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"If we had a little more flexibility." perceptions of programmatic challenges and opportunities implementing government-funded low-income energy efficiency programs

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ABSTRACT

Since 1976, the U.S. Department of Energy's Weatherization Assistance Program (WAP) has provided state block grants for no-to low-cost energy efficiency retrofits for more than 7 million low-income households. Yet, more than 35 million households meet income-qualifications for the program. While numerous program evaluations demonstrate the energy- and non-energy-related benefits of WAP, some argue low uptake, and a low rate of return on retrofit costs to energy savings. To further our understanding of government-funded low-income energy efficiency program implementation, we examined local agency-level perceptions of challenges and opportunities. Findings from semi-structured interviews with program managers, representing one-third of Michigan's WAP funding and retrofit production, suggest three funding-related challenges: funding instability; funding allocation formula; and limited advertising and marketing funding, and two regulatory-related challenges: cumbersome paperwork and restrictive guidelines. Program managers also identified three workaround opportunities: collaboration with utilities and other organizations; intra-agency innovation and integration; and strategic productivity and per unit spending. Lastly, one recommendation for further exploration would be testing the efficacy of granting local agencies greater flexibility to work around funding and regulatory challenges to increase the number of households weatherized, reduce long waitlists and deferral rates, and use staff time more efficiently.

1. Introduction

According to data from the United States Energy Information Administration (EIA), twenty-three million homes (approximately 20% of all U.S. homes) are poorly insulated or have no insulation at all (U.S. Energy Information Administration, 2018). There are major disparities in energy costs and consumption experienced by low-income households when compared non-low-income households. Studies of national energy consumption data show that lower-income households live in smaller homes and consume less energy (Min et al., 2010; Adua, 2010; Ewing and Rong, 2008). Consequently, low-income households have smaller utility bills relative to the average household and higher income households, spending 21 percent less than non-low-income households. While this fact may be viewed positively, a contrary relationship exists when energy costs are normalized by housing square area. For instance, low-income households spend 20 percent more per square foot on energy and consume 27 percent more energy per square foot than non-low-income households (Health and Human Services, 2011). Energy poverty is often operationalized by residential energy burden, or the proportion of household income spent on energy costs. Often households who spend more than 10 percent of their income on energy costs are considered energy poor. These measures of energy burden and energy efficiency illustrate that low-income households, on average, suffer disproportionately higher energy burdens and live in less energy efficient housing.

Moreover, having low incomes inhibits households from investing in energy efficiency improvements. Energy efficiency investments often involve high initial costs, followed by incremental savings over time. Since low-income households are often unable to cover upfront costs and tend to be more credit strained, they are more likely to settle for cheaper, less energy-efficient alternatives or choose to make no improvements at all (Crandall-Hollick and Sherlock, 2018). For low-income households, the split-incentive barrier to energy efficiency is particularly acute as 67% of households in poverty are renters (U.S. Census Bureau, 2018a).

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The split-incentive barrier to energy efficiency is a principal-agent problem occurring when landlords, as the energy efficiency decision-maker, decide not to pay for energy efficiency improvements because they themselves do not directly receive the benefits of the investment (Bird and Hernández, 2012). For many landlords, investing in energy efficiency improvements is often an unprofitable proposition, especially when considering 87% of renters are responsible for paying some or all of their energy costs (U.S. Energy Information Administration, 2018). Furthermore, 82% of WAP benefits go to owner-occupied units (Reames, 2016a). It is necessary to also consider and humanize the lived experience of households in energy poverty and its health impacts (Sovacool, 2015). Households who struggle to pay energy costs also choose unhealthy tradeoffs as a coping strategy. The 2015 Residential Energy Consumption Survey (RECS), found that 25.4 million U. S. households reduce or forgo food or medicine to pay energy costs (U.S. Energy Information Administration, 2018).

Increasing energy efficiency for low-income households exhibits great potential for energy poverty reduction by directly addressing energy inefficiency as a key underlying cause of energy poverty (Scarpellini et al., 2019). National governments, such as United States, France, Norway, Spain, United Kingdom, and others, have funded energy efficiency schemes focused on low-income households to address energy poverty.

In the U.S., the Weatherization Assistance Program (WAP) is the country's largest and longest running government-funded energy efficiency program (Bednar and Reames, 2020). The WAP is administered by the Department of Energy and was established in 1976 under the Energy Conservation and Production Act "in order [both] to aid those persons least able to afford higher utility costs and to conserve needed energy." (PUBLIC LAW 94-385, 1976). Part 440.1 of chapter II under title 10 of the Code of Federal Regulations (10 CFR 440.1) discusses the purpose and scope of the Weatherization Assistance Program as

> "to increase the energy efficiency of dwellings owned or occupied by low-income persons, reduce their total residential expenditures, and improve their health and safety, especially low-income persons who are particularly vulnerable such as the elderly, persons with disabilities, families with children, high residential energy users, and households with high energy burden"
>
> (Code of Federal Regulations, 2000).

The WAP has long been subject to political debates and has gone through multiple program evaluations, forming arguments around both its cost-effectiveness and impact. These evaluations highlight performance challenges for the local Community Action Agencies (CAAs) primarily responsible for implementing the WAP. However, some argue that a sole focus on program cost-effectiveness may often overshadow a more holistic understanding of implementation challenges. As a complement to a previous evaluation on WAP implementation in Michigan (Fowlie et al., 2018) and in an effort to explore some less attended to aspects of WAP implementation in the literature, this study focuses on local agency perceptions of challenges and opportunities faced by program managers as they implement the program. To this end, we had three primary research questions: 1) what are the programmatic challenges to implementing WAP; 2) what are the impacts of these challenges on program implementation; and 3) what opportunities do agencies see to overcome implementation challenges?

The next section provides background and literature review on WAP and its evaluations. Section 2 explains the methodology and data used in the study. Section 3 presents a discussion of the key themes resulting from data analysis. Results from this study can raise additional awareness among policymakers about the impacts of WAP, emphasize the challenges facing program implementation and highlight potential opportunities CAAs may leverage, given the unique characteristics of their agencies and service areas. The final section of the paper provides conclusions and policy implications.

