

Exploring an equitable transition to clean heating in cold climates

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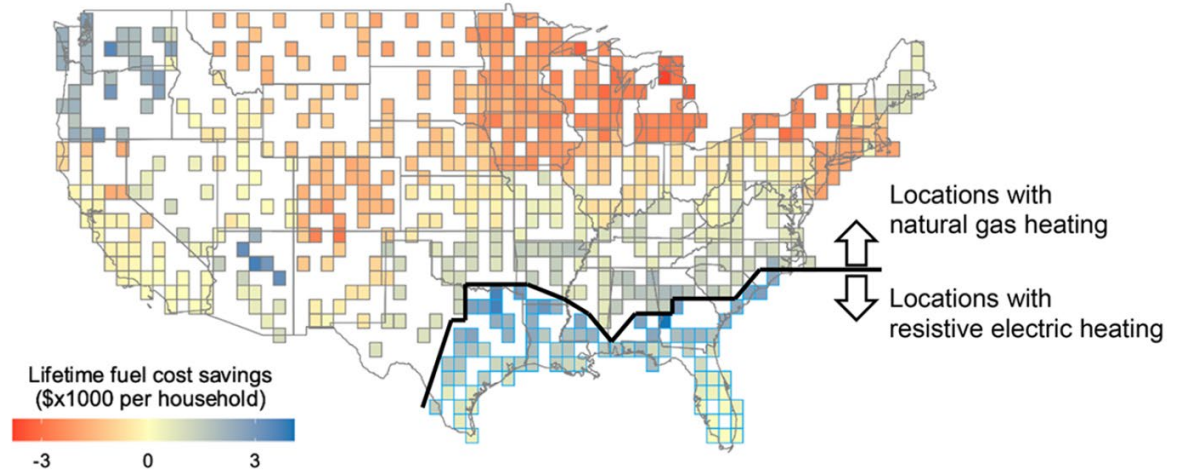


How I arrived at this work...



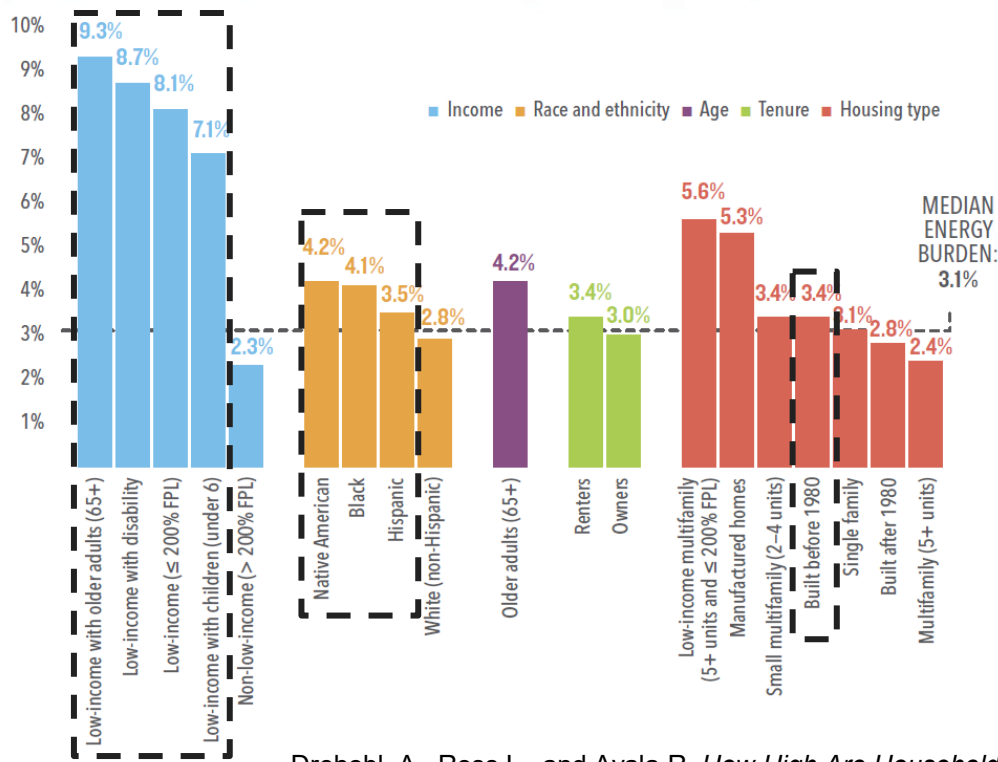
Lifetime fuel cost savings from a switch to heat pumps with current generation mix

