June 2019

TEXAS ENERGY POVERTY RESEARCH INSTITUTE

LOW-INCOME COMMUNITY PROFILE SERIES

Part 1.

Texas Overview

TEPRI
Texas Energy Poverty Research Institute

LEAD AUTHORS

Dana Harmon

Jacquie Moss

PROJECT PARTNERS

LBJ School of Public Affairs
The University of Texas at Austin

EDF Environmental Defense Fund
Finding the ways that work

LICP Series

TEPRI designed the Texas Low-Income Community Profile (LICP) Series to reveal insights at the intersection of poverty and energy affordability to advance lasting energy solutions for low-income communities. This report, the Texas Overview, is the first in the series.

Part 1.
Texas Overview

This report is a state level summary of Texas low-income communities and their relationship to energy. It lays the foundation of the series.

Part 2.
Regional Reports

Higher resolution exploration into demographics, economic hardships, housing, energy behaviors, and quality of life for each study region.

Part 3.
Geospatial Tool