1.1. The Weatherization Assistance Program (WAP)

The WAP was created to address concerns about low-income household energy unaffordability. Its creation followed the political alignment between anti-poverty advocates demanding energy equity, and business and labor groups demanding that the federal government act to stabilize energy prices and supply during the 1970s energy crisis (Melosi, 1985; Higgins and Lutzenhiser, 1995). Based on the success of early emergency weatherization programs designed to reduce heat losses and energy use, the WAP was authorized by the Energy Production and Conservation Act of 1976 (Kaiser and Pulsipher, 2004; Higgins and Lutzenhiser, 1995). The Department of Energy's (DOE) Office of Energy Efficiency and Renewable Energy administers the WAP. Weatherization funding is provided to states through federal block grants. Briefly explained, WAP is a means-tested program which provides no-to low--cost energy efficiency measures (e.g. furnace, water heater, insulation) to income-qualified households based on annual federal income guidelines. WAP is available to both homeowners and renters and residents receive service with the same prioritization criteria regardless of their tenure. The DOE annually accepts applications from grantees (i.e. U.S. states, the District of Columbia, U.S. territories, and Native American tribes). The funding received by grantees is distributed among sub-grantees to implement WAP locally. Three factors are considered in determining the WAP formula allocation including low-income population, climatic conditions, and residential energy expenditures by low-income households in each state. In addition to the formula allocation, each state has a fixed, base allocation which differs from other states. A portion of the WAP funding appropriation is allocated to administrative funding which goes toward operating the program. WAP is defined as a production-based program. The number of weatherized units is referred to as production and thus the measure of success for WAP implementers. Local administration of WAP is carried out by local government and non-governmental organizations, primarily Community Action Agencies (CAAs). CAAs were established around the country under the "Economic Opportunity Act" of 1964 and designed to be non-governmental agencies who operate programs with federal funding. Currently 85% of CAAs operate as non-governmental organizations (Bunch and Sulamoyo, 2017).

Historically, WAP funds targeted households at or below 125% of federal poverty line (FPL) (Brown et al., 1993). After the energy crisis of 1990s, the program guideline was expanded to 150% of FPL (Tonn et al., 2003). Finally, in the wake of the Great Recession of the 2000s, income eligibility was further expanded to 200% of FPL as more Americans became un- and under-employed and unable to afford rising energy prices. Annual appropriations for WAP have never exceeded $250 million dollars, except for the fiscal year 2009 during which the program received $450 million, preceding a $5 billion federal appropriation stimulus package under the American Recovery and Reinvestment Act of 2009 (ARRA) (Reames, 2016b), an allocation that has been referred to as a "windfall of money" for WAP (Carley et al., 2015). However, eligibility expansions combined with increased need for assistance, during periods of economic crisis, potentially offset any increase in the program funding allocation. Fig. 1 illustrates the annual congressional appropriation levels for WAP, including ARRA, since 1977.

As with most social programs, WAP funding levels are inconsistent with the overall need for assistance. Although more than 7-million homes have been retrofitted through WAP since 1976, more than 35 million households meet income-qualifications for the program. The WAP is sometimes framed as a welfare program rather than an energy program, exposing it to reduced funding threats, or worse, elimination. The Trump administration proposed eliminating WAP under its Department of Energy budget adjustments for 2018, 2019 and 2020 (U. S. Department of Energy, 2017b, 2018, 2019); however, the U.S. Congress has consistently appropriated funds to continue WAP. This funding uncertainty often holds state grantees and local sub-grantee implementing agencies, and more importantly energy poor

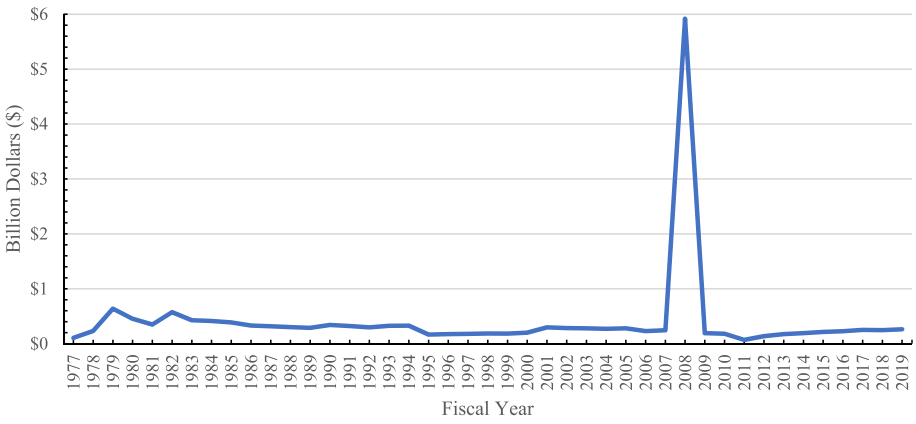

Fig. 1. Weatherization Assistance Program Federal appropriations, 1977–2019. Source: LIHEAP Clearinghouse

households, in a programmatic limbo until Congress deliberates and passes its budget.

1.2. Weatherization Assistance Program evaluations

As with many federal assistance programs, WAP is expected to be economically reasonable based on a cost-benefit analysis. Cost-effectiveness has been assessed via evaluations and meta-evaluations which use energy savings based on pre-weatherization energy consumption and expenditure as the primary measures compared to the weatherization costs. The first national evaluation of WAP was done in 1993 based on the results from the 1989 program year. The purpose of this evaluation was to do a benefit cost analysis of the program as well as to calculate energy savings (Brown et al., 1993). In a continued effort to understand the value of WAP, the first meta-evaluation was done covering the period of 1990–1996. This study was an evaluation of 19 studies collected from 15 states (both published and unpublished) (Berry, 1997). This was followed by another meta-evaluation covering the period of 1996–1998, assessing data from ten studies done by six states and the District of Columbia (Schweitzer and Berry, 1999). The two meta-evaluations found huge differences between their calculated energy savings of weatherization compared to that of the 1989 national evaluation. Both studies concluded that these differences could possibly be attributed to the increased uptake of more sophisticated efficiency measures in addition to a more precise energy audit process using the blower door test. Corresponding with these analyses, two other meta-evaluations were done on state studies to collect updated data and to cover all climate regions. The first, based on data collected from thirty-seven studies found that households who were higher energy consumers before receiving weatherization could achieve significantly more savings in terms of energy costs while lower energy users had a narrower margin to decrease their consumption (Berry and Schweitzer, 2003). These findings were consistent with previous studies in that the energy savings were now higher than those found in the national evaluation of 1989.