Switching to a heat pump **increases energy cost**, especially in the upper midwest



Historically **marginalized communities** experience the **highest energy burden** nationwide

FIGURE ES1. National energy burdens across subgroups (i.e., income, race and ethnicity, age, tenure, and housing type) compared to the national median energy burden

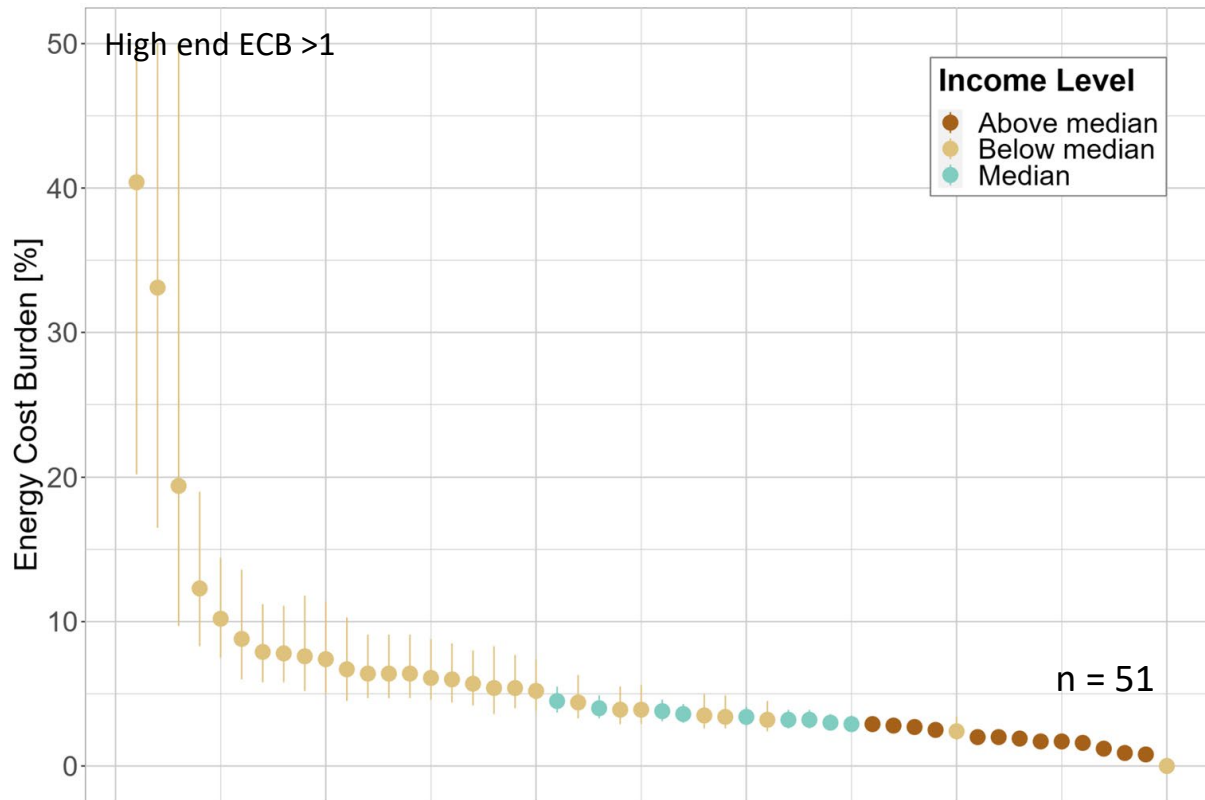


Drehobl, A., Ross L., and Ayala R. *How High Are Household Energy Burdens? An Assessment of National and Metropolitan Energy Burden across the United States*. Prepared by ACEEE Washington, DC, 2020.



