Evaluating the Health Benefits of Weatherization

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OUTLINE

- Overview of Weatherization Assistance Program (WAP)
- Methods Used to Monetize Health Benefits
- Selected Results
- Conclusions







What is WAP?

- The Weatherization Assistance Program is the largest residential energy efficiency program in the U.S.
- U.S. Department of Energy (DOE) provides grants to states and territories based on funding formulas
- States provide grants to local weatherization agencies for free service delivery

It's purpose, as established by law, is:

"...to increase the energy efficiency of dwellings owned or occupied by low-income persons, reduce their total residential energy expenditures, and improve their health and safety, especially low-income persons who are particularly vulnerable such as the elderly, the persons with disabilities, families with children, high residential energy users, and households with high energy burden."







WAP Services

- Energy efficiency measures need a savings to investment ratio (SIR) of 1.0 or greater
- Per unit spending limits mean that sometimes measures with a SIR > 1.0 are not installed
- Typical Weatherization Measures Installed Include
 - Air Sealing: Attics, doors, windows
 - Insulation: Attics, walls, rim joists
 - Ducts: sealing, insulation
 - Furnace: Tune-up, repairs









WAP Services

- Health and Safety Measures
 - Combustion Appliances: Furnace, Water Heater, Stove/Oven, Dryer
 - Moisture Management: Kitchen and Bathroom Ventilation, Dryer Vents
 - Lead Safe Weatherization
- Health and Safety measures are subject to limits identified in each state WAP Plan (15% per job is the rule of thumb)









Two Approaches to Monetizing Health & Household-related Benefits

- 1) Based on survey data pre- and post-wx with a comparison group (e.g., preventing thermal stress)
- 2) Based on measures installed and known impacts on health (e.g., installing CO monitors)
- Health costs drawn from two U.S. national databases: Medical Expenditure Panel Survey (MEPS) and Health Cost and Utilization Project (HCUP)
- Value of a life saved \$7.5 million
- Present value of health benefits calculated over 10 years using federally approved discount rates



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TIERS – These Benefits Group By Strength of Data and Methodology

- <u>Tier One</u> contains the estimates with the relatively highest accuracy, which at the very least are based on observed survey results and do not have any major methodological issues.
- <u>Tier Two</u> contains estimates that may be based on observed survey data but have one or two methodological issues and/or be based on strong programmatic observations (e.g., installation of carbon monoxide monitors) but not on direct reports of health change.
- <u>Tier Three</u> contains the estimates that some may deem as the most speculative.



Monetized H&HHD Benefits of WAP (Tier #)

- Reduced Thermal Stress on Occupants: Heat and Cold (T1)
- Reduced Asthma-Related Healthcare and Costs (T1)
- Fewer Missed Days at Work (T1)
- Reduced Need for Food Assistance (T1)
- Reduced Use of High Interest, Short-Term Loans (T2)
- Increased Ability to Afford Prescriptions (T2)
- Increased Productivity at Work Due to Improvements in Sleep (T3)
- Increased Productivity at Home Due to Improvements in Sleep (T3)
- Reduced Heat or Eat Choice Dilemma Faced by Pregnant Women (T3)
- Reduced Carbon Monoxide Poisonings (T2)





Indoor Thermal Stress: Reduced Incidences

In the past 12 months, has anyone in the household needed medical attention because your home was too cold or too hot? (National Occupant Survey from WAP evaluation)

| Sample Group | Too cold | Too hot |
|--------------------------------|----------|---------|
| Pre-Weatherization Treatment | 3.2% | 2.4% |
| Post-Weatherization Treatment | 1.5% | 1.5% |
| Post-Weatherization Comparison | 2.1% | 1.1%* |
| Rate of Reduced Incidences | 1.4% | 1.1% |

- N = # of incidences avoided
- Type of medical treatment: a = hospitalization, b = emergency department (ED) visit, c = Physician visit:
- **N**(*a*, *b*, *c*) = [(number of weatherized units completed in PY 2008) * (decreased rate of seeking medical care) * (% of type of medical treatment (a, b, c)]