However, Clinch and Healy (2001) argued that most economic evaluations rarely capture the benefits of energy efficiency programs beyond the dollar value of energy savings and some environmental benefits (mainly reduction in carbon dioxide). Thus, a more holistic understanding of energy efficiency benefits is needed. In the Oak Ridge National Laboratory (ORNL) WAP evaluation reports, all the energy and non-energy benefits (NEBs) of WAP are considered, including avoided cost of health problems resulting from weatherization. The authors concluded that the benefits of weatherization are four times greater than its cost when accounting for NEBs (Tonn et al., 2014a). Considering NEBs further increases the saving-to-investment ratio (SIR) of the program, which in turn helps demonstrate WAPs impact and supports an economic justification of the program. Findings from this evaluation are consistent with similar studies. For instance, Goodacre et al. (2002) also accounted for the benefits achieved from avoided health costs and increased employment opportunities as a result of energy efficiency practices. Tonn et al. (2014b) explored the connection between WAP and other energy assistance programs like the federal Low-income Home Energy Assistance Program (LIHEAP) and other social safety net programs (including government-funded health insurance programs like Medicaid). The first-year societal benefits from WAP implementation (in Program Year 2008) for prevented Emergency Department (ED) visits and hospitalization, caused by unintentional, non-fire related (UNFR) carbon monoxide poisoning, alone, were valued at over $30k and $47K in avoided Medicaid and Medicare costs, respectively, and over $6 million in societal benefits from reduced need for food assistance. Nevertheless, while numerous studies and evaluations demonstrate convincing evidence of the net societal benefits to WAP, “the extent to which research in the area of economic evaluation of energy efficiency programs is beneficial depends upon whether the programs themselves can be effectively implemented” (Clinch and Healy, 2001).

Despite the results from the ORNL evaluations on the benefits of WAP, a study was conducted in 2015, based on a sample of approximately 30,000 households in five counties in Michigan, concluded that WAP has a very low rate of return, and the upfront cost of the program’s energy efficiency investments are about twice the cost of its realized energy savings. (Fowlie et al., 2018). However, the authors do mention that WAP reduced energy consumption for the participant households by 10–20%. Fowlie et al. (2018) also found low program uptake through the WAP process life cycle from application to energy audit to completed weatherization. The authors noted several factors that explain low uptake, including a failure to follow-through on requests for more information and a failure to meet program eligibility requirements. Considering the national retrospective evaluations together with the Michigan-based study described above, this paper attempts to improve the understanding of government-funded low-income energy efficiency programs, by exploring the challenges and opportunities for local implementation of WAP from the perspective of program managers in Michigan.

2. Methodology

2.1. Study area description

Michigan is consistently one of the highest recipients of WAP appropriations, coming second after New York in 2017, due to its climatic conditions, the number of low-income households, and low-income household energy expenditures (U.S. Department of Energy, 2017a). This study focuses on five counties in Michigan, served by four Community Action Agencies (one agency serves two counties). The area is home to a population of around 4 million total and approximately 1.3

million people (roughly 250,000 households) below 200 percent of the U.S. federal poverty level (U.S. Census Bureau, 2017). In 2019, the Michigan Department of Health and Human Services (MDHHS) was appropriated approximately $16.9 million in WAP funding. During this program year, the four agencies in this study accounted for approximately one-third of Michigan's WAP allocation and were responsible for one-third of the state's weatherized homes. The cumulative funding in 2019 for these four agencies exceeded the funding allocation of 38 states (excluding training and technical assistance) (Michigan Department of Health and Human Services (MDHHS), 2019).

The four agencies serve a large share of the state's households receiving public assistance. The study area is home to 41% of Michigan households who received public assistance income, 45% of households who received government-provided food assistance known as Food Stamps or Supplemental Nutrition Assistance Program (SNAP), and 41% of the population covered under Medicaid (United States government-provided health coverage for income-qualified people) (US Census Bureau, 2017, 2018a; 2018b). Despite the relatively small sample size, we believe results from this study could have implications and applications beyond the study area, particularly in large metropolitan areas, as many of the themes discussed here are related to general WAP operations which are consistent with the stringent implementation and regulatory requirements of this Federal Government-funded program.

2.2. Data collection and analysis

Semi-structured phone interviews were conducted, in 2017, with four senior-level staff members responsible for WAP implementation at their agency. Interviews were transcribed verbatim, creating the material for performing qualitative data analysis. Interviewees were asked questions on the Weatherization Assistance Program in the following areas: program procedures; agency approach in program implementation; funding allocation; average expenditure; challenges for implementing the program; area-specific characteristics; program impacts; opportunities for improvements; and impacts of potential program elimination or budget allocation cuts. While we recognized that semi-structured interviews could introduce bias, we ensured that during all interviews we were careful not to nudge the interviewees in any particular direction. Most importantly, program manager perceptions were derived from answers broad questions, while more specific questions dealt with general WAP guidelines, instructions, and programmatic expectations. The list of interview questions can be found in Appendix A.

The qualitative analysis software ATLAS.ti was used to code transcribed interviews. A hybrid approach was taken for coding, combining a list of pre-set codes (where applicable) and free-coding to capture nuances. Due to the richness of the ideas discussed in the interviews, free-coding was primarily used since the pre-set list could not fully capture the diversity and comprehensiveness of the interview responses. The overall coding was done based on the NCT model (Friese, 2014; Saldaña, 2016). This model consists of a non-linear multi-cycle approach for qualitative coding. The first-cycle coding was performed at the first encounter with the transcripts to gather information and ideas. The interview transcripts were scanned and highlighted for common words, terminology and discussed concepts. A list of these words/phrases was prepared as the result. A second assessment was done to determine the frequency of each word/phrase or concept coming up during the interviews. A simple count of instances was the result of this step. A final list of 23 phrases/concepts with higher frequency was chosen as representative of the discussed points. The described steps together consisted the first cycle of coding.

During the second cycle of coding, a more flexible approach was adopted, looking to enrich the set of ideas related to each of the pre-set codes discussed in the first cycle. The flexibility assisted with categorizing the concepts while enriching each category as well as identifying other patterns, new codes/categories and getting insight as new connections were made between the concepts. The codes were grouped into families based on similarity of the concepts they presented. Numerical prefixes were assigned to the codes to help categorize them into smaller groups within each family. Later, inside each family, the codes with similar information were merged and grouped into broader topics or super-codes while other ones became subsets. At this stage the super-codes were divided to categories and subcategories based on their broadness, and the subsets became the collection to form meticulous codes to assess the subject matter. The categories were finally grouped to create higher order themes. Lastly, the subcategories were linked to their related lower order codes, associated with quote(s) where applicable. The results from this analysis are presented and discussed in the next section. The list of the pre-set codes and an example describing numbering and categorizing the codes are included in Appendix B.