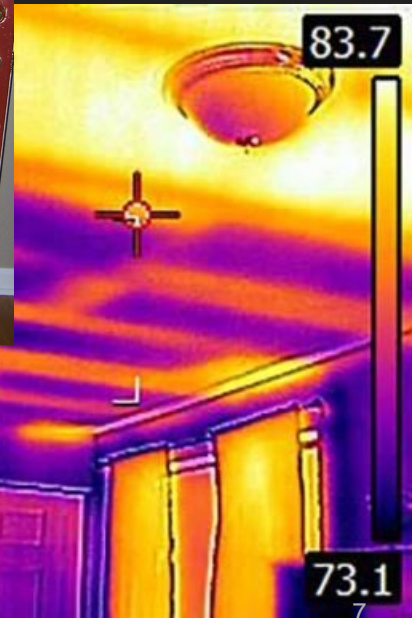
Disparity in quality of housing is at the core of energy burden

Setting the baseline for energy burden

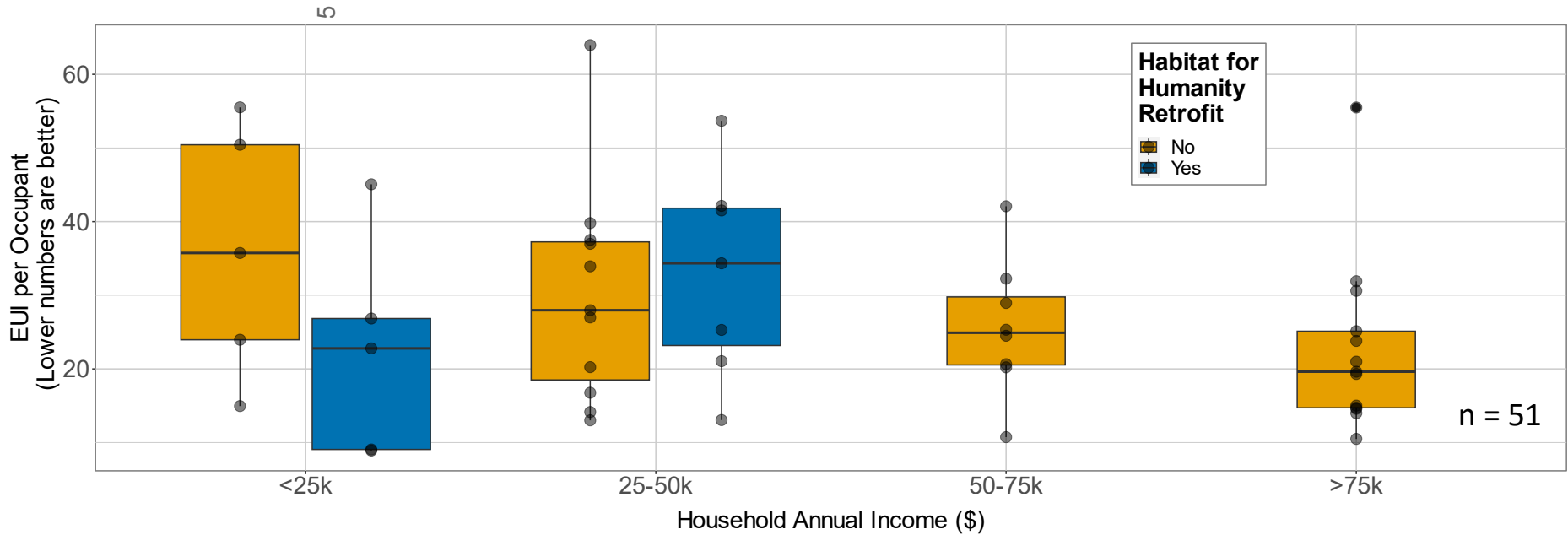


Heating with Justice

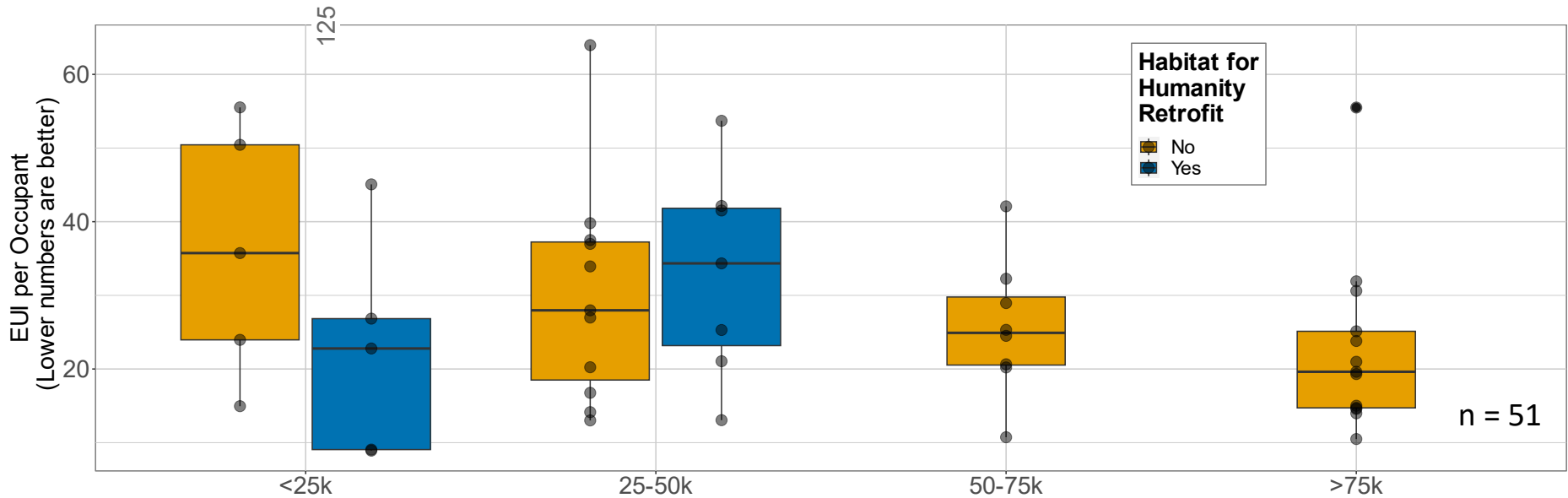
- **51 houses** in Southeast Michigan
Mix of urban, rural, suburban
- **Professional energy audit performed** at every house: incl. blower door
- Obtained gas and electric **metered utility data** for one year
- Installed **smart thermostats** in every home



