Achieving Health Equity through Housing: Understanding the Impact of Non Energy Benefits in the United States

Brendan Wade Brown

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Behavior, Energy & Climate Change Conference
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Framing Policy and Programs Panel
What we will cover today

1. Non Energy Benefits
2. Impact on Housing Affordability
3. Impact of Housing Quality
4. Indirect Impacts
5. Benefits for Owners
6. National and Community Level Benefits
Evolution of GHHI’s Research into Health Equity & Non Energy Benefits

- GHHI Identified Barriers and Opportunities to Make Housing Green and Healthy Through Weatherization Report
- Federal Healthy Homes Interagency Work Group
- DOE Weatherization Plus Health initiative and 11-6 Policy Guidance
- 2014-2016 HUD General Program NOFA providing Priority Points for comprehensive, integrated health and energy approach in HUD funded housing; HUD HHRS
- “Weatherization and Its Impact on Occupant Health Outcomes” (2017)
- “Achieving Health Equity through Housing: Understanding Non-Energy Benefits in the United States” will be released on Weatherization Day October 30, 2017
What are health inequities?

“Health inequities are systematic differences in opportunities by which groups can achieve optimal health, leading to unfair and avoidable differences in health outcomes.”
Definition of Non-Energy Benefits

International Energy Agency defines non-energy benefits as...

"the wider socio-economic outcomes that can arise from energy efficiency improvement, aside from energy savings".

Non-Energy Benefits are also known as:
- Multiple Benefits
- Co-benefits
- Non-energy impacts
- Net Benefits
Weatherization Works:
Framework for Understanding Non-Energy Benefits

- Economic Benefits: Societal
  - Economic Stability
  - Energy Security
  - Household Income Benefits
  - Household Expenditure Benefits
- Physical Changes to Home
  - Household Health & Safety Benefits
  - Household Well-Being Benefits
- Environmental Benefits: Societal
  - Medical & Social Services Benefits
  - Reduced Utility Costs: Ratepayers

Integrated Weatherization Programs

Societal Environmental Benefits:
- Integrated Weatherization Programs
- Economic Benefits: Societal
  - Economic Stability
  - Energy Security
- Physical Changes to Home
  - Household Income Benefits
  - Household Expenditure Benefits
- Environmental Benefits: Societal
  - Medical & Social Services Benefits
  - Reduced Utility Costs: Ratepayers
Direct Links to Social & Physical Determinants of Health

The link between residential housing and health are known to include three inter-related aspects:

- Conditions of the home environment
- Conditions of the neighborhood
- Housing affordability
Social Determinants of Health

Five Key Factors Underlying SDOH:

1. Economic Stability
   - Poverty
   - Employment
   - Food Security
   - Housing Stability

2. Education
   - High School Graduation
   - Enrollment in Higher Education
   - Language and Literacy
   - Early Childhood Education/Development

3. Neighborhood and Built Environment
   - Access to Healthy Foods
   - Quality of Housing
   - Crime and Violence
   - Environmental Conditions

4. Health and Health Care
   - Access to Health Care
   - Access to Primary Care
   - Health Literacy

5. Social and Community Context
   - Social Cohesion
   - Civic Participation
   - Discrimination
   - Incarceration
What Are the Impacts of Non-Energy Benefits?

There is strong evidence on energy efficiency and weatherization investments positively impact:

• Housing Affordability
  ▪ Economic Security
  ▪ Energy Security

• Housing Quality
  ▪ Health Outcomes
  ▪ Comfort & Safety
  ▪ Quality of life

• Indirect Impacts - school and work productivity, residential stability and mental health benefits

• Owner benefits

• National and community benefits
Impact of Housing Affordability
Affordable Housing Shortage

only 35 affordable units for every 100 extremely low income households

Poor quality housing with hazardous conditions is increasingly common for low and moderate income households due to the limited availability of affordable housing stock.

Housing Market Dysfunction

Pressures on Affordable Housing
- High cost of new housing
- Households occupying housing below the value of what they can afford
- Housing discrimination
- Macro-economic trends (i.e. wage stagnation)
- Lack of funding to develop and maintain

Inefficient & Unaffordable Housing

Deferred maintenance is one of the primary causes of unhealthy housing. Coupled with energy cost burdens from poorly weatherized conditions, which exasperate budgets and health conditions, families become destabilized.