3. Results

This section contains findings from the data collection and analysis methods described above. Quotes from interview participants are included with minimum editing, except when required for clarification or confidentiality purposes, such as removing names of persons, organizations, and locations. We detail program manager perceptions on how challenges manifest in the implementation of WAP as well as opportunities they see or have initiated to improve program implementation. Program managers identified five challenges as impediments to effective WAP implementation. They can be categorized as follows: three funding-related challenges: funding instability; funding allocation formula; and limited advertising and marketing funding, and two regulatory-related challenges: cumbersome paperwork and restrictive guidelines. Beyond the identified challenges, program managers also described opportunities for challenge workarounds. Three such workaround opportunities were identified: collaboration with utilities and other organizations; intra-agency innovation and integration; and strategic productivity and per unit spending to increase the number of homes weatherized. Table 1 illustrates the WAP implementation barriers, impacts, and opportunities to identified in this study.

3.1. Funding-related challenges

For context, interviewees discussed the large energy burden disparities between households of different income levels. According to one program manager, low-income households, on average, can spend 17%

Table 1
WAP implementation challenges, impacts and workaround opportunities.

Challenges		Impacts	Opportunities
Funding-related	Funding instability	Annual goals for number of weatherized units	Collaboration with utilities & other organizations
	Funding allocation formulas	Walkaways or deferrals	Intra-agency innovations & integration
	Limited marketing & advertising funding	Long wait lists	Strategic productivity & per unit allocations
Regulatory-related	Cumbersome paperwork	Efficient use of staff time	
	Restrictive guidelines		

of their income on household energy bills, more than four times greater when compared to an average energy burden of 4% for middle-income households. The opportunity to reduce low-income household energy burdens was viewed as a principal benefit of the WAP. Consistent with some national evaluations, WAP's success as "a program for energy reduction" was credited by some program managers as leading to as much as "20%–30% annual energy savings per home." Weatherization has been credited with helping overcome the "heat or eat" dilemma, which one program manager remarked is a frequent occurrence for energy poor households who have to decide, "am I going to pay my heat bill or am I going to eat this week?" The practical ways in which the benefits of weatherization occur highlight the intersection of poor physical housing characteristics and high energy bills for low-income households as well as the potential of having more disposable income post-weatherization to spend on other necessities like food. As one program manager described:

A lot of these houses are pretty large and have no insulation in the walls, or the attic, where you could be paying $800 a month for the electric bills, for the gas bills. If you have a furnace that is 20 years old, we can go into a house like that and insulate the walls, insulate that attic, put in a new furnace and maybe a water heater and bring that bill down to maybe two or three hundred dollars a month instead of $800 a month, it is really beneficial to these people, maybe helps them to be able to feed the baby instead.

The program manager perceptions mirror national WAP participant evaluations, which found program recipients directly attributed the following benefits to weatherization: lower energy bills; fewer work sick days for workers; fewer school absentees for kids; fewer health-related emergencies; increased indoor thermal comfort; increased affordability of energy bills and other utility bills; and increased financial resources to buy food, prescription, and other necessities (Tonn et al., 2014a).

3.1.1. Funding instability

Fig. 1 and national evaluations of WAP show that annual production (or the number of homes weatherized) suffers from funding instability and fluctuations in Congressional appropriations and is a principal implementation challenge for grantees and subgrantees (Tonn et al., 2016). Program managers also identified insufficient funding appropriations as a barrier to program success. At the time of the interviews, funding for the next program year had not been appropriated by the U.S. Congress, and the proposed federal budget from the Trump Administration called for the elimination of WAP. Thus, when asked to describe the impacts of funding instability, program managers described catastrophic consequences for households in need for weatherization and doubled-down on the inability of low-income households to afford their bills. As one program manager noted, "if these programs are cut, yeah, there is a huge impact, there is no safety net for low-income people or people that are vulnerable if these programs are cut."

Beyond energy-related benefits, program managers espoused overwhelmingly the WAP's NEBs that would be impacted by funding instability. The NEBs for low-income households mentioned by the program managers included financial empowerment and providing a healthy and safe environment. The larger societal NEBs included creating jobs, reducing burdens on other taxpayers because weatherized low-income households were able to pay their bills and less likely to go into arrears as well as reduction in carbon footprint. Program managers also described the housing security and stability benefits of WAP, even depicting WAP as a homelessness diversion program. Without a fully-funded WAP, one program manager forecasted, "I just foresee a lot of homelessness, a lot more homelessness than what we already have." Another program manager focused on the benefits of WAP for senior households,

> We can keep seniors in their home instead of going into assisted living or into a hospital because we are providing a safe and healthy environment for them.

It would be important to further explore and monetize other NEBs of WAP, including increased housing stability for fixed-income seniors and potential government savings by facilitating seniors to age in-place, in their homes, as opposed to the costs of nursing homes. Hernández and Bird (2010) explored the positive relationship between WAP and housing stability for low-income households.

It was clear that funding instability was not a new challenge for the program managers. They all had experienced previous threats to program funding many times before and thus expressed confidence that WAP funding would not be totally eliminated, but likely reduced from previous years. One program manager was steadfast in their opinion that enough data existed to justify maintaining some level of program funding.

> I don't anticipate these programs being cut, I'm anticipating *some* cuts but I'm not anticipating entire eliminations that were proposed in the Trump budget. Because I think there is more data on these programs that they do make a difference.

While most program managers echoed a similar confidence that WAP funding would not be eliminated, some program managers acknowledged and called for more retrospective evaluations of completed weatherization jobs as a way to not only assist agencies with implementing WAP but also provide additional evidence that demonstrates the cost-effectiveness and benefits of the program. It was pointed out that "as meticulous as the process of weatherization program is," for agencies, there could be a benefit to going back and collecting data on completed projects. It goes without saying that agencies would need additional capacity and financial support to carry out this type of assessments. Although national evaluations are conducted, as discussed earlier, one program manager noted the perceived benefits of conducting evaluations locally.

> There should be something in place where we go back to all the houses that we weatherized and get some hard data on "hey, we saved Mrs. Jones X-dollars last year. So, then when you have that in your hand and somebody saying "hey, these programs are waste of money", you can pull that out of your pocket and say "no, it's not, that's what we saved this lady. Look at the energy we took off the grid, the energy use that we moved from the grid because of this program." So, we don't go back and gather that data for some reason, and I think that would be something that would definitely benefit the program as a hard evidence to show people. Right now, what we can do is say "yeah, we are helping people save money" and somebody says, "well, you know, where is the evidence of that?' We are not required to do that. We are required to do so many other things to make sure we are spending the money to operate. But there is no hard evidence on the results which I know would be beneficial.