Benefit = [N (a, b, c) * (average total medical costs - out-of-pocket and payments by Medicaid, Medicare, and other insurance)]

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Indoor Thermal Stress: Reduced Incidences

Input

Number of single family and mobile homes weatherized (2008): 80,352

Decreased rate of seeking medical care: Cold exposure, 1.4%; Heat exposure, 1.1%

Type of treatment sought for cold-related illnesses* Hospitalizations = **10%**, ED visits = **40%**, Physician Visits = **50%**

Type of treatment sought for heat-related illnesses* Hospitalizations = **4%**, ED visits = **11.5%**, Physician visits = **84.5%**

Total **out-of-pocket medical costs** paid (mean) -- treatment of cold-related illnesses** Hospitalization = **\$87,428**; ED = **\$53,918**; Physician Office Visit = **\$12,509**

Total **out-of-pocket medical costs** paid (mean) -- treatment of heat-related illnesses** Hospitalization = **\$15,944**; ED = **\$104,030**; Physician Office Visit = **\$2,263**

Total medical costs **paid by insurance** (mean) -- treatment of cold-related illnesses** Hospitalization = **\$977,146**; ED = **\$193,740**; Physician Office Visit = **\$64,339**

Total medical costs **paid by insurance** (mean) -- treatment of heat-related illnesses** Hospitalization = **\$189,228**; ED = **\$361,802**; Physician Office Visit = **\$11,640**

> * Medical Expenditure Panel Survey- (MEPS): <u>http://meps.ahrq.gov/mepsweb/</u> **Healthcare Cost and Utilization Project – (HCUP): <u>http://www.ahrq.gov/research/index.html.</u>

Monetization of Benefits - Reducing Indoor Thermal Stress on Occupants

| Cold-Related Illnesses | | | | | |
|------------------------|----------------------------------------------------------------------------------------------|----------|----------------------------------------|--------------|--|
| | First Year Per HouseholdPV Per Unit BenefitFirst YearBenefitOver Ten YearsProgram Benefit | | PV Program Benefit Over 10 years | | |
| Households | \$1.91 | \$19.04 | \$153,854 | \$1,530,119 | |
| Society | \$15.37 | \$152.88 | \$1,235,225 | \$12,284,587 | |
| Total | \$17.29 | \$171.93 | \$1,389,079 | \$13,814,706 | |

| Heat-Related Illnesses | | | | | | |
|------------------------|-------------------------------------------------------------------------------------------------------------|---------|-----------|-------------|--|--|
| | First Year Per HouseholdPV Per Unit BenefitFirst YearPV ProgramBenefitOver Ten YearsProgram Benefityears | | | | | |
| Households | \$1.52 | \$15.13 | \$122,236 | \$1,215,668 | | |
| Society | \$7.00 | \$69.64 | \$562,669 | \$5,595,870 | | |
| Total | \$8.52 | \$84.77 | \$684,905 | \$6,811,538 | | |



Indoor Thermal Stress and Mortality

Deaths due to extreme thermal stress can be prevented through weatherization.

of lives saved = [(% of hospitalizations resulting in deaths (U.S. population) * (# of hospitalizations prevented by WAP in PY 2008)]

Benefit = # of lives saved by WAP * Value of Human Life

- % of hospitalizations due to thermal stress resulting in deaths (U.S., 2008) 4% (cold); 2% (hot)
- Number of hospitalizations prevented (WAP, PY 2008) 113 (cold); 35 (hot)
- Number of lives saved (WAP, PY 2008) 4 (cold); 1 (hot)

| Non-Energy Benefit (Present Value per Household) | Total | Total (Value of Life Excluded) | Societal | Household |
|--------------------------------------------------------|---------|-----------------------------------|----------|-----------|
| Thermal Stress-Cold | \$3,911 | \$172 | \$3,892 | \$19 |
| Thermal Stress- Hot | \$870 | \$85 | \$855 | \$15 |