Impacts of Energy Insecurity

**Energy Insecurity**

**Housing Instability**

**High Household Mobility**

**Economic Impacts**
- Reduced productivity
- Lower job security
- Fewer benefits
  - Paid time off
  - Health insurance

**Health Impacts**
- Exposure to environmental hazards
  - Lead based paint
  - Asthma triggers
- Mental health conditions
  - Stress
  - Anxiety
  - Depression
- Childhood stress
  - Chronic health conditions

**Education Impacts**
- Poor grade level performance
- Lower graduation rates
- Lost earning potential
Non-Energy Benefits in Affordable Housing

- **Society NEB**
  - Environmental Air Quality – reduce GHG & Criteria Air Pollutants
  - Economic – reduce energy costs; increase job creation and market development

- **Utility**
  - Decreased costs

- **Owner**
  - Operation maintenance savings
  - Preserve affordability
  - Increase Home Value
  - Decreased vacancy – Preserve affordability; reduce risk of eviction

- **Occupant**
  - Health- improve IAQ; improve environmental quality
  - Financial Stability- Reduce energy costs; reduce risk of eviction; reduce reliance on energy assistance program; increased food security from reduced housing costs
Impact of Housing Quality
Unassisted Low-Income Renter Households

13.72 million

Worst Case Housing Needs

7.72 million

A) Unassisted LI renter + severely rent-burdened
7.23 million

B) Unassisted LI renter + severely inadequate
0.22 million

C) Unassisted LI renter + severely inadequate + severely rent-burdened
0.27 million
The Burden of Unhealthy and Energy Inefficient Homes

- 30M families live in unhealthy homes
- Homes with environmental hazards are making their residents sick
- 14.4M missed days of school each year
- Asthma is the top reason students miss school
- 14.2M missed days of work each year
- Collateral burden of sick children is missed days of work for parents and caretakers
- $51B+ spent on asthma
- $31B+ spent on slip & fall injuries
- $43B+ spent on lead poisoning
- Over $100B in taxpayer funding is spent each year to address the impact of these hazards

Low income families spend 20% of monthly income on energy costs VS. 3.5% in other households

30M families live in unhealthy homes
Homes with environmental hazards are making their residents sick

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Combustion Gases and Ventilation

**Weatherization**

**Source Control:**
- Removal of all unvented combustion space heaters
- Repair/replace unvented heat pumps, vented gas heating, or enclosed wood burners

**Ventilation:**
- Increases the volume of indoor to outdoor air exchanged

**Healthy Homes**
Install CO Monitors in homes with Combustion appliances

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**Better Indoor Air Quality**

- Reduced concentration of poly-cyclical aromatic hydrocarbons (PAH), hydrocarbons, aldehydes, carbon monoxide (CO), sulfur dioxide (SO2), nitrogen oxides (NOx), and particulate matter (PM) in the home

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**Outcome**

**Lower Incidence of**

- CVD related Emergency Room visits,
- Adverse respiratory symptoms
- COPD
- CO poisoning hospitalization and death

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**HP Indicator**

**EH-22.7**
Increase States that monitor diseases or conditions that can be caused by acute exposure to CO poisoning

**HDS-2**
Reduce coronary heart disease deaths

**RD-1-13**
Respiratory Diseases

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**SDOH**

**Neighborhood & Built Environment:**
- Quality of Housing
- Environmental Conditions

**Economic Stability:**
- Poverty
- Employment
### National Ambient Air Quality Standards (NAAQS)

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>US Average Range</th>
<th>US Typical Peak</th>
<th>Most Recent NAAQS for Criteria Pollutants (Averaging Time)</th>
</tr>
</thead>
<tbody>
<tr>
<td>O₃ Ozone</td>
<td>0-125 ppb</td>
<td>2000 ppb</td>
<td>75 ppb (8h)</td>
</tr>
<tr>
<td>NO₂</td>
<td>0.5-50 ppb</td>
<td>200 ppb</td>
<td>100 ppb (1h) 53 ppb (Annual mean)</td>
</tr>
<tr>
<td>NO</td>
<td>0-100 ppb</td>
<td>200 ppb</td>
<td></td>
</tr>
<tr>
<td>SO₂</td>
<td>0.1-50 ppb</td>
<td>150 ppb</td>
<td>75 ppb (1h) 6/22/2010 140 ppb (Annual mean)</td>
</tr>
<tr>
<td>CO</td>
<td>0.1-5 ppm</td>
<td>20ppm</td>
<td>35 ppm (1h) 9 ppm (8h)</td>
</tr>
<tr>
<td>PM₁₀</td>
<td>10-100 µg/m³</td>
<td>300 µg/m³</td>
<td>150 µg/m³ (24h)</td>
</tr>
<tr>
<td>PM₂₀</td>
<td>5-50 µg/m³</td>
<td>100 µg/m³</td>
<td>12 µg/m³ (Annual mean) primary 15 µg/m³ (Annual mean) secondary 35 µg/m³ (24h)</td>
</tr>
<tr>
<td>PM₂₅</td>
<td>Mean=(13.4±5.6) µg/m³</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lead</td>
<td>0.5-5 ng/m³</td>
<td>150 ng/m³</td>
<td>12 µg/m³ (Rolling 3 month average)</td>
</tr>
<tr>
<td>PAH</td>
<td>2-50 ng/m³</td>
<td>200 ng/m³</td>
<td>NA</td>
</tr>
</tbody>
</table>
**Radon**