Another manager remarked,

> We can say "hey, we did 130 jobs and then based on that number I have 130 people what was their bill when they first came to us and what was a year later since their home has been weatherized, they have all those numbers out. And our agency has saved our community this amount of energy. I think that would be awesome.

3.1.2. Funding allocation formula

In some areas the situation and needs, as one manager noted, "are much broader and complex than the Weatherization Program is designed to respond to." The funding allocation formula for WAP grantees has been modified over time, with a major effort going toward more equitable funding for southern and hot-weather states as the majority of funding historically went to cold-weather states. While the larger, national funding allocation formula was not of great local concern, one key component of the funding allocation formula was raised. Program managers discussed that the funding allocation formula

is based on the state's poverty rate from decennial census poverty statistics, which introduces two challenges. First, the use of state-level poverty statistics may dilute the need of some agencies with high levels of concentrated poverty in their service territories. Second, the use of only the decennial census suggests appropriations are based on the same poverty statistic for a decade without accommodations for major changes in poverty, both statewide or in individual counties, until the next census takes place. Program managers mentioned higher funding allocation for WAP could result in more administrative dollars for hiring staff to improve program implementation and effectiveness.

3.1.3. Limited advertising and marketing funding

Another funding-related challenge was the inability to pay for advertising and program marketing. Program guidelines are very clear on the functions for which funds can be expended. While agencies are unable to invest in traditional advertising and marketing, WAP does benefit from its longevity as a well-known government assistance program. While program managers lamented the lack of funding for advertising and marketing, they also described alternative methods, including online efforts, to get the word out about the program.

> Well, the agency does not advertise for these. We are not allowed to. The rules, like what's allowable and what's not allowable. Advertising is not allowable but we advocate and promote the program. It's on our website, you know, we have information at city halls, public libraries, common public places; but, once the word is out in the community, it's pretty much word of mouth.

> We don't really advertise the program, we can't really, we don't have any money budgeted for advertising and I don't think through the Department of Energy we are allowed to advertise but we do, you know, have a Facebook page, we do have our home website.

A major impact of funding-related challenges identified by program managers manifested as long applicant waitlists. In some communities, the need is so great and the budget is so constrained that agencies cannot process additional clients because they would just end up on long waitlists. Agency waitlists can be extremely large highlighting the imbalance between funding and need. As one program manager explained,

> There is probably around maybe upwards of 2000 people on the waiting list in [the] county for the program, and we can only do about 300, we are only funded to do 300 homes per year.

Another program manager linked the development of waitlist directly to running out of funds during the program year, and having to tell households that they have to wait until the next funding cycle. As one program manager bemoaned, *"the waitlist is the waitlist. So, if once you are out of money, you are out of money and you have to wait till the next program cycle."* It is however, important to note that a households' qualification lasts only 12 months, so if the opportunity for that household to participate in the program occurs outside of those 12 months, they must be recertified.

Alternatively, some agencies did not have waitlists or are able to get through their waitlists during the funding cycle, according to one program manager,

> People who are applying are waiting while we have to give service to the folks in the order of the priority. But right now, we have enough funding from our weatherization grants to do about 50 single family homes and we have about that many people on our waiting list or in the process of weatherizing their homes. So right now, we are just about at an equilibrium for people to apply and funds to assist.

3.2. Regulatory-related challenges

Despite evidence of achieved energy- and non-energy-related benefits of WAP, a set of regulatory barriers still hinder perceived program effectiveness. Regulatory barriers are policy and bureaucratic rules that can impede program implementation. Two regulatory barriers were identified across the interviews: cumbersome paperwork that ties up staff time; and restrictive guidelines that limit agency flexibility to address commonly discovered issues in low-income homes such as required pre-weatherization repairs, and health and safety issues.

3.2.1. Cumbersome paperwork

Cumbersome paperwork was perceived as adding undue pressure on already constrained staff time, administrative staff budgets and staff shortages. This challenge primarily occurred during the client intake process. For instance, each client has to provide numerous documents for eligibility assessment in order to receive assistance. Although it was recognized that the reasoning underlying the required documentation is fraud prevention, this did not negate the perception that the current paperwork process created burdens both for the client and agency staff. As described by one program manager, it may take up to 2 h for agency staff to process a client intake.

> We are not given a lot of money to administer the program to begin with, so when the person is doing the intake spends two hours just taking the application from the person, it just seems that it can move along faster in a bunch of different areas.

Another program manager expressed frustration with the process and longed for the process to become faster, more efficient, and streamlined.

> Year after year it seems like there are more restrictions and more paperwork and it just seems old-fashioned to me and could be streamlined. So, that's just the point I am making.

Moreover, many states and agencies have tried to develop ways in which to improve the intake process. For instance, two agencies mentioned utilizing a client and program management software. Once a client is in the system for any of the assistance programs they provide, the system notifies the staff of any other programs that client is eligible for. Furthermore, in October 2018 the State of Michigan launched an online portal called *MI Bridges* to streamline application and eligibility approval for government-sponsored assistance programs, including WAP. The online portal also allows for year-round application for WAP. Previously, households were only able to apply between November and May, the State's designated energy crisis season. According to a news article about this development, the MDDHS began "processing all applications, in the hope that this new system will streamline the application process and give their grantee organizations the ability to focus on helping recipients become self-sufficient" (Goldman, 2018).

3.2.2. Restrictive guidelines

A second regulatory-related challenge identified by program managers was the perception of restrictive compliance guidelines required when implementing WAP. Program managers mainly discussed restrictive guidelines pertaining to the allowances for performing pre-weatherization repairs (e.g., minor repairs to a home's physical structure or to address health and safety issues, like mold remediation). In a study of WAP implementation in Missouri, the requirement of pre-weatherization repairs was also identified as a barrier to program implementation, particularly in areas with older homes, lower household-incomes, and high rates of deferred maintenance (Reames, 2016a). According to one program manager, removing or easing restrictive guidelines could assist agencies in providing more service,

> If we could move some of those increased regulations on the weatherization and expand some of the repairs that you could do, I

think we could catch up and do more units. I think that's a barrier to success of the program.

