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DTE CleanVision Energy Efficiency

Health and Safety Pilot

EWR Collaborative

January 17, 2023

Agenda

- Program Overview
- Evaluation Methodology
- Summary of Results
- Recommendations

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Program Overview

Pilot Overview

The Low-Income Health and Safety pilot provides funding to address issues that prevent the delivery of energy efficient products and services (i.e., walk-aways) for both single-family and multi-family buildings.

Pilot Information

The Low-Income Health and Safety pilot focuses on homes in need of repairs outside of the traditional scope of Energy Waste Reduction (EWR) programs. Once deferral issues are rectified, **DTE Energy (DTE) can garner EWR savings made available from an otherwise unavailable housing stock.**

The Low-Income Health and Safety pilot was implemented in both single-family and multi-family homes during the 2020 and 2021 program years and was extended for 2022 and 2023. **DTE reached 312 homes in 2020, 353 homes in 2021, and 478 homes in 2022.**

Research Objectives

Identify key Non-Energy Impacts (NEI) which have a relationship to the DTE Low-Income Health and Safety Pilot measures by performing a **literature review.**

Confirm whether Pilot measures result in the identified NEIs by assessing customers' health and living conditions through survey before and after Pilot intervention OR applying geographic and demographic adjustments for NEIs that cannot be assessed by survey.

Summary of Measure Installation

Program Summary

- EEA Health and Safety measures were installed at 1,143 locations.
- Most common EEA locations: Detroit & Muskegon
- Electrical Upgrades were the most commonly installed measure within the EEA H&S pilot measures.
- LIMF – No H&S Projects in 2020 and 2021. Three completed projects in 2022.

EEA H&S Pilot Measures	PY 2020 – 2022 Site Count
Other[1]	574
Electrical Repair/Upgrade	425
Roof Repair	198
Asbestos Removal	65
Structural Repair	31
Water Infiltration Repair	19
Mold Removal	9
Pest Control	3

EEA H&S Pilot Measures	PY 2022 Average Cost
Other[1]	$1,383.55
Electrical Repair/Upgrade	$1,051.93
Roof Repair	$12,305.01
Asbestos Removal	$4,090.72
Structural Repair	$1,923.23
Water Infiltration Repair	$1,962.50
Mold Removal	$4,047.37
Pest Control	$1,066.23

PY 2022 LIMF H&S Pilot Measures
Electric Panel Replacement & Asbestos Removal
Electrical Repair/Upgrade
Roof Repair

1. *Other measures included H&S interventions like old system removal, plumbing work, gas line upgrades, and venting improvements. Common line items were "plumbing work", "labor to remove old furnace" and "chimney liner."*

"I am so thankful to DTE for repairing my home. We have been contacting multiple agencies for over 6 years without any results. Our home used to be unlivable and the eyesore in the neighborhood, now we are beacon of hope to our neighbors. I am a school bus driver who has been unemployed for 14 months due to Covid. We had roof, wall and floor damage that became so bad that the front of the home was in danger of collapsing. We have received a new roof, windows, structural repairs, new flooring and interior repairs to the damaged areas. I am extremely pleased to express my utmost eternal gratefulness for making my house livable and healthy place to raise our family." – Reginald Williams

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Methodology

- **Literature Review**
- **Surveys**
- **COVID-19 Considerations**

Methodology

Literature Review

- Guidehouse performed a secondary literature review to identify possible NEIs related to the SF and MF health and safety pilot improvements.
- The secondary literature review informed the development of interview question and survey questions.

Pre / Post Surveys

- Guidehouse attempted to conduct pre / post surveys of all SF customers who participated in the health and safety pilot in 2020.

Interviews

- Guidehouse conducted an interview with each of the property managers involved with the program.

Literature Review

Methodology

This review considered sources in each category and prioritized them based on relevance, rigor, and detail.

Source	Definition
Primary medical research	Research performed that was related to specific health and safety metrics.
Academic, state, or non-profit reports	Reports and papers that discuss methodology, monetized values, and other pertinent information for this evaluation.
Evaluation reports	Reports on evaluations for programs similar to DTE's EEA program.
Literature reviews	Review of existing studies on the topic.
Infographics	Information about health and safety concerns that may be more anecdotal than rigorous and can include big picture details that would be important to this analysis.

Relevance

Applicability to DTE's program and demographics.

