The Effect of Incentive-Based Pay in the Weatherization Assistance Program on Energy Efficiency in Illinois

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Partner organization(s): Illinois Home Weatherization Assistance Program (IHWAP)

Retrofitting is a key strategy for improving energy efficiency in homes and buildings and is crucial for reducing greenhouse gas emissions. Although home upgrade programs offer improvements that are often cost-effective, actual savings often fall short of projections. Researchers conducted a randomized evaluation of the Illinois Home Weatherization Assistance Program (IHWAP), which aims to improve energy efficiency in low-income households. The study tested the impact of performance-based pay for contractors implementing air sealing retrofits as part of IHWAP. Contractors were randomly assigned to receive either no bonus, a low bonus (US$0.40), or a high bonus (US$1.00) per unit of air sealing beyond the target. The introduction of performance bonuses led to increased air-tightness in homes, reduced the likelihood of contractors being called back due to deficiencies, and resulted in overall reductions in household energy use.

Policy issue

The building sector accounts for 30 percent of annual greenhouse gas emissions in the United States, due largely to inefficient and leaky buildings that require energy-intensive heating and cooling systems. To address this, many organizations invest in large-scale energy efficiency upgrades and retrofits for existing buildings. Air sealing—the identification and sealing of air leakage sites, including those in attics, walls, basements, and/or crawl spaces—is one key strategy. The United States has addressed this issue through federally funded programs like the Weatherization Assistance Program (WAP), which aims to mitigate climate change and reduce energy costs for low-income households by enhancing energy efficiency. In Illinois, this initiative operates as the Illinois Home Weatherization Assistance Program (IHWAP), which focuses on improvements such as air sealing.

Previous research has found that home upgrade programs often deliver less savings than expected, with contractor underperformance and modeling bias identified as drivers of these differences. While enforcing minimum quality standards might improve workmanship, some stakeholders believe that offering performance-based pay may facilitate a more efficient allocation of contractor effort. Yet, there is limited evidence on how these incentives influence contractors' work, especially for air

sealing retrofits. This study investigated whether performance-based pay can meaningfully enhance energy savings and overall program outcomes.

Context of the evaluation

The WAP is the largest US residential weatherization program, annually reducing energy costs for approximately 35,000 low-income households by increasing home energy efficiency.[1] Illinois, along with four other states, accounts for roughly one-third of the program funding, which is allocated based on factors such as weather conditions and the size of the low-income population. The IHWAP operates through roughly 33 agencies that serve the state's 106 counties. Air sealing is among the four major energy-saving retrofits that these agencies perform—wall insulation, attic insulation, and furnace replacements comprising the remainder—and is especially important for homes older than 20 years, which tend to be leakier.

The Bipartisan Infrastructure Investment and Jobs Act, approved in late 2021, allocated US$3.5 billion to expand the WAP. This additional funding presented a timely opportunity to improve the cost effectiveness and energy efficiency of air sealing upgrades. Within the IHWAP, all counties outside of Cook County utilized fixed payments for air sealing that were based on the initial leakage level, providing the opportunity to evaluate the impact of performance-based payments for contractors in these areas. Researchers hypothesized that offering bonuses to contractors based on the reductions of leakiness of the house after air sealing would incentivize higher quality work and further reduce emissions.



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Details of the intervention

Researchers conducted a randomized evaluation to test the impact of piece-rate incentives for contractors, utilizing both low and high incentive payments to understand how contractors respond to different rates. The primary outcomes of interest were air sealing effectiveness, measured by using blower door tests—which assess how leaky a house is—and energy savings, determined through utility bill data.

The study used job-level randomization, assigning 1,698 contracts to one of three groups. This approach allowed individual contractors to work across any of the treatment groups, facilitating a thorough comparison of strategies:

- High payment group: Jobs assigned to this treatment group included an offer of US$1.00 per unit of air sealing achieved beyond the target.
- Low payment group: Jobs assigned to this treatment group included an offer of US$0.40 per unit of air sealing achieved beyond the target.
- Comparison group: Jobs assigned to this treatment group did not include a bonus offer beyond the usual fixed payment.

Between 2018 and 2019, jobs were randomly assigned to one of three groups using the same software that assigned work orders to contractors in the IHWAP. Contractors performed the air sealing work in eligible homes as part of the regular weatherization process. Contracts for jobs in the high payment and low payment groups explicitly highlighted the performance-based incentive assigned to the job.

Researchers used comprehensive administrative data, inspection reports completed by quality control inspectors, and monthly gas and electric billing data to estimate the effect of the intervention. The evaluation measured three outcomes: homes' air-tightness, likelihood of contractors being called back by inspectors to fix deficiencies, and household energy use. To measure home's air-tightness, or how well a building prevents air leakage, blower door tests, the standard practice in the industry, were used. Blower door tests involve placing a large fan at the entrance of a home to pull air out of the house, creating a pressure difference. The amount of air needed to maintain this pressure, measured in CFM50 (cubic feet per minute at 50 Pascals), indicates how tightly sealed the home is.

Results and policy lessons

Performance-based incentives for the IHWAP contractors improved the effectiveness of air sealing retrofits, reduced the likelihood of contractors being called back due to deficiencies, and resulted in overall reductions in household energy use.

Air Sealing Effectiveness and Callbacks:

The bonus payment regime—including both high and low incentive payments—resulted in an average reduction of 89 CFM50 beyond the 1563 CFM50 reduction achieved by contractors with fixed payments (a 5.7 percent increase in air-tightness). Additionally, performance incentives, whether high or low bonus payments, reduced the probability of inspectors calling back contractors to fix deficiencies by 2.95 percentage points relative to a baseline callback rate of 7.8 percent for contractors with fixed payments (a 37 percent decrease). Researchers found no significant difference between the high and low payment treatments on callbacks or air sealing effectiveness.

Energy Savings:

Jobs that were randomly assigned to performance-based bonuses, whether high or low, led to reductions in household energy use. These homes decreased their gas consumption by an average of 0.28-0.38 MMBtu (million British thermal units) beyond the 1.58-1.62 MMBtu reduction achieved in jobs with fixed payments—a 5.5 percent decrease.

Assignment to a high-payment or low-payment job did not lead to lower-quality performance in subsequent fixed payment retrofits, suggesting that contractors maintained quality across all assigned jobs. Moreover, contractors who previously

performed high-quality jobs responded more strongly to the incentives.

Cost Effectiveness:

Researchers estimated the program's cost-effectiveness by examining both its private (which is the metric relevant for WAP) and social benefits and evaluating how efficiently government spending translated into public gains. They found that while the high payment incentives led to slightly larger benefits per home, the low payment incentives proved to be more cost-effective. The results suggest that it may be more cost-effective to distribute smaller bonuses across a larger number of contracts rather than providing large bonuses to fewer contracts.

Overall, the findings in this paper suggest that performance-based pay for weatherization services has the potential to reduce household energy consumption. Air sealing can also be a key strategy in abating household greenhouse gas emissions and contractor incentives, structured like the ones in this evaluation, can offer a cost-effective solution to providing increased air sealing to leaky homes.

https://www.nber.org/papers/w31322

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1. Brookings Institution. "The U.S. needs better, more accessible home weatherization programs.". 2022. https://www.brookings.edu/articles/the-u-s-needs-better-more-accessible-home-weatherization-programs/.