The Federal Government's Health and Safety guidance states grantees and subgrantees must submit Health and Safety plans defining what they would want to treat as "minor repair". The State of Michigan caps the health and safety spending at 20% of the subgrantee's budget and not to exceed 50% of the total cost for each project. Health and safety factors which cannot be corrected with weatherization funds include: removal of mold, odors, viruses, bacteria, unsanitary (including raw sewage) conditions, and rotting wood. Mandatory health and safety measures to be installed with weatherization include: installation of smoke detectors and carbon monoxide (CO) alarm/detector; properly vented clothes dryers; and ventilation meeting ASHRAE requirements.

Older homes often require repairs before weatherization improvements can be made. In some parts of the study area the average home age could be 90 years old. Program managers described the social and physical conditions of the communities they serve which increase the prevalence of deferred maintenance of homes and required pre-weatherization repairs. The most common pre-weatherization repair issues included poor roof quality issues, flooded basements, mold and moisture, old knob-and-tube electric wiring, and asbestos. Households in poverty face difficult financial situations affecting their ability to afford many of life's necessities and as one program manager explained, when it comes to the many competing interests for households with limited financial resources, "they just make due as best as they can." The inability to afford to make repairs on old, substandard housing can impact public health and exacerbate economic strain as some households attempt to finance needed repairs through high-interest, predatory lending or financing that places a lien on their home, while others are unable obtain additional financial resources because of an existing lien or two on their home.

WAP energy auditors holistically evaluate the whole house, both the indoor and outdoor physical structure, considering air movement, heating and cooling, insulation, indoor air quality, mold and moisture, and other health and safety concerns. Once one of the common pre-weatherization repair issues is identified in a home, the restrictive guidelines render that home ineligible for program participation, although they met income and other eligibility requirements. Program managers discussed this occurrence as "deferrals" or "walkaways." [1] Once a client is deferred, or the agency has to "walk away" from that home, the client is responsible to address the issue or issues before they would become WAP-eligible again. Since low-income households often lack sufficient financial resources to rectify these issues, many never receive weatherization. One program manager described the situation this way,

> Hey, I went to this home, and she had signed up for weatherization but she got a hole in the roof and we can't do it because WAP won't allow it.

High client deferral or walkaway rates were perceived as a major implementation barrier resulting from restrictive guidelines. The rate of walkaways was so high in some areas that staff may have to inspect over 100 income-eligible houses in order to identify 50 physically-eligible homes as described by one program manager.

> Typically, if we inspect 100 houses, probably close to 50% of the houses we are going to walk away from. And there [are] a few reasons why we walk away from these houses. They have electrical issues, bad old knob and tube electric in their houses, we don't want to insulate over that, that could be health issues creating fire. If the roof is leaking, we don't want to put insulation on that attic get soaking and wet and get a moisture and mold issue. The basement or the foundation has standing water or is out leaking, we walk away from that as well. Just because of moisture and mold concerns. So we do have about a 50% deferral rate.

The 50 percent deferral rate was echoed by another agency program manager as well as other issues that lead to a walkaway.

> If we would have enough money to do 50 homes, generally we found that it takes about 100 applicants to get the 50 because 50 of them will have – because weatherization you know is not an emergency services program, it is a program for energy reduction – we may run into barriers that would prevent us from being able to do their home, like the roof is bad, or sanitation issues, losing it to foreclosure. There are some things that prevent us from being able to provide services to that client and we are also finding that the homes that are in the area that need the assistance sometimes they are just beyond; the amount of works that is needed.

For some agencies the situation is even more arduous as described by another program manager.

> We might have to look at two or three times the amount of units in order to hit our goal. I'm hearing from our weatherization staff that we walk into rooms through 750 to 900 units in order to get 350 of good housing that meets the weatherization.

The restrictiveness in addressing pre-weatherization repairs creates a paradoxical challenge for weatherization implementers in areas with older homes and concentrated poverty and agencies endure additional strain as they strive to meet or exceed their production goals. Walkaways not only affect clients but also the agencies. Program managers described expending a great amount of staff time and resources on "applications that never become jobs" in their pursuit to identify enough physically-eligible homes for performing weatherization. Another manager lamented that the restrictive guidelines on pre-weatherization repairs is creating a program that is only "for houses in decent shape."

One agency performed an evaluation of their walkaway situation to better understand and estimate the costs of pre-weatherization repairs that resulted in client deferrals during one month. Based on 100 income-eligible homes that received an initial site visit, 75% were deferred because of physical and health and safety issues. The agency described the average costs of rectifying these issues for the 75 deferred homes to be anywhere from $500-$1,000, with a cost assessment for remediating some issues as low as $200. Roof repairs were mentioned as the "hardest and most expensive to deal with." Program managers detailed that repairing or replacing a roof may cost anywhere from $8000 to $25,000 on average depending on its condition. Program managers noted that they did not typically take on many roof jobs since the cost of that undertaking could prevent them from achieving their production goal, or reducing the per unit amount available for other homes.

Moreover, program managers perceived that guidelines had become more restrictive over time. For instance, guidance on asbestos abatement was described as stricter and when identified, asbestos mandated a walkaway or client deferral.

> There is a lot more stricter guidance [on] asbestos and repairs which makes the walkaways a lot higher. If there is open asbestos, the home is not eligible for this service. So, you have health and safety issue but we can't really do anything about it because it doesn't meet the criteria of the weatherization program. So, you are not going to go in and put $7,000 or $8,000 into a home that has exposed asbestos.

Guidelines (e.g. asbestos abatement, roof repairs) become more complicated when agencies try to couple weatherization with other

[1] Walk-away or client deferral happens when the household is income-eligible to receive WAP, but their housing structure is in a condition that prevents agencies from performing weatherization. This typically happens due to maintenance or health and safety issues in the house. Although there are other reasons behind walk-aways or client deferrals, only deferral due to physical barriers in the housing structure is subject of discussion in this paper.

program(s) at the time of service, causing time-wasting redundancies and incompatibility in regulatory compliance. With any increase in guidelines or any removal of an allowance, it becomes more challenging for agencies to implement the program forcing them to seek other venues to assist clients as a result of new guidelines. Coordination between multiple assistance programs was not easy for agencies. There was little clear-cut coordination between WAP and other federal programs, often preventing program managers from leveraging the full potential of available assistance to help clients. For instance, income-eligibility criteria are not consistent across some assistance programs. On the agency's side, the allowances could also be different between programs. When attempting to combine funding from different sources, program managers discovered that funding some repairs were allowed under one program but not allowed under another. For instance, while roof repairs are not easily allowed under WAP, some agencies previously repaired roofs using funds from another federal energy assistance program, the Low-Income Home Energy Assistance Program (LIHEAP). However, according to some program managers, that allowance was eliminated in the previous year.

