



HEALTH AND RESILIENCE BENEFITS OF MULTIFAMILY WEATHERIZATION

November 6, 2020





Agenda

- 10:30am – 10:45am: Overview
- 10:45am – 10:50am: Breakout Room Selections
- 10:50 am – 11:30am: Results
 - Breakout Room 1 – Health
 - Breakout Room 2 – Building Systems Resilience
 - Breakout Room 3 – Social & Community Resilience
- 11:30am – Noon: Policy-Focused Plenary
 - Monetization Results
 - Open Discussion
- Noon -- Close

Acknowledgments

Sponsors

- The JPB Foundation & Utility Program Administrators in Massachusetts

Key Team Members

- Three³ – Bruce Tonn, Beth Hawkins, Erin Rose, Michaela Marincic
- SLipstream – Claire Cowan, Scott Pigg, Erikka Byrne, Mikhaila Calice, Syed Abbas, David Vigliotta & many others
- NMR – Monica Nevius, Greg Clendenning, Nicole Rosenberg, Christina Smaglia & many others
- In-field staff – Anne Hare, Walter Groux
- Center for Applied Research and Evaluation, University of Tennessee, Knoxville – Linda Daughtery, Amy Melton

Contributors

- Weatherization Agencies (e.g., CEDA, CEO, La Casa, Project Home, Racine Kenosha CAA, AEA, NMIC, SPRC, ABCD, Action Inc.)
- Building Owners (e.g., LUCHA, Mercy Housing, Related Midwest)
- Utilities (e.g., National Grid, Eversource)
- State Weatherization Offices (e.g., WI, VT, NH)
- Energy Efficiency For All State Leads & others in the affordable housing sector

Research Project Essentials

- **Goals:**
 - Estimate the health & household related NEIs attributable to weatherizing affordable multifamily (MF) buildings
 - Policy impact—increase funding allocations for income-eligible federal, state and utility weatherization programs providing services to our vulnerable populations living in MF buildings
- **Hypothesis:** single-family (SF) weatherization NEI estimates cannot be generalized to the MF sector
 - Different demographics
 - Different measures installed
 - Building envelopes behave differently
- **Sample:** MF buildings with 5+ units located in MA, NYC, IL, WI, RI, VT, NH, PA
- **Recruiting buildings that:** have already been weatherized, will soon be weatherized, and will not be weatherized, referred to as:
 - CwT- Comparison with Treatment (Weatherized)
 - T - Treatment (Unweatherized)
 - C - Control (Unweatherized)



Major Study Components

- **RS (Resident Survey):** addresses health, budget, apartment conditions, social community resilience; administered pre- and post-wx
- **PM (Property Manager) Survey:** addresses building systems resilience
- **PO (Property Owner) Interview:** discusses weatherization programs: process, strengths and weaknesses
- **Data With a Soul (DWaS):** documents personal experiences
- **Monetization of Non-Energy Impacts (NEIs):** health and household related NEIs, at the household and societal levels
- **National Workshops:** Workshops were held in New York City, Chicago, and Knoxville, TN to engage the stakeholder community about this study



Building the Sample Frame

- **Challenge**

- No national or regional affordable MF building database
- No national or regional database of affordable MF buildings already or about to be weatherized

- **Approach to Building the Sample Frame**

- Convenience sampling
- Reached out to over 100 organizations & individuals
 - State and local weatherization agencies, utilities, building owners (non-profit and commercial), other interested parties (e.g., Energy Efficiency for All (EEFA) state leads)
- Recruiting property owners to participate in the study was much more difficult and time consuming than expected
- Number of buildings in the queue for weatherization was much lower than expected (we were not in the ARRA period anymore!)



Reaching Out to Potential Respondents to Complete the Residential Survey

- **Steps**
 - **Contact Building Owners or Property Managers for permission to enter the buildings.**
 - **Ascertain the dominant language used by occupants of the building. Surveys were translated into Spanish, Mandarin and Russian.**
 - **The most common approach was to hang a plastic bag containing a paper survey (in booklet form), along with a cover letter and postage pre-paid envelope, on doorknobs. The cover letter explained that respondents could call a phone number to take the survey or do the survey on-line. These options were not frequently chosen.**
 - **At times, the field team stayed on-site until paper surveys were completed.**
 - **Gift cards were mailed to respondents when surveys were received.**
 - **Respondents were re-contacted by phone if they provided a number.**
- **Lessons Learned**
 - **Hanging surveys on doorknobs was an effective approach to reaching out to this hard to reach population.**
 - **Being on-site also allowed the field team to interview property managers and collect data on the physical layout of the buildings.**

Sample Size

Sample Size by Study Group & Characteristic	Comparison w/ Treatment	Treatment		Control	
Characteristic	Phase 1 (T_Post)	T_Pre	T_Post	Phase 1	Phase 2
No. of Households (HH) (Total n=1,921)	612	417	198	892	553
No. of Persons (Total n=2,964)	880	742	309	1,273	700
No. of 'Matched pairs' HH (Total n=751)	0	198		553	
No. of Buildings (Total n = 382)	140	103		139	
No. of Sites (Total n = 186)	72	50		64	