Rigor

Sample size, treatment and control groups, ability to separate outside influences from program interventions.

Available Detail

Was enough information provided to have confidence in the results? Would we be able to replicate the analysis or change inputs to make them specific to DTE's program?

Customer Survey Overview

Objectives

- Evaluate likely NEIs realized through the low-income health and safety pilot program by conducting a pre-/post- customer survey effort asking questions to quantify the top NEIs. This approach would evaluate NEIs associated with both the health and safety measures, as well as the EWR services.
- Answer a set of key research questions, for example:
  - Are customers who receive health and safety improvements and weatherization realizing improvements in health?
  - Which health/comfort/safety impacts are realized by participants?
  - What is the financial impact realized by the statistically significant NEIs?

Approach

- Guidehouse evaluated the NEIs associated with receiving *both health & safety measures and EWR services* for PY2020 participants using participant surveys.
- Surveys targeted the census (n=292) via an email invitation to participate in the online survey. This was followed by a postcard and telephone call.
- Customers were surveyed at two points in time, at the time of receiving health and safety measures (November - December 2020) and approximately one year after (September/October 2021)[1, 2].
- Customers received received a $20 electronic gift card incentive per survey completed.
- The responses from 25 participants who completed both surveys were used for NEI analysis.

1. *Only the customers that completed the Pre-Survey were invited to take the Post-Survey.*
2. *Forty-six customers completed the pre-survey.*

COVID-19 Considerations

Due to COVID-19, Guidehouse considered the following:

Number of People in the Home

Young adults may have returned home during the COVID-19 crisis.

Additional people in the home could have caused additional stress and may have allowed additional infiltration of outside elements.

More Time in Home

Due to shelter in place, participants were more likely to be in their home than usual.

Additional time in the home may have led to more consistent exposure to at home allergens and triggers. The participant may also have been more susceptible to thermal stress as they could not go to places with air conditioning (e.g., the workplace or other).

Out of Work

Participants may have been out of work due to COVID-19 which could have resulted in additional stress due to inability to pay bills.

Financial stress may have meant repairs are de-prioritized. Alternatively, participants may have been in a position to fix things in the house they were not able to while working.

Avoiding the Doctor or Hospital

Participants likelihood of traveling to see the doctor or go to the hospital when they feel unwell due to concerns around contracting COVID-19.

Lack of preventative care or treatment of minor symptoms could have led to more severe illness later on, unrelated to housing concerns. Alternatively, participants were more comfortable with telehealth, meaning some barriers associated with going to the doctor were removed.

To account for these complications, we included survey questions to ensure we could filter out COVID-19 specific behavior or housing situations.

Results: MF Research

- Literature Review
- Interviews

Literature Review – Positive Impacts

Positive Impacts

Increased lighting can have positive impacts on the **perception of safety** and has shown a **positive impact on crime** in recent reports.

A recent report found a positive correlation between improved lighting and perception of safety.	The research paper, *Illuminating for Safety: Investigating the Role of Lighting Appraisals on the perception of Safety in the Urban Environment*,[1] mentions: "A number of studies show that if we ask people to think about the most important environmental feature that affects their sense of safety, they more frequently mention the presence of lighting than, for example, the presence of other people or having an open view."
	The research also showed a positive correlation (r = 0.47) between the perceived quality of the lighting and the perceived environmental safety.
There have been mixed results on actual crime reduction associated with lighting.	Notably, in 2017, the FBI burglary data[2] showed that 424,886 residential burglaries occurred during the day and only 255,524 occurred at night (a further 160,873 occurred at an unknown time).
	However, a recent experimental study based in New York City[3] shows promising results. In the study, affordable housing complexes were randomly assigned to a control or treatment group where the treatment entailed an increase in lighting in shared spaces. The experiment found a 36 percent reduction in crime associated with increased lighting.
There have been positive safety impacts in Michigan.	In Detroit, there has also been a positive relationship with improving street lighting and pedestrian safety.
	According to a news article from 2018,[4] pedestrian deaths decreased 40 percent between 2015 and 2017 after an effort to replace 65,000 streetlights.