Studies of WAP implementation during American Recovery and Reinvestment Act (ARRA) period support these claims by program managers. One study discovered program implementation difficulties due to several reasons, including an increase in regulations and reporting requirements (Carley and Hyman, 2013; Tonn et al., 2016). Along with the opportunity to serve more households during the ARRA-era funding windfall appropriation, the increased funding not only introduced new regulations and restrictions, but also increased media attention, federal oversight, and scrutiny which ultimately created additional hurdles for the weatherization network to overcome (Tonn et al., 2016).

3.3. Opportunities for implementation challenge workarounds

While the previous section detailed WAP implementation challenges identified by program managers, we were also interested in opportunities agencies found to workaround challenges in order to meet or exceed production goals and serve as many households as possible. Agencies identified three such opportunities: collaboration with utilities and other organizations; intra-agency innovation and integration; and strategic productivity and per unit spending to increase the number of homes weatherized.

3.3.1. Collaboration with utilities and other organizations

First, collaboration with utility companies and other organizations was described as beneficial to effective program implementation. Overall, having support from the community network, such as, local governments, financial institutions, and other nonprofit organizations, assisted agencies in carrying out their mission. Some agencies experienced strong communications and collaborations with the local utility company resulting in the referral of high energy burdened utility customers to the agency for WAP enrollment. The collaborative agency-utility effort ranged from providing appliance replacement to providing rebates and energy education. This is particularly relevant as more states are requiring utilities implement ratepayer-funded energy efficiency programs for their customers, and to also develop specific carve outs for low-income households. Michigan requires this of its regulated, investor-owned utilities which service the majority of homes in the state. One program manager described how the utility provider positively collaborated with their agency.

> Now they are required to do a certain amount of energy education and energy upgrades and all of that, so they are also assisting us, they will call us and say "hey, we got clients that's qualifying for a furnace and it would be nice if we could do weatherization on the home, and we try to match their services with our services so that we can again get the most bang for the buck when we are at that home.

Program managers also mentioned that several charitable organizations referred clients for WAP, which was perceived as beneficial to meeting their production goals.

Next, increased opportunities for coordination between WAP and other federal programs was described as beneficial to effective program implementation. In some communities, agencies could access minor home repair dollars through the Community Development Block Grant (CDBG) which is administered by the U.S. Department of Housing and Urban Development (HUD). Also, state policy also allows a percentage of LIHEAP grant funds, administered by the U.S. Department of Health and Human Services (HHS) to be allocated to weatherization. Leveraging additional dollars to assist with pre-weatherization repairs, reducing walkaways, and funding additional energy efficiency measures was made possible through the efforts of agencies to coordinate WAP with other programs. However, program managers exclaimed that more effective coordination could be achieved through closer inter-agency coordination of anti-poverty programs at both the federal- and state-level.

3.3.2. Intra-agency innovation and integration

Intra-agency innovations and program integration were discussed as another opportunity to improve program implementation. Since agencies administer multiple poverty reduction programs as well as provide a multitude of services to their clients ranging from energy assistance to childhood education to financial literacy, finding creative ways to provide "wrap-around services" to households was core to each agency's operational improvement. Program managers perceived this comprehensive service delivery method (e.g. providing a combination of energy education, credit repair and weatherization to empower a low-income household) achieved greater results for both agency and household. As one program manager noted, "it seems like poverty, with all its complex circumstances and consequences, could better be alleviated through leveraging a holistic approach toward assisting those who struggle." Additionally, leveraging external funding played an important role for some of the agencies, proving most beneficial in rectifying pre-weatherization repairs, deferred maintenance, and health and safety issues which otherwise would prevent clients from receiving WAP. Some agencies were able to leverage external dollars, from local governments and philanthropic foundations, in order to re-enter previously deferred clients into the program to receive weatherization.

3.3.3. Strategic productivity and per unit spending

Agencies have discovered strategic approaches to productivity and per unit spending in order to increase the number of homes weatherized. Program mangers reported having to be creative in order to weatherize as many homes as possible within the production-driven funding model. Agencies are required to report their production efforts to the state quarterly. Once the third quarter report is filed, the state evaluates the production status of each agency and the status of the state's overall grant goals and will re-appropriate funds accordingly to ensure that all funds are spent. At this point, the highest producing agencies in the state are able to share in unused funds and weatherize more homes in their service area. The strategy of some agencies was described by two managers as such,

> If we get in the third quarter, you know each quarter we let them know where we are at with our numbers and how we are spending, because again they want to project are you going to hit your numbers, and if you are not going to hit your numbers, what you need to do to reach your numbers and/or if you are on track to hit your numbers and let's say another area in Michigan is not hitting their numbers, well does it make sense for them to keep that money or let's send it to somebody to use it, that is caught up and on track, let's get it to them so that they can spend it. Because clearly, they are moving in the right direction. For carry over-money, I think you got to be at 95% or 98% or above to receive the carry over funds, because

> if you are not at 95% then the state says, "hey, we need to take your money and give it to somebody that is at 95%.
>
> So, you want to make sure that you have a good weatherization director and a good weatherization staff. Because if you can't spend the money, your community loses it and it goes to someplace else.

Agencies are also strategic with regard to their per unit spending in order to meet or exceed production goals. Agencies receive a set amount and a goal of the number of homes they must weatherize. Agencies can extend the number of homes weatherized by strategically identifying and implementing a mix of low- and high-cost retrofits. The strategy was described by one program manager as such,

> They give us $200k and they say you have to weatherize 40 homes or whatever. Then we have to make sure that we spend all the money and do a certain number of homes so the average cost per homes has to work out. So, we have to have some homes that are bigger projects and homes that are smaller projects. Not every home needs a full weatherization job, you know, they might not need added insulation or a new furnace. But some homes would need everything. Those jobs could be $10,12 or 14k versus some homes might only get $1500 or something like that. At the end of the year it all has to average out and that's how we have to make it work.

While the challenges and opportunities are discussed individually here, it is important to note that they are highly interrelated particularly relating to negative or positive influences on program implementation.

