energy efficient & resilient; lead service line replacement
- HOPE4HOMES (In the House Energy and Commerce Committee’s Clean Future Act) Rebates for home energy upgrades and expand the market for whole-home retrofits.

**State Level** – Participate in 3 year utility planning process, to promote funding for low income energy efficiency and valuation of health benefits.