**Home Intervention**
- Weatherization
  - Cover exposed ground in the homes (i.e. basements) with a vapor barrier
  - Make HVAC Units ASHRAE compliant
  - Install radon mitigation system

**Output**
- Better Indoor Air Quality
  - Drop in radon levels in all levels of the home

**Outcome**
- Lower Incidence of
  - Radon attributable lung cancer cases

**HP Indicator**
- EH-14
  - Increase the proportion of homes with an operating radon mitigation system for persons living in homes at risk for radon exposure

**SDOH**
- Neighborhood & Built Environment:
  - Quality of Housing
  - Environmental Conditions
  - C-2
    - Reduce the lung cancer death rate
Biological and Unsanitary Housing Conditions

**Home Intervention**
- **Weatherization**
  - Remove moldy objects from home
  - Repair moisture intrusion points
  - Repair/Improve home HVAC systems
  - Improve home insulation
  - Exterior repairs to downspouts, gutters, and grading to reduce water infiltration

**Output**
- **Reduced Environmental Toxins**
  - Reduce the number of dust mites
  - Lower levels of surface and ambient mold
  - Lower levels of surface and ambient bacteria

**Outcome**
- **Lower Incidence of**
  - Asthma symptom days
  - Asthma related school and work absences
  - Allergic reactions
  - Asthma genesis
  - Upper and lower respiratory illness
  - Hospital Admissions

**HP Indicator**
- **RD-1-6**
  - Respiratory Diseases

**SDOH**
- **NEIGHBORHOOD & BUILT ENVIRONMENT:**
  - Quality of Housing
  - Environmental Conditions

- **EDUCATION:**
  - Early childhood education and development
  - School attendance

- **HEALTH AND HEALTH CARE:**
  - Access to primary care and health literacy

**Healthy Homes**
- Distribute allergen impermeable bedding
- Education on cleaning and washing protocols for furnishing and floors
- Use of dehumidifiers
- Removal of carpets
- Roof repair or replacement
Unintentional Injury Prevention

**Home Intervention**
- **Fall prevention**
  - Encapsulation (covering lead paints with a neutral paint barrier),
  - Enclosure (covering paint with a rigid barrier),
  - Window replacement and/or Window treatments

**Output**
- **Improve Home Safety for Children**
- **Reduce Falls in Older Adults**

**Outcome**
- **Lower Incidence of**
  - Falls
  - Poisonings
  - Drownings
  - Suffocations

**HP Indicator**
- **IVP-11**
  - Reduce unintentional injury deaths
- **IVP-1**
  - Reduce nonfatal unintentional injuries
- **IVP-23**
  - Prevent an increase in fall-related deaths
- **IVP-24**
  - Reduce unintentional suffocation
- **IVP-25**
  - Reduce drowning deaths

**SDOH**
- **Neighborhood & Built Environment:**
  - Quality of Housing
  - Environmental Conditions
  - Crime and violence

- **Education:**
  - Early childhood education and development
  - School attendance

**Healthy Homes**
Education on home safety practices, maintenance and repair protocols
FIVE LEADING CAUSES OF UNINTENTIONAL INJURY RELATED CHILD DEATHS, BY AGE GROUP, UNITED STATES, 2009

Health Benefits of Weatherization

Weatherization and its Impact on Occupant Health Outcomes

Weatherization Interventions Alone
• Reduce energy cost burdens
• Increase thermal comfort
• Improve indoor air quality

Multi-Component Weatherization Interventions
• Reduce other environmental hazards and safety defects:
  • lead based paint
  • pests
  • radon
  • carbon monoxide
  • fire hazards
  • structural deficiencies