Lower income folks live in less efficient homes



Lower income folks live in less efficient homes



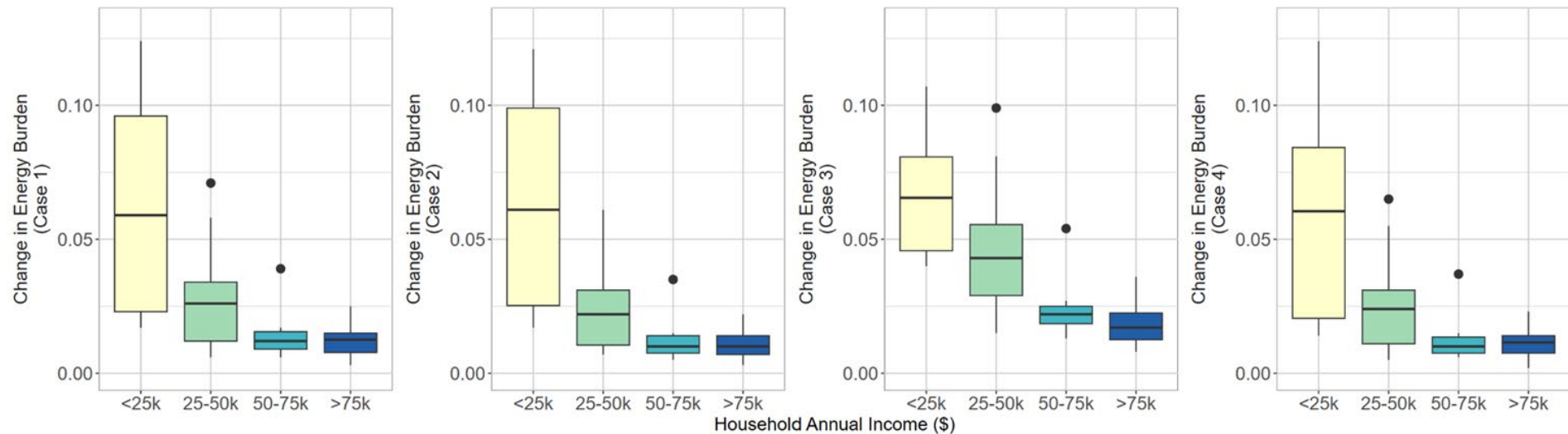
Below median income for county

Below median income for county

Median income

Above median income for county

Energy burden increase for below median households 4 times higher than those at or above median income



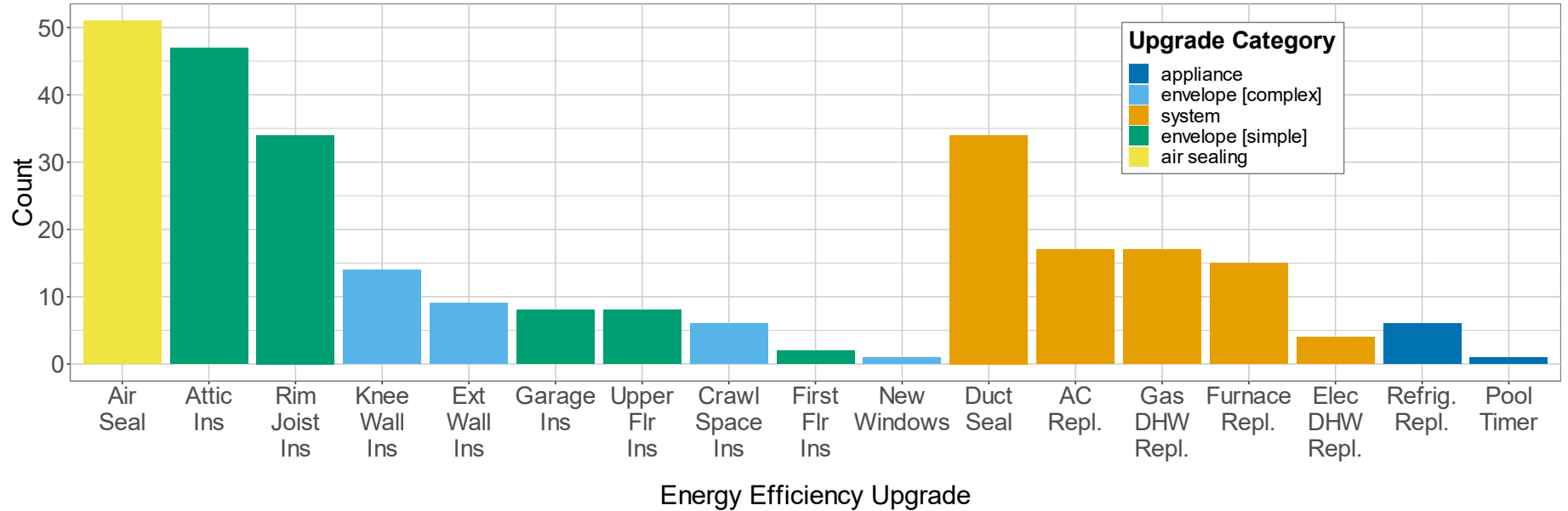
Case 1: Standard flat electricity rate and 2022 natural gas cost

Case 2: Standard time of use electricity rate (DTE D1.11) and 2022 natural gas cost