1. *https://journals.sagepub.com/doi/pdf/10.1177/0013916517718888*
2. *https://ucr.fbi.gov/crime-in-the-u.s/2017/crime-in-the-u.s.-2017/tables/table-23*
3. *https://urbanlabs.uchicago.edu/projects/crime-lights-study*
4. *https://usa.streetsblog.org/2018/10/04/the-understated-importance-of-street-lights/*

Literature Review – Negative Impacts

Negative Impacts

Increased lighting can have **negative impacts on sleep quality** and **safety**.

Sleep quality can decrease when outdoor lighting causes brightness inside the home.

The article, "Missing the Dark: Health Effects of Light Pollution,"[1] summarizes studies on the health impacts of missed sleep, which covers shift work disorder and delayed sleep phase syndrome.

Shift-work disorder is one such sleep disorder that affects people who rotate shifts or work at night. Delayed sleep-phase syndrome occurs when individuals don't fall asleep until very late at night and have difficult waking up in time for work or school.

Lighting that is too bright or placed without care can decrease safety by creating blind spots.

The Florida Atlantic University Observatory has detailed webpages[2] discussing the impacts of improperly installed lighting on crime. The webpages cover instances where lighting may be too bright and as a result limit the field of vision. In addition, there are pages detailing cases where crime did not increase even when streetlights were turned off and summary statistics showing if crimes are committed more often during the day than at night.

1. *https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2627884/*
2. *http://cescos.fau.edu/observatory/lightpol-security.html#GlarebombsNoSec*

Interview Responses

Response Summary

- **Before** the project, all three property managers said residents voiced concerns about the lighting.
- **After** the project, all three property managers said they heard positive things from the tenants, including an increased sense of security.

Project Reach

3
Complexes

733
Units

~1,750
Residents

Have you received any feedback from residents about the new outdoor lighting?

"Comments we have heard: It is so nice, it's so bright, I love the lights, you are doing a great job!"

"Yes, it has made the complex and surrounding areas brighter, adding to a sense of security for the tenants."

"Yes. They love how much it has brightened up the area. Really good lights. They like the safety and that it brightened up the area. Definitely helps at night."

When asked about the main benefits of the program:

One customer responded they had enough savings from the lighting to invest in security cameras

Another property manager said savings offset the cost for other improvements they could make to the property.

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Results: SF Research

- **Literature Review**
- **Adjusted Values**
- **Survey**

NEIs Considered – Health and Safety Interventions

Guidehouse considered the following 15 NEIs for inclusion in the pilot research

Summary

Guidehouse found 31 NEIs related to DTE Low Income Health and Safety pilot interventions.

Of those, there are 15 likely NEIs related to health and safety measures DTE expects to install.

	Asbestos Removal	Ductwork, Venting	Electrical	Gas Lines	Knob & Tube Replacement	Mold Removal	Moisture Control	Other	Pest Control	Roof Repair	AC, AC Tune-Up	Structural Repair	Water Infiltration Repair
Health - Ongoing Symptoms													
Asthma incidence		⊕				⊕	⊕		⊕	⊕			
Environmental allergens		⊕		⊕		⊕	⊕		⊕	⊕			⊕
Chronic obstructive pulmonary disease (COPD)		⊕				⊕	⊕		⊕	⊕			
Colds		⊕				⊕	⊕		⊕	⊕			
Thermal stress hot										⊕	⊕	⊕	
Thermal stress cold										⊕		⊕	
Health - Long Term Impacts													
Lung disease	⊕												
Chronic stress	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕
Aging in Place	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕
Lead Exposure													
Safety - Acute Events													
Trips and falls												⊕	
Food poisoning/spoilage													
Financial													
Inadequate repair	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕
Property value	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕
Financial Benefits										⊕			

Key ⊕
NEI Associated with Intervention

NEIs Considered – EEA Measures

Guidehouse considered the following 15 NEIs for inclusion in the Phase II research

Summary

Guidehouse found 31 NEIs related to DTE Low Income Health and Safety pilot interventions.

Of those, there are 15 likely NEIs related to health and safety measures DTE expects to install.

