

Addressing Energy Insecurity in Alaska Native Communities through Weatherization Programs: Behavioral and Socio-cultural Dimensions of Perceived Use

Author(s): Amanda Quarshie¹, Dr. Cristina Poleacovschi², Dr. Kristen Cetin³, Marcus Nartey⁴

¹Graduate Research Assistant, Department of Civil, Construction, & Environmental Engineering, Iowa State University. email: quarshie@iastate.edu (*corresponding author)

²Assistant Professor, Department of Civil, Construction, & Environmental Engineering, Iowa State University. email: poleacov@iastate.edu

³Associate Professor, Department of Civil & Environmental Engineering, Michigan State University. email: cetinkri@msu.edu

⁴Graduate Research Assistant, Department of Civil, Construction, & Environmental Engineering, Iowa State University. email: mtnartey@iastate.edu

Keywords:

Weatherization, Alaska Native communities, Community Experiences

RESEARCH PROBLEM

Alaska Native communities (ANCs) are faced with high degrees of energy burden. Energy burden refers to the percentage of household income spent on energy utilities including heat and electricity per year (Brown et al., 2020; MacDonald et al., 2020; Drehobl et al., 2020). In the United States, high energy burden is estimated as more than 6% of household income (Bohr & McCreery, 2020; Moore & Webb, 2022). Comparatively, ANCs spend as high as 47% of household income on residential energy costs (MacDonald et al., 2020; Hossain, 2017). Studies have shown that high energy burden has adverse effects on physical and mental health, food security, housing stability, general well-being and local economic development particularly for low-income communities (Chen et al., 2021; Fabian et al., 2014; Drehobl et al., 2020; Hernández & Bird, 2010; Makhijani, 2021)

Weatherization programs have been a major strategy adopted by federal and state organizations to address energy burden for low-income communities (Hayes et al., 2022). Some studies have shown an energy reduction potential of 30% post-implementation (Gerarden, 2008; Drehobl et al., 2020; Rose & Hawkins, 2020). Weatherization programs generally comprise strategies that enhance the energy efficiency of the building envelope and building systems such as unit heating, cooling, lighting, windows, and water heating (Drehobl et al., 2020; Hayes et al., 2022).

Despite the potential to address energy burden, the adoption of weatherization among low-income households in the US is particularly low (Cluett et al., 2016; Drehobl et al., 2020; Huang et al., 2019). In ANCs, our partner discussions suggest that some weatherization measures are not being used by homeowners as initially designed nor fully perceived useful. As a result, the maximum energy saving potential of weatherization programs are not fully realized. These issues outline the need to study people's motivation driving the use or misuse of weatherization strategies (De Feijter et al., 2021; Southwell & Murphy, 2014; Ashby, 2017).

Current literature on people's motivation with weatherization programs present two major gaps. First, existing studies have over focused on positive experiences or people's desire to use weatherization programs (Rose et al., 2015; Bruce et al., 2015; Raissi & Reames, 2020). These studies provide an under-estimated position of potential negative experiences on the adoption, use and outcomes of weatherization programs. Second, there is a limited understanding of ANCs' experiences with weatherization programs. ANCs share Indigenous knowledge, norms and values that are different from Western perspectives (Barnhardt, 2007;

Barnhardt & Kawagley, 2005). These perspectives are expected to play a critical role in driving their desire to use different weatherization programs.

This paper addresses the need to study behavioral and socio-cultural aspects of weatherization programs implementation by answering two questions: (1) What is the current state of the literature that focuses on behavioral, social and cultural factors determining the use of weatherization programs generally? (2) What are the perceptions and experiences of AN communities with weatherization programs?

BRIEF RESEARCH METHODOLOGY AND APPROACH

This paper used qualitative methods to respond to the two questions. To answer the first question, a systematic literature review was conducted of journal articles from Scopus, Web of Science and Google Scholar databases from 1990 to 2021. A total of 60 peer reviewed journals were identified using “weatherization”, “weatherproofing”, “energy efficiency”, “retrofitting” as key words.