Download at ghhi.org
## Indirect Impacts

<table>
<thead>
<tr>
<th>Residential Stability</th>
<th>Mental Health</th>
<th>Performance and Productivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tenant satisfaction with affordability and quality</td>
<td>Substandard housing and economic burdens impact mental health (stress, anxiety, etc.)</td>
<td>Residential stability has positive relationship with school attendance and performance</td>
</tr>
<tr>
<td>Energy affordability and environmental health quality improve perception of housing value</td>
<td>Stress can impact asthma maintenance, early childhood development</td>
<td>Academic performance and lead</td>
</tr>
<tr>
<td>Frequent moves impact economic mobility</td>
<td>Affordable utilities reduce tradeoffs for food and healthcare</td>
<td>Academic performance and asthma</td>
</tr>
</tbody>
</table>
Owner Benefits

Tenant Benefits
- Improved Occupant Health
- Reduced Energy Use
- Reduced Tradeoffs in Tenant Budgeting
- Lower Healthcare Costs
- Increased Tenant Affordability
- Increased Economic Security
- Increased Tenant Satisfaction
- Lower Tenant Turnover/Increased Housing Stability
- Fewer Evictions

Mutual Benefits
- Decreased Housing Code Violations
- Lower Maintenance Costs
- Improved Reputation Among Renters
- Fewer Late Payments
- Reduced Property Fines & Liens
- Increased Resources for Operations and Maintenance
- Increased Property Value
- Decreased Vacancy Rate

Direct Owner Benefits
- Improved Occupant Health
- Reduced Energy Use
- Reduced Tradeoffs in Tenant Budgeting
- Lower Healthcare Costs
- Increased Tenant Affordability
- Increased Economic Security
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- Decreased Vacancy Rate
## Community benefits

<table>
<thead>
<tr>
<th>Well Being &amp; Neighborhood Revitalization</th>
<th>Economic Growth</th>
<th>Community Resilience</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Higher economic security related to lower rates of heat or eat tradeoffs</td>
<td>• Household energy security</td>
<td>• An area’s ability to thrive rather than survive</td>
</tr>
<tr>
<td>• Greater economic security increases healthy food options</td>
<td>• Increased property values</td>
<td>• Reduced stress, increased ability to recover from disasters</td>
</tr>
<tr>
<td></td>
<td>• Job creation</td>
<td>• Ability to be disaster ready and prepare for climate change or other natural disasters</td>
</tr>
</tbody>
</table>
Questions
Announcement Number EPA-OAR-ORIA-17-02: National Indoor Environments Program: Reducing Public Exposure to Indoor Pollutants

Project Title:
Advancing and Achieving Health Payer Investment and Reimbursement in Environmental Management of Asthma Triggers


### Site Production Benchmarks

<table>
<thead>
<tr>
<th>Phase of Integration</th>
<th>2018</th>
<th>2019</th>
<th>2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business Development</td>
<td>5 sites</td>
<td>5 sites</td>
<td>5 sites</td>
</tr>
<tr>
<td>Reimbursement</td>
<td>2 sites</td>
<td>4 sites</td>
<td>4 sites</td>
</tr>
</tbody>
</table>

**Timeline for Site Selection of Business Development Plan**

1) National Campaign Launch October 17 to December 15 2017
2) Request for Proposals on November 15, 2017 2018 and 2019
3) Site Selection announced on January 15 2018, 2019 and 2020
4) Technical Services and Support from January 15 – September 30 2018, 2019 and 2020
EPA National Indoor Environments

GHHI 4 Major Deliverables

1) Convene and manage the Asthma Outcome Metrics Working Group to develop Environmental Management & Health Outcomes Metrics (EMHOME) system.

2) Outreach, Training and Site Partnership Development (10 site webinars, training and outreach to 30 health plans or health payers, 15 new partnerships and engage 15 Medicaid Directors)

3) Each year GHHI’s Asthma Impact team will solicit RFPs, select 5 sites and provide technical services related to business development plans (basically producing 5 feasibility reports a year in 2018, 2019 and 2020).

4) GHHI is also responsible for consulting services to 10 sites in reimbursement phase (2 in 2018 and 4 in both 2019 and 2020)- from newly developed sites graduating with business plans or any site ready for reimbursement (potential to align with GHHI Consulting and Technical Assistance Services) would qualify for reimbursement services.