	Advanced Power Strips	Boilers, Water heaters	Faucets, Showerheads	Furnaces, ECM	Insulation	Lighting	Refrigerator Replacement	AC, AC Tune-Up	Thermostats	Window Replacement
Health - Ongoing Symptoms										
Asthma incidence					⊕					
Environmental allergens					⊕					
Chronic obstructive pulmonary disease (COPD)					⊕					
Colds					⊕					
Thermal stress hot					⊕			⊕	⊕	
Thermal stress cold				⊕	⊕				⊕	
Health - Long Term Impacts										
Lung disease										
Chronic stress	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕
Aging in Place	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕
Lead Exposure										⊕
Safety - Acute Events										
Trips and falls						⊕				
Food poisoning/spoilage							⊕			
Financial										
Inadequate repair	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕
Property value		⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕
Financial Benefits	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕

Key ⊕
NEI Associated with Intervention

NEIs Excluded

Guidehouse did not consider the following NEIs found during our literature review for Phase II research

Summary

Guidehouse found 31 NEIs related to DTE Low Income Health and Safety pilot interventions.

Of those, there are 16 NEIs which were not considered for Phase II research.

Double Counting Concern	Don't Recommend Quantifying via Participant Survey or Adjusting Value
Ability to pay for prescriptions	Shocks / electrocution
Food security	Lung disease
Reduced smell	Radon exposure increase
Improved mental health	Improved economic sustainability
Increased comfort	Reduced home fires
Reduced missed days of work	Carbon Monoxide
Reduced missed days of school	
Reduced noise	
Increased safety	
Improved sleep	

Literature Review

Of the 15 NEIs considered for inclusion in the Phase II study, Guidehouse recommends the following:

Include (13) NEIs in Survey

- ❑ Asthma Incidence
- ❑ Environmental Allergens
- ❑ COPD
- ❑ Colds
- ❑ Thermal Stress Hot
- ❑ Financial
- ❑ Thermal Stress Cold
- ❑ Chronic Stress
- ❑ Aging in Place
- ❑ Trips and Falls
- ❑ Inadequate Repair
- ❑ Scalding
- ❑ Food poisoning

- ❑ Many of the NEIs rely on some risk level in the participants that could be significantly different from the literature review populations.
- ❑ A survey is necessary to quantify the reduction in incidence for this population.

Adjust (2) Values

- ❑ Lead Exposure
- ❑ Property Value
- ❑ Carbon Monoxide

- ❑ Some NEIs are tied to rare events or have long term impacts which are challenging to assess in a survey.
- ❑ Values identified in secondary research were adjusted.

Example Literature Review Summary

Respiratory – Asthma

Asthma

- Asthma is a condition where an individual's airways become inflamed, leading to difficulty breathing.
- Asthma symptoms can be exacerbated by environmental conditions in the home including mold, excessive moisture, and infiltration of outside elements. Building envelope improvements and moisture targeted foundation

Range of NEI Value[1]

- $9.99/hh[2]/yr - $2,009/hh/yr
- Incidence reduction range: 20%-70%

- Asthma symptoms are common in the literature and often assessed through surveys. The exact NEI varies slightly between studies – some focus on self-reported symptoms, others on medical metrics, and others still on visits to the doctor's office, ER, or hospital.
- The metrics assessed generally fall into two categories:
  - Severity (requires medication, a visit to the doctor, etc.) and frequency (every day, once a month, etc.) of symptoms before and after interventions.
  - Following a survey, the change in medical costs are estimated using local data.
- **Recommendation:** Assess the change in asthma symptoms before and after interventions using the participant survey.

1 Summary of literature review resources available upon request

2 Where hh/yr is house hold per year

Example Adjusted Value: Lead Exposure

Window replacements in older homes are associated with large monetizable benefits, though they are a small part of the overall program

$1,193

Average benefit per home with window replacement

The dollar value of each window replacement is calculated as the dollar value of the window replacement multiplied by the likelihood that a child is present in the home.

There were two window replacements among Health and Safety pilot participants, one in a house built in 1870 and one in a house built in 1950.

Window replacements are the key measure associated with reducing lead exposure. The older a home is, the more likely it is to have lead paint on the window frames.

The value of window replacements in terms of lead avoidance have been place at $6,847 (houses built before 1940) and $2,847 (houses built 1940-1960).[1]

These dollar values are based on the improvement in lifetime earnings associated with low blood-levels as a child.

Based on census data, there's a 24.62% likelihood that each of these homes has at least one child below the age of 18.[2]

The monetization above assumes that at least one child is present in the home.

In the entire 2020 EEA program (~4,200 households), 49 had window replacements.