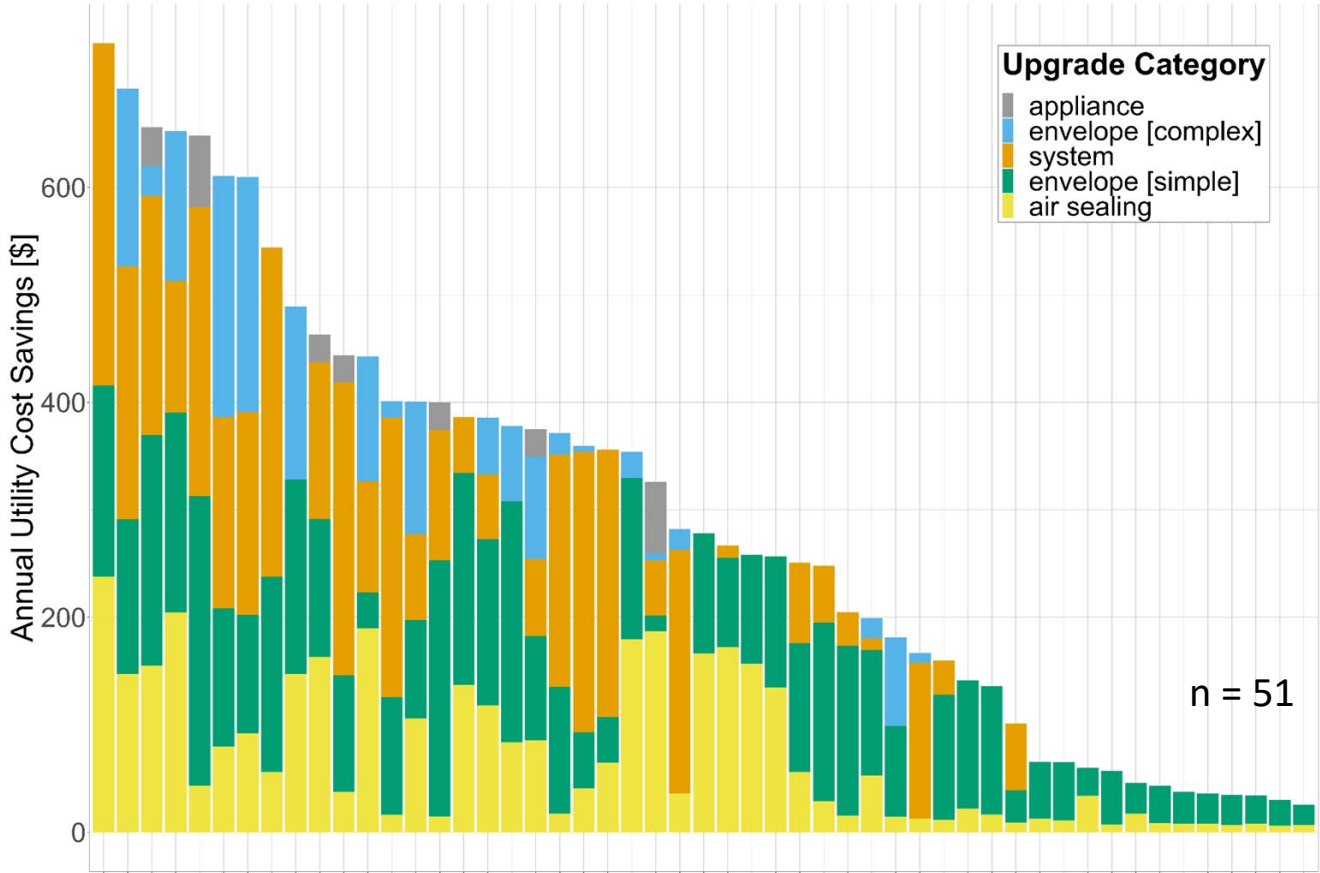
Case 3: Enhanced time of use electricity rate (DTE D1.2) and 2022 natural gas cost

Case 4: Standard flat electricity rate (DTE D1) and 2023 natural gas cost.

No clear pattern for energy cost savings from retrofits



No clear pattern for energy cost savings from retrofits



What are participants saying?

I keep the heat at 64 during the day because propane is so expensive.

I'm paying almost \$800 a month for heating, I can't afford the renovation.

My energy bills have gone up by double in the last ten years, at least.

We just bought this place - are we failing? Did we get the worst score?

I blocked off this room because the house costs so much to heat.

They told me the bills were going to be \$50 a month, but in winter it's \$80.

Next step - qualitative research exploring barriers to energy efficiency adoption

Thank you!

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