¹³ Managed by NEIRS Ty National Fire Incident Reporting System; NFPA – National Fire Protection Association

| Fire Equipment Ignition and Suppression Factors Categories | Relevant Wx Measures | Weighted Wx Homes in PY 2008 | Percent of Wx Units | WAP Weighted NFIRS Fires | Percent of Fires |
|---------------------------------------------------------------------|-------------------------|------------------------------------|------------------------|-----------------------------|---------------------|
| EI1 | Electrical | 4,324 | 5.38% | 8.85 | 2.96% |
| EI2 | Heating | 39,128 | 48.70% | 10.76 | 3.60% |
| EI3 | Cooling | 4,969 | 6.18% | 1.54 | 0.51% |
| EI4 | Clothes Dryer | 16,086 | 20.02% | 6.18 | 2.07% |
| EI5 | Refrigerator | 11,918 | 14.83% | 0.80 | 0.27% |
| EI6 | Water Heater | 44,340 | 55.18% | 2.53 | 0.85% |
| EI7 | Chimney | 2,176 | 2.71% | 1.88 | 0.63% |
| EI8 | Fans | 11,205 | 13.94% | 1.38 | 0.46% |
| EI9 | Lighting | 51,556 | 64.16% | 1.52 | 0.51% |
| No EI | No EI1-EI9 | 1,399 | 1.74% | 263.40 | 88.14% |
| SF1 | Smoke Alarm | 36,619 | 45.57% | 3.14 | 1.05% |
| SF2 | Windows, Doors | 39,805 | 49.54% | 1.29 | 0.43% |
| SF3 | Ventilation | 19,229 | 23.93% | 1.97 | 0.66% |
| SF4 | Air Sealing | 75,673 | 94.18% | 1.28 | 0.43% |
| SF5 | Wall | 25,291 | 31.48% | 2.28 | 0.76% |
| SF6 | Roof,Attic,Ceiling | 51,624 | 64.25% | 6.53 | 2.19% |
| SF7 | Floor | 20,226 | 25.17% | 1.11 | 0.37% |
| SF8 | Gas | 1,061 | 1.32% | 0.47 | 0.16% |
| No SF | No SF1-SF8 | 1,667 | 2.07% | 283.87 | 94.99% |
| Total | - | 80,352 | - | 298.84 | - |

| Damage | Frequency | Household | Society | Total |
|--------------------|-----------|-----------|-------------|-------------|
| WAP Fires | 46.99 | \$503,800 | \$874,843 | \$1,378,643 |
| WAP FF Deaths | 0.0022 | \$0 | \$16,791 | \$16,791 |
| WAP Other Deaths | 0.70 | \$0 | \$5,278,798 | \$5,278,798 |
| WAP FF Injuries | 4.64 | \$0 | \$27,377 | \$27,377 |
| WAP Other Injuries | 1.64 | \$1,563 | \$8,130 | \$9,693 |
| Total | - | \$505,363 | \$6,205,939 | \$6,711,302 |

Table 4.25. Summary Frequency and Monetization of Various Prevented Fire Damages

Table 4.26. Monetization of Benefits Attributable to Fire Prevention

| Beneficiary | First Year Program Benefit | First Year Per Unit Benefit | PV Program Benefit Over 10 Years | PV Per Unit Benefit Over 10 Years |
|-------------|-------------------------------|--------------------------------|----------------------------------------|-----------------------------------------|
| Households | \$505,363 | \$6 | \$5,025,946 | \$63 |
| Society | \$6,205,939 | \$77 | \$61,719,426 | \$768 |
| Total | \$6,711,302 | \$84 | \$66,745,373 | \$831 |



CONCLUSIONS

- Health and household-related non-energy benefits can be monetized using survey and measure installation data, rates of usage of health-related services, and national costs for health-related services.
- Even more accurate estimates could be made using actual household medical costs pre- and post-wx (e.g., in the U.S., private insurance and Medicaid/Medicare records).
- There may be a non-energy benefits dividend of braiding weatherization with healthy homes measures.
- These and other measures can also improve the resilience of low-income homes to climate change and
 Mextreme weather events.