Approximately one in every 100 households has window replacements in the EEA program, so the Health and Safety pilot (two houses in 292 participants) is tracking slightly below that rate.

1. *https://www.semanticscholar.org/paper/Monetary-benefits-of-preventing-childhood-lead-with-Nevin-Jacobs/62a95dbc1f51d2b84ae8d5db89fc54f3447cb481/figure/3*
2. *https://data.census.gov/cedsci/table?q=S11&g=0400000US26&d=ACS%201-Year%20Estimates%20Subject%20Tables&tid=ACSST1Y2019.S1101&hidePreview=true*

Example Survey Finding – Asthma

Out of 25 responses, 10 households had members diagnosed with asthma. Of those 10 households, seven received measures that could impact the frequency and severity of asthma flare-ups.

Frequency of Asthma Flare-Ups

71%

- Survey results showed that 71% (5 of 7)[1] of homes that received measures of impact for asthma saw a decrease in frequency of asthma flare-ups after Pilot intervention.[2]

Severity of Asthma Flare-Ups

29%

- Survey questions inquired about what kinds of medical care customers needed for their asthma flare ups (doctor visits, urgent care, emergency room or overnight hospitalization)
- Survey results showed that 29% (2 of 7) of homes that received measures of impact for asthma needed less medical care overall after Pilot intervention.[3]

1. *Two of seven did not see a change in asthma flare-up frequency between surveys.*
2. *There were three households that reported having members diagnosed with asthma in the pre-survey but did not receive any measures of impact for asthma. All three of these households did NOT report having anyone with asthma in the post survey. For this reason, Guidehouse was unable to use the comparison group's results for comparison with the treatment group.*
3. *To calculate changes in the severity of flare-ups, each type of medical care was given a "point value" based on severity: none = 0, doctor visit = 1 point, urgent care = 2 points, emergency room = 3 points, overnight hospitalization = 4 points. Changes were considered a NEI if the point value for the medical care needed in the post-survey was less than the point value for the medical care needed in the pre-survey.*

Measures of Impact – Asthma

- Ductwork/Venting
- Mold Removal
- Moisture Control
- Roof Repair
- Pest Control
- Insulation

Overall Survey Findings

Low Confidence Surveyed		Mid Confidence Surveyed		Calculated NEIs	
+	Asthma	+	Environmental Allergies	+	Lead Exposure[1]
+	COPD	+	Colds	+	Property Value[2]
+	Thermal Stress (cold)[3]	+	Chronic Stress		
+	Thermal Stress (hot) [3]	+	Inadequate Repairs		
+	Trips and Falls[3]				
x	Aging in Place[3]				
x	Food Poisoning				
x	Scalding				
–	Financial Burden				

Due to small sample sizes, NEIs determined by survey could not be tested for statistical significance. Therefore, all survey results are directional and have mid to low confidence.

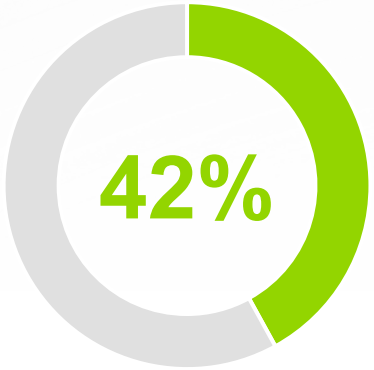
1. *Lead exposure NEIs were determined based on secondary research results that found the average monetized benefit for avoided lead exposure. Since this monetary value was not calculated based on survey results, the confidence is high.*
2. *Property Value NEIs were determined based on secondary research results that found the average return-on-investment for an upgrade or repair. Since this monetary value was not calculated based on survey results, the confidence is high.*
3. *The NEIs for these conditions were measured as a whole sample difference rather than by individual because they are infrequent events. Because of their infrequency, it is likely the sample size, regardless of the survey population size, would be small.*

Key

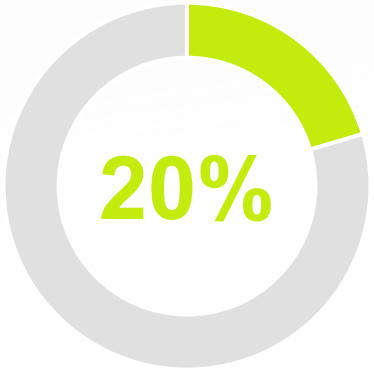
+	Improvement/NEI observed
x	No change or not reported
–	Condition worsened

COVID-19 Question Results

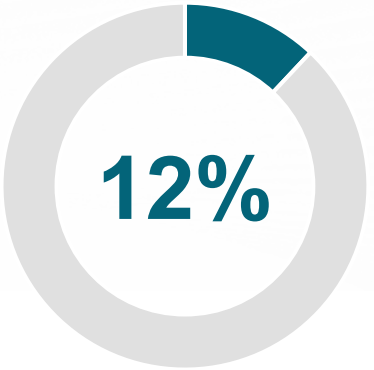
Guidehouse asked questions about how participants' behavior or living situations had changed in response to the COVID-19 pandemic. These questions may help explain unexpected outcomes or responses in the post-survey.



Percent of respondents (n=50) who avoided going to the doctor for preventative medical care or for care related to a pre-existing condition because of worries over the COVID-19 pandemic.



Percent of respondents (n=49) who said they or someone else in the home lost their job due to the COVID-19 pandemic.

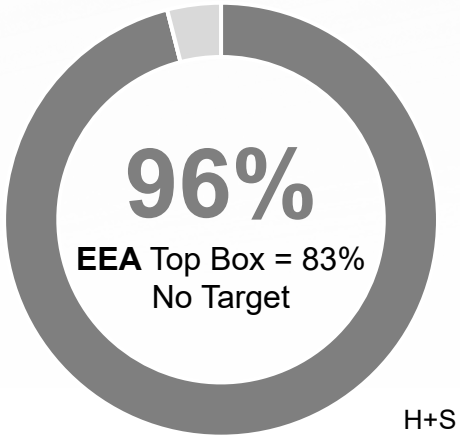


Percent of respondents (n=50) who said the number of individuals living in their home has increased since the pandemic started.

Customer Satisfaction

Health and Safety Pilot Overall and Top Box

H+S (n=25)
EEA (n=259)[1]



H+S (n=25)
EEA (n=259)[2]

9 - 10	"…it's helping lower my bill."	"…I would have lost my home if it wasn't for DTE…"

Satisfaction Higher for Health and Safety Pilot Participants

- The Health and Safety pilot participants had higher satisfaction (100%) with the Energy Efficiency Assistance (EEA) program than customers who did not receive health and safety measures (97%).[3]
- Additionally, Pilot Top Box satisfaction improved between the pre-survey and post-survey (From 84% to 96%). Overall Pilot satisfaction was 100% in both surveys.

Complaints

Despite high numerical ratings, there were still a couple of complaints about DTE's EEA program. Complaints were related to customer expectations around what they could receive and bill amounts still being high.

1. *EEA Program 2021 Satisfaction as of November 15, 2021.*
2. *EEA Program 2021 Top Box Satisfaction as of November 15, 2021.*
3. *Overall satisfaction is calculated as the percentage of applicable responses that rate satisfaction with the program as 6 or higher; Top Box satisfaction is calculated as the percentage of applicable responses that rate satisfaction with the program as 9 or higher. The difference is not statistically significant.*

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Recommendations

Recommendations

Guidehouse recommends several actions to improve Pilot research and implementation in the future

Tailoring Interventions to Customers

- Identifying customer health and safety conditions (i.e., asthma, trips and falls etc.) prior to installation could help additionally tailor measures installed to the customer's needs, leading to strong NEIs.
- This could be done through a survey given to approved participants or by partnering with local health organizations to inform patients with severe health conditions about the Pilot.

Continue Pilot Offerings

- Customers were incredibly grateful to the Pilot for its improvements to their homes.
- Continuing to offer these Pilot services by partnering with other funding agencies (i.e., ACEEE[1]) means supporting more of these underserved communities, more savings and more NEIs.

1. *https://www.aceee.org/blog-post/2021/11/aceee-seeks-partners-tap-1b-federal-funds-improve-home-health-and-efficiency*

Research Limitations

- Survey questions were adapted to isolate the impacts of the pilot from outside factors but there may be unavoidable external factors captured in the survey data.
- Self-reporting from participants could result in respondent biases or error. Additionally self-reporting increases the importance of surveying the same customers in the pre- and post-surveys.
- NEIs that came from non-surveyed conditions had to be extrapolated since survey questions could not accurately capture improvements over time.

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