



Healthy Homes Incentive Program: Health Impact Assessment

Alyssa Bruehlman, MS3; Thuy Bui, MD; Ellie King, MID; Ian Brown, MA



Growth Through Energy+Community Health



BACKGROUND

- Residential energy efficiency interventions (REEIs) have been associated with outcomes including:^{1,2,3,5,6}
 - improved thermal comfort
 - decreased relative humidity
 - reduced energy consumption and costs
 - improved physical health and psychological health
- Energy poverty and energy burden disproportionately affect low-income persons^{1,4}
- Allegheny County, PA has significantly aging housing stock
 - 60% of homes built data before 1960, including 30.9% before 1940⁷

HEALTHY HOMES INCENTIVE PROGRAM

- Weatherization/energy retrofit initiative for Allegheny County homeowners
- \$300,000 grant from Allegheny County Clean Air Fund⁹

- Mid/high income group:
 - Partial subsidies up to \$2,500 for those who can invest \geq \$5,000
 - Services coordinated by Growth Through Energy + Community Health (GTECH) Strategies, homeowners contacted GTECH directly
- Low income group:
 - Homeowners already receiving other services through Rebuilding Together Pittsburgh (RTP), secondarily qualified for HHIP interventions
 - Full subsidies, no cost to homeowner

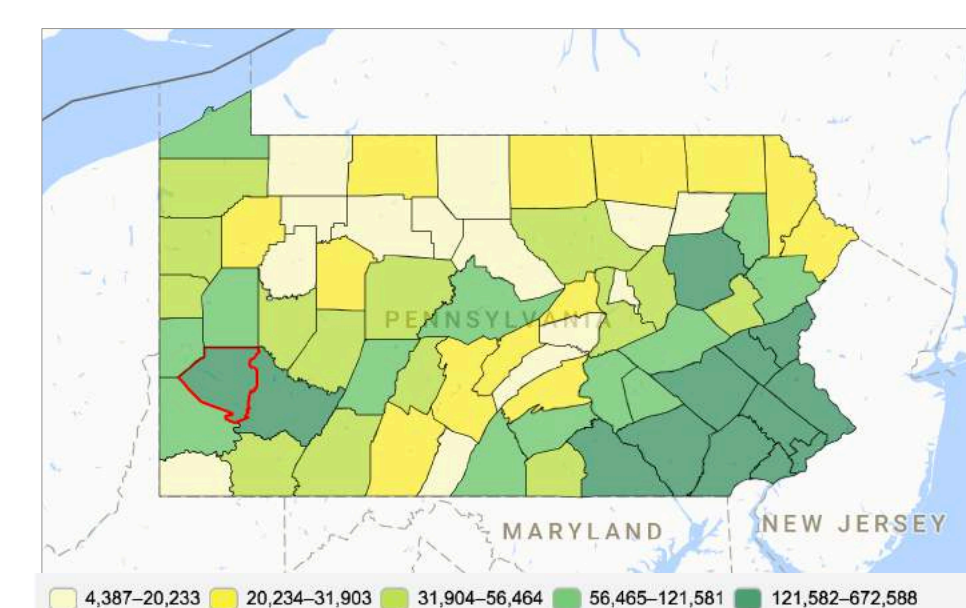


Figure 1. Key denotes number of housing units by county. Allegheny County outlined in red.⁸

OBJECTIVES

- To assess homeowners' perceived sense of health, safety, and financial burden with respect to their indoor home environment
- To assess any health or financial impacts experienced by participating homeowners regarding weatherization and energy retrofit services through the Healthy Homes Incentive Program

METHODS

DATA COLLECTION:

- Meetings at participants' homes, minimum 2 months after finishing HHIP participation
- Two components:
 - Written questionnaire: demographic info and Likert-type scales
 - Interview: audio recorded and later transcribed

ANALYSIS:

- Questionnaire data:
 - Unpaired t-tests, statistical significance at $p < 0.05$
- Interview data:
 - Code defined based on 2 prior studies of energy efficiency interventions^{1,3}
 - 2 sample interviews coded by 2 investigators to ensure appropriateness of codebook, inter-coder reliability
 - Remainder of interviews coded by PI

DEMOGRAPHICS

	Middle-High Income (GTECH, N=12)	Low Income (RTP, N=10)
MEAN AGE	46.5 years (range: 26-76)	69 years (range: 59-78)
GENDER	5 male, 7 female	4 male, 6 female
RACE	10 white, 1 black	6 white, 3 black
HIGHEST SCHOOLING	10 bachelor's or higher 1 associate degree 1 less than 12 years	1 bachelor's or higher 5 some college 3 high school grad/GED 1 less than 12 years
EMPLOYMENT	11 employed 1 retired	8 retired 1 disability