Building Characteristics By Household – Completed Surveys Only

Characteristic	Comparison with Treatment	Treatment		Control	
	P1 (post-T)	P1 (T_pre)	P2 (T_post)	P1	P2
No. of Households	612	417	198	892	553
Rise					
Low-rise (< 5 stories)	78%	54%	66%	59%	58%
Mid-rise (5 to 9 stories)	16%	24%	33%	34%	37%
High-rise (10+ stories)	5%	20%	0%	6%	6%
Size (housing units)					
5 to 12 units	22%	30%	41%	14%	12%
13 to 39 units	30%	21%	20%	22%	20%
40 or more units	48%	49%	39%	64%	69%
Ownership					
Apartments, condominiums, and private	42%	27%	33%	45%	44%
Non-profit and public	54%	51%	57%	33%	35%
Unknown	4%	22%	10%	22%	22%

Building Characteristics By Household – Completed Surveys Only (cont.)

Characteristic		Comparison with Treatment	Treatment		Control	
		P1 (post-T)	P1 (T_pre)	P2 (T_post)	P1	P2
No. of Households		612	417	198	892	553
Housing Function						
Family		14%	26%	17%	22%	19%
Mixed Use		6%	2%	0%	8%	7%
Senior		56%	12%	17%	30%	27%
Supportive		5%	7%	5%	27%	31%
Unknown		20%	53%	60%	15%	15%
Region/State						
Midwest	Illinois	16%	0%	0%	60%	64%
	Wisconsin	11%	8%	6%	5%	5%
Northeast	Vermont	4%	3%	5%	0%	0%
	New York	11%	32%	10%	3%	2%
	Rhode Island	11%	31%	47%	8%	7%
	Pennsylvania	12%	1%	0%	5%	3%
	New Hampshire	2%	5%	7%	0%	0%
	Massachusetts	34%	20%	25%	19%	20%

Characterizing Survey Respondents

Respondent Demographics	Comparison with Treatment	Treatment		Control	
	P1 (post-T)	P1 (T_pre)	P2 (T_post)	P1	P2
Number of Households (N=1,921)	612	417	198	892	553
Number of Persons (N=2,964)	880	742	309	1,273	700
Age Main Respondent (mean) ***	64	58	60	57	60
Gender Main Respondent (female) (%) **	70%	69%	73%	62%	60%
Primary Wage Earner Employed (%) *	20%	27%	25%	24%	21%
Primary Wage Earner Retired (%) ***	60%	46%	40%	42%	42%
Household Size (mean) ***	1.4	1.8	1.6	1.4	1.3
Single Person Household (%) ***	75%	58%	68%	76%	84%
Education – Some College or more (%)*	44%	38%	25%	33%	42%
Race – White (%) ***	63%	37%	39%	38%	38%
Race – Black (%) ***	20%	24%	26%	50%	54%

◇ Difference is statistically significant at the p<0.1 level. * Difference is statistically significant at the p<.05 level.
** Difference is statistically significant at the p<.01 level. *** Difference is statistically significant at the p<.001.

Demographics – Comparison to National Evaluation of Weatherization Assistance Program(WAP) Single Family and Mobile Home Survey Results

- The affordable multifamily sample is similar to the WAP sample in these ways:
 - Age of main respondent is in late 50's
 - Three quarters of main respondents are female
 - Level of education is similar
- The affordable multifamily sample is dissimilar to the WAP sample in these ways:
 - The average household size is much smaller
 - More primary wage earners report being retired
 - The multifamily sample is much more diverse racially

Health Benefits Highlights

- As expected, general health improved post-weatherization.
- The largest specific health impacts are in the areas of thermal stress and arthritis.
- The lack of impacts on asthma was unexpected.

Social Determinants of Health Highlights

- Energy affordability is a substantial issue for the MF sample, though challenges faced by single family households in weatherization programs appear greater.
- The conditions of the MF buildings and units in our sample are better than what our research has found in the SF/MH sector, which was unexpected.
- Weatherization reduced dustiness, draftiness, noise, odors and infestations of insects.

Building Systems Resilience Benefits Highlights

- Property manager survey data suggest that 35% of the building sample experienced at least 4 extreme heat events lasting more than 3 days while 47% experienced at least one power outage lasting more than 3 days.
- 16% of MF occupants across our full MF sample are currently taking prescriptions that need to be refrigerated and 14% rely on electric medical equipment. Close to half of those stated that an extended power outage would be life-threatening because of their medical vulnerabilities.
- Health outcome data shows that weatherization can improve a building's passive survivability through the installation of standard measures – especially for elders that suffer from medical conditions associated with extreme temperatures, such as heat stress and arthritis flares.

Social and Community Resilience Benefits Highlights

- The subjective resilience of households living in affordable multifamily buildings in the Midwest and Northeast region is strong. The majority of participating households either agreed or strongly agreed that people in their building feel like they belong to a community, help each other, and will stay safe during a natural disaster event.
- 32% of the households in this sample are classified as having very low or low food security. The majority of households (58%) reported they received either food stamps or WIC at baseline (year 1). No significant changes in food security status were observed post-weatherization.
- Of those that pay at least one of their energy bills, 36% reported receiving energy assistance at baseline (year 1). During the second year, a sharp rise in assistance was observed in the control group; the treatment group only minimally increased.