4. Conclusions and policy implications

There has been limited research exploring programmatic challenges and opportunities to implementing the U.S. Department of Energy's Weatherization Assistance Program (WAP) based on perceptions of local agency program managers. The results from semi-structured interviews with four WAP program managers from local Community Action Agencies in Michigan, representing one-third of both the WAP funding and weatherization production in the state, revealed common themes on or around how implementation challenges manifest as well as opportunities program managers found to work around those challenges. While our sample is small, this study offers an initial explanation for future research expansion to a larger sample of agencies and sets the stage for a more holistic understanding of the delivery of government-funded low-income energy efficiency programs beyond conventional economic models used to date. As argued by one program manager, "simply making numbers based on economic models will result in losing [the] human portion or personal end of the situation." Increasing the energy efficiency of energy poor households has repercussions beyond energy savings, to the extent that a 10–20% energy saving could mean more food for the family, and being able to purchase much-needed medication or school supplies, which are often monthly tradeoffs struggling households make. Program managers all perceived that WAP, as the primary Federal Government low-income energy efficiency program, if leveraged to its full potential would have the capacity to more meaningfully and strategically address and reduce energy poverty across the country.

Program managers identified five implementation challenges, three funding-related challenges: funding instability; funding allocation formula; and limited advertising and marketing funding, and two regulatory-related challenges: cumbersome paperwork and restrictive guidelines. The primary impacts of theses funding and regulatory challenges, identified by the program managers, were perceptions of fewer homes than the potential number being served by WAP, a greater number of WAP income-eligible homes been deferred or walked away from, longer waitlists (in some agency service areas), and less than optimal use of staff time. To this end, program managers demonstrated their resourcefulness and thereby identified some three workaround opportunities to the perceived implementation challenges they faced: collaboration with utilities and other organizations; intra-agency innovation and integration; and strategic productivity and per unit spending. Program managers differed slightly in some WAP implementation approaches which were primarily predicated on any unique characteristics of their service area or individual client situations. Consequently, program managers preferred a funding allocation that could be more responsive to local characteristics such as recognizing cumulative challenges like high poverty rates coupled with older housing stock. This funding allocation approach could potentially pave the way for relaxing some of the stricter guidelines that limit the number of and ways in which households are served by WAP. Program mangers could leverage WAP and other programs, either federal or local, to assist their clients when circumstances are more complicated than those able to be addressed with WAP alone.

While it is no surprise that program managers perceived that an increase in WAP funding appropriations would improve program effectiveness, a more realistic proposal emerged that could potentially enhance program effectiveness notwithstanding perceived funding-related challenges. Agency program managers shared the fundamental responsibility to assist those in need as best as they could with the resources at hand. Summed up best by one program manager, "because again we want as many dollars that we receive to go towards the end user, but we can't, if [only] we had a little more flexibility." For instance, flexibility to undertake pre-weatherization minor home repairs with WAP dollars as well as the ability to easily address other health and safety issues, like asbestos abatement which could be remediated at relatively low costs. Consequently, a key recommendation for further exploration would be testing the efficacy of granting local agencies greater flexibility to work around funding and regulatory challenges, when compared to the status quo, in order to understand the effectiveness of greater flexibility to increase the number of households weatherized, reduce long waitlists and deferral rates, and use staff time more efficiently. As future funding allocations for WAP continue to be fodder for debate between political parties, efforts to demonstrate program effectiveness must also continue, which may include retrospective evaluations and estimating government savings in other areas when homes occupied by low-income households are made more energy efficient.

CRediT authorship contribution statement

Shiva Raissi: Conceptualization, Investigation, Data curation, Formal analysis, Validation, Visualization, Funding acquisition, Writing - original draft, Writing - review & editing. **Tony G. Reames:** Conceptualization, Validation, Visualization, Writing - original draft, Writing - review & editing.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Questions for Semi-structured Interviews

Customer Base:

1. How do you target people? How do you prioritize the customers? Does the agency advertise for the WAP or LIHEAP program?

Eligibility Process:

2. We know there are standard eligibility processes for both programs, WAP and LIHEAP. Currently, those residents who receive TANF and SNAP are given priority to receive the program benefits. What percentage of your program beneficiaries are in this category? Would you guys consider that you have a higher demand than actual supplied for the WAP program?
3. Does the CAA make your quota for program participants for both WAP and LIHEAP? Is there a wait list process for excess applicants? If so, how long do program applicants spend on your wait list. Where do you typically receive your funding from?

Expenditures:

4. After much research, we learned that the WAP and LIHEAP financial distribution are recorded in the DOE and WAP report. There are some small discrepancies with the values given between the two reports, which report would most likely reflect the funds given to your agency?
5. Under the LIHEAP program, there is also a small amount of funds allocated to the WAP program. Do these funds have *separate* eligibility and use guidelines than the present guidelines for WAP?
6. Is there a maximum amount you spend on a household? Are the number of homes you serve based on the amount of funding you receive for the year?
7. What is your procedure at the end of the year if you run short on funding or if there are remained funding?

Program Operations:

8. Is there any connection between the WAP and LIHEAP programs? For example, those that are receiving funding to pay their bills, being prioritized for receiving WAP since they are having high energy burden?
9. Is there a referral program between the two programs?
10. Do the utility companies provide you data on households that have received foreclosure based a homeowner's outstanding utilities debt?
11. What do you think will make the program better and more effective? Do you see any barriers in running the program?

Appendix B. Coding

List of Pre-set Codes	Example describing numbering and codes categorizing
LIHEAP	**5-0-_barriers in running the program"**
Weatherization	**5-1- [High Extent of] Walkaways (Client Deferral)**
Funding	5-1-1- asbestos
Community action agency	5-1-2- roof [issues]
Utility company/utility provider	5-1-3- leaky house, flooded basement, broken doors and windows
2018 budget proposal	5-1-4- sanitation issues
Budget cut	5-1-5 environmental concern
SNAP	5-1-6- Lien placed on home
TANF	**5-2- Cumbersome Guidelines**
Automatic eligibility	**5-3-_Staff Issues**
Senior citizen	5-3-1_Staff Shortage (leading to low intake)
Children	5-3-2_staff time
People with disability	5-3-3_staffing cost
Waiting list	**5-4- Aging Housing Stock**
Unit goal	**5-5- (expensive) Monitoring**
Billing assistance	**5-6- [Minor] home repair dollars [or lack thereof]**
Advertising	**5-7- Cumbersome Paperwork**
Asbestos	**5-8- Difficulty to have enough clients**
Flooding	**5-9- Funding Issues**
roof hole	**5–10- Waitlist Issues**
minor home repair	5-10-1 waitlist bringing people ahead of time no longer qualifying to receive weatherization
availability	5-10-2- hard to prioritize within the waitlist
other sources of funding including private foundations like Kellogg	**5–11- difficulty/problem with the pointing system**
funding criteria/hierarchy/the dynamics on the institutional level	

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