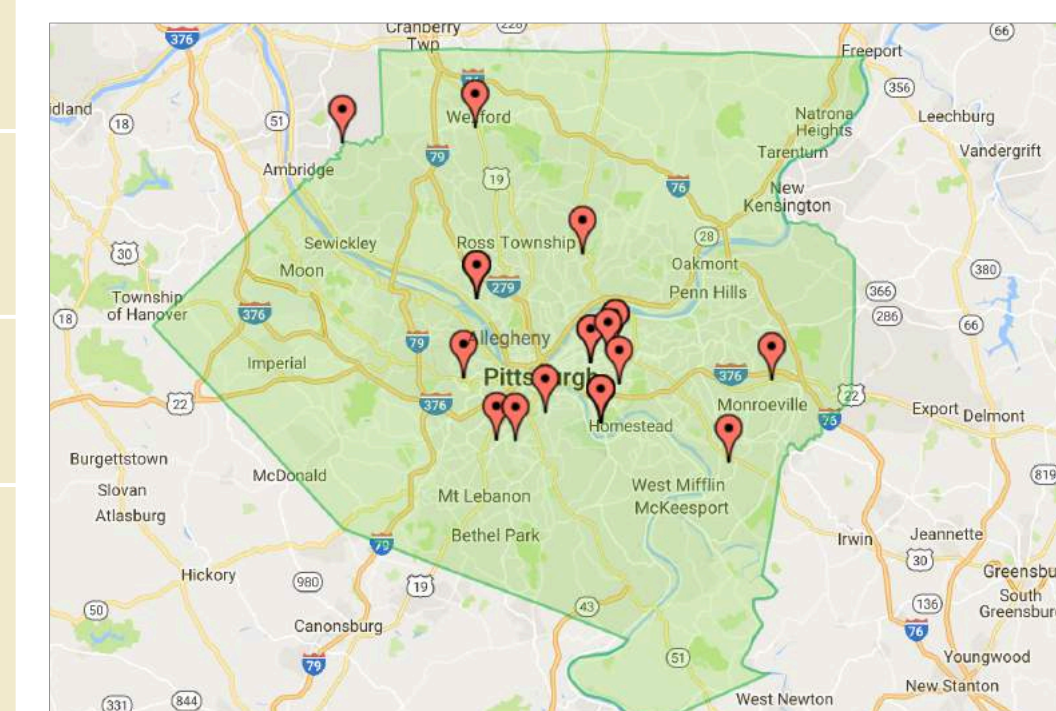


Figure 2. Geographic distribution of participant homes in Allegheny County

Table 1. Demographic survey. N=22 total for all questions except race (N=20) and employment (N=21).

INTERVIEWS: HHIP impacts

AFFORDABILITY

--"I had to cut back [on] the basic needs of maintaining the home...to make sure I could you know, pay the bills...Now, I can take that money and buy a fixture you know without having to go browse through the thrift store." (RTP)

--"[When we] went into this process of investing [in] energy efficiency improvements...Before we signed onto anything we [considered] how much [were] willing to spend, and it was maybe a third of what we ended up spending." (GTECH)

HOME ENVIRONMENT

--"Moisture was coming up through the floor and that encourages mold... Now the basement is dry, the walls are dry, the floor is dry and they put glass block windows in for me." (RTP)

--"Based off the temperature of the home and everything it feels better... I am optimistic it will be better because of the insulation work we had done...the insulation is doing a really good job." (GTECH)

PSYCHOSOCIAL:

--"Before this work was done... I would get really upset because there was nothing I could do. I didn't have the money to fix my house... [This] is a serious help to my mental state. [It's] easier to sleep at night because they did so much work." (RTP)

--"We try to take care of the energy that's used... we're proud of our environmental consciousness in the home and beyond that, too." (GTECH)

--"Absolutely worthwhile because it changed my mental state. You know, I used to just walk around and say bless these people, you know no matter what they come and say." (RTP)

QUESTIONNAIRE: Homeowner values

Topics ranked in order of personal importance (1= most, 5= least)

- No significant difference between groups in mean rankings of health and well-being, comfort, and in-home safety
- Significant difference between groups in mean rankings of **energy efficiency** ($p=0.004$, 95% CI [-2.66, -0.58]) and **ability to pay utility bills** ($p=0.012$, 95% CI [0.05, 2.45]).

	Mid/High Income (GTECH, N=12)	Low Income (RTP, N=7)
[1.75] Health and well-being	[1.71] Health and well-being	
[2.67] Energy efficiency	[2.86] In-home safety	
[3.17] Comfort	[3.00] Ability to pay utility bills	
[3.17] In-home safety	[3.14] Comfort	
[4.25] Ability to pay utility bills	[4.29] Energy efficiency	

Table 2. Topics ranked in order. Mean ranking in brackets.

QUESTIONNAIRE: Before vs. After

On a scale of 1 (worst outcome) to 5 (best outcome) please rate...	Income Level	Mean Point Improvement Pre vs. Post	p-value	95% CI
How challenging it was/is to pay your utility bills	Mid/High	0.50	0.565	(-0.91, 0.51)
	Low	0.70		
Your feelings of safety in your indoor home environment	Mid/High	0.33	0.029	(0.16, 2.58)
	Low	1.70		
Your feelings of physical health while in your home	Mid/High	0.50	0.777	(-0.63, 0.83)
	Low	0.60		
How concerned you were/are about mold, rodents, insects, or lead in your home	Mid/High	0.42	0.437	(-1.76, 0.79)
	Low	0.90		
The overall air quality in your home	Mid/High	1.08	0.968	(-0.84, 0.87)
	Low	1.10		
The overall temperature in your home	Mid/High	1.25	0.102	(-1.66, 0.16)
	Low	0.50		

Table 3. Results from Likert-type scales in written questionnaire. N=12 for mid/high income group, N=10 for low-income.

DISCUSSION

- Homeowners in both groups describe positive trends in quality of life benefits and financial impacts
- Peace of mind and pride in residence contribute to improvement in psychological health of beneficiaries
- Future REEI programs would most benefit those who suffer from high burden of energy insecurity (low SES/fixed income) and those most affected by unsafe or uncomfortable home environments (the elderly, persons with mental health issues/mood disorders).
- Partially subsidized programs are positively received, however large upfront costs are a potential barrier
- Future studies would benefit from prospective design and greater attention to quality of life and mental health metrics

REFERENCES

- Hernandez D, Phillip D. Benefit or burden? Perceptions of energy efficiency efforts among low-income housing residents in New York City. *Energy Res Soc Sci*. 2015 Jul 1;8:52-59. [PubMed: 27054092]
- Liddell C, Guiney C. Living in a cold and damp home: frameworks for understanding impacts on mental well-being. *Public Health*. 2015 Mar;129(3):191-99. [PubMed: 25726123]
- Willard N, Rieley I, Muller C. Towards explaining the health impacts of residential energy efficiency interventions — A realist review. Part 1. *Pathways, Soc Sci & Med*. 2015 May;133:191-201. [PubMed: 25687402]
- Hernandez D, Bird S. Energy burden and the need for integrated low-income housing and energy policy. *Poverty Public Policy*. 2010 Nov;2(4):5-25. [PubMed: 27053989]
- Wilkinson P, Smith KR, Bevers S, Torne C, Oreszko T. Energy, energy efficiency, and the built environment. *Lancet*. 2007 Sep 29;370(9593):1175-87. [PubMed: 17888820]
- Breyer J, Dixon S, Gregory J, Philby M, Jacobs DE, Kreger J. Effect of weatherization combined with community health worker in-home education on asthma control. *Am J Public Health*. 2014 Jan;104(1):e57-64. [PubMed: 24228661]
- U.S. Census Bureau. QuickFacts: Allegheny County, PA. 2015 Jul 1. Accessed 15 Jul 2016. Available at: <http://www.census.gov/quickfacts/allegheny-county-pa>
- U.S. Census Bureau. Map, housing units. QuickFacts: Allegheny County, PA. 2015 Jul 1. Accessed 10 October 2016. Available at: <http://www.census.gov/quickfacts/map/HSG01021542003>
- Allegheny County Health Department. ACHD offers funds for home energy upgrades: Increasing energy efficiency cuts consumption & improves air quality. ACHD Press release. 2014 Mar 5. Accessed 16 October 2016. Available at: http://www.achd.net/pr/pubs/2014release030514_energy.html

ACKNOWLEDGEMENTS

This project would not have been possible without the academic support of University of Pittsburgh School of Medicine Scholarly Project program including Drs. Donald DeFranco, John Fowler, and James Irrgang. Additional thanks to Alan Sisco with Rebuilding Together Pittsburgh, all the staff at GTECH Strategies including former HHIP coordinator Nicole Miller, and tMedia transcription services. Financial support provided through the University of Pittsburgh SP Travel Award and Student Executive Committee funds.