To answer the second question, this paper used the case of one community in Norton Sound region in Alaska. A combination of purposive and convenience sampling methods were used to conduct semi-structured interviews with participants who were available and were willing to participate in the study. To be included in the study, respondents had to be 18 years and older. All interviews were administered face-to-face by one of the trained research assistants in English. All research participants were compensated with a \$50 gift card after the interview. Participants were asked questions about whether they have received weatherization assistance before, what they think about weatherization programs, their experiences and what opportunities exist to improve weatherization programs. After data collection (n=40), interviews were transcribed, coded manually and analyzed using narrative analysis. The study was reviewed by the Iowa State University Institutional Review Board (IRB) and Alaska Area Institutional Review Board (AAIRB) to ensure that research followed acceptable procedures to engage human subjects.

KEY FINDINGS AND IMPLICATIONS

Preliminary finding from the systematic literature review indicated that studies are recent ranging from 2014 to 2020. Geographically, majority (80%) of the studies were conducted in the USA and a few in the UK. However, there was a limited focus on cold regions. In terms of methodology, studies primarily used qualitative methods. Most (60%) of the journal articles analyzed showed that weatherization recipients have had positive experiences as evidenced in improved health, increased thermal comfort, energy cost savings among others. Conversely, only a few papers reported negative experiences such as poor functioning of new windows and doors installed. It was discovered from the literature that some qualified low-income households are not motivated to participate in weatherization programs because of the perception that potential benefits of programs are not commensurate with the struggle applicants face with the application and implementation processes.

To answer the second research question, our conversations with participants revealed that most (55%) of the respondents have no experience with weatherization or had their homes weatherized a long time ago (more than 8 years ago). Perceptions that the benefits of weatherization programs are far less than the efforts made to benefit from them could be one of the reasons for the low weatherization uptake. For those who had participated in weatherization programs, we found that proportion of people who had positive (25%) and negative experiences (20%) are almost the same. In the final paper submission, we will present the specific socio-cultural and behavioral reasoning behind the use of weatherization programs.

This study suggests the need for weatherization agencies to pay keen attention to the perceptions held about programs as well as undesirable experiences to enhance weatherization adoption and use, and improve program outcomes in ANCs.

REFERENCES

- Ashby, K. (2017). Behavior Insights and Tools. How Social Science Has Been — and Could Be — Applied to Connected Programs. *Consortium for Energy Efficiency, September*.
https://library.cee1.org/system/files/library/13330/2017_CEE_Connected_Behavior_Insights__Tools_-_public.pdf
- Barnhardt, R. (2007). Creating a Place for Indigenous Knowledge in Education: The Alaska Native Knowledge Network. *Place-Based Education in the Global Age: Local Diversity*, 113–134.
<https://doi.org/10.4324/9781315769844-13>
- Barnhardt, R., & Kawagley, A. (2005). Indigenous Knowledge Systems and Alaska Native Ways of Knowing. *Anthropology & Education Quarterly*, 36(1), 8–23. <https://doi.org/10.1525/aeq.2005.36.1.008>
- Bohr, J., & McCreery, A. C. (2020). Do Energy Burdens Contribute to Economic Poverty in the United States? A Panel Analysis. *Social Forces*, 99(1), 155–177. <https://doi.org/10.1093/sf/soz131>
- Brown, M. A., Soni, A., Lapsa, M. V, Southworth, K., & Cox, M. (2020). High energy burden and low-income energy affordability: conclusions from a literature review. *Progress in Energy*, 2(4), 042003.
<https://doi.org/10.1088/2516-1083/abb954>
- Bruce, T., Carroll, D., Rose, E., Hawkins, B., Pigg, S., Bausch, D., Greg, D., Blasnik, M., Eisenberg, J., Cowan, C., & Colnlon, B. (2015). *Weatherization Works II – Summary of Findings From the ARRA Period Evaluation of the U.S. Department of Energy’s Weatherization Assistance Program* (Issue July).
- Chen, C., Nelson, H., Xu, X., Bonilla, G., & Jones, N. (2021). Beyond technology adoption: Examining home energy management systems, energy burdens and climate change perceptions during COVID-19 pandemic. *Renewable and Sustainable Energy Reviews*, 145, 111066.
<https://doi.org/10.1016/j.rser.2021.111066>
- Cluett, R., Amann, J., & Ou, S. (2016). *Building Better Energy Efficiency Programs for Low-Income Households* (Issue March).
<https://www.southeastdn.org/wp-content/uploads/2019/11/Building-Better-Efficiency-Programs-for-Low-Income-Households.pdf>
- De Feijter, F. J., Van Vliet, B. J. M., & Spaargaren, G. (2021). Energy Efficient Housing through Organized Interactions? Conceptualizing the Roles of Householders and Providers in Housing Retrofitting in the Netherlands and China. *Housing, Theory and Society*, 38(1), 21–41.
<https://doi.org/10.1080/14036096.2019.1658623>
- Drehobl, A., Ross, L., Ayala, R., Zaman, A., & Amann, J. (2020). How High Are Household Energy Burdens? An Assessment of National and Metropolitan Energy Burden across the United States. In *ACEEE* (Issue September).
<https://www.aceee.org/energy-burden>
- Fabian, M. P., Adamkiewicz, G., Stout, N. K., Sandel, M., & Levy, J. I. (2014). A simulation model of building intervention impacts on indoor environmental quality, pediatric asthma, and costs. *Journal of Allergy and Clinical Immunology*, 133(1), 77–84. <https://doi.org/10.1016/j.jaci.2013.06.003>
- Gerarden, T. (2008). Residential Energy Retrofits: An Untapped Resource Right at Home. *Federation of American Scientists*.
- Hayes, S., Macpherson, M., Gerbode, C., & Ross, L. (2022). *Pathways to Healthy, Affordable, Decarbonized Housing: A State Scorecard* (Issue August).
- Hernández, D., & Bird, S. (2010). Energy Burden and the Need for Integrated Low-Income Housing and Energy Policy. *Poverty & Public Policy*, 2(4), 668–688. <https://doi.org/10.2202/1944-2858.1095>
- Hossain, Y. (2017). *Energy-efficient homes in Alaska: historical and contemporary perspectives on adaptation and innovation*.
<https://core.ac.uk/download/pdf/162579220.pdf%0Ahttp://search.proquest.co>

- m/openview/ea6d606dc68bf3ba883dd4bb614d0f16/1?pq-origsite=gscholar&cbl=18750&diss=y
- Huang, W., Krejci, C. C., Dorneich, M. C., Passe, U., Shenk, L., & Stonewall, J. (2019). Analyzing residential weatherization decisions using hybrid simulation modeling. *Building Simulation*, 12(3), 517–534. <https://doi.org/10.1007/s12273-019-0518-4>
- MacDonald, S., Winner, B., Smith, L., Juillerat, J., & Belknap, S. (2020). Bridging the rural efficiency gap: expanding access to energy efficiency upgrades in remote and high energy cost communities. *Energy Efficiency*, 13(3), 503–521. <https://doi.org/10.1007/s12053-019-09798-8>
- Makhijani, A. (2021). Addressing Energy Burden : Estimate of funds for low- and moderate-income households during the transition to a clean, regenerative, and just energy system. *JUST ENERGY PAPERS*, 1–33.
- Moore, D., & Webb, A. L. (2022). Evaluating energy burden at the urban scale: A spatial regression approach in Cincinnati, Ohio. *Energy Policy*, 160, 112651. <https://doi.org/10.1016/j.enpol.2021.112651>
- Raissi, S., & Reames, T. G. (2020). “If we had a little more flexibility.” perceptions of programmatic challenges and opportunities implementing government-funded low-income energy efficiency programs. *Energy Policy*, 147(August), 111880. <https://doi.org/10.1016/j.enpol.2020.111880>
- Rose, E., Hawkins, B., Conlon, B., & ... (2015). Assessing the potential of social networks as a means for information diffusion—the Weatherization Experiences (WE) project. In *Ornl/Tm-2014/405* ... (Issue April). https://weatherization.ornl.gov/wp-content/uploads/pdf/WAPRecoveryActEvalFinalReports/ORNL_TM-2014_405.pdf
- Rose, E. M., & Hawkins, B. A. (2020). *Background Data and Statistics on Low-Income Energy Use and Burden for the Weatherization Assistance Program: Update for Fiscal Year 2020* (Issue June). <https://www.osti.gov/servlets/purl/1761662/>
- Southwell, B. G., & Murphy, J. (2014). Weatherization behavior and social context: The influences of factual knowledge and social interaction. *Energy Research & Social Science*, 2, 59–65. <https://doi.org/10.1016/j.erss.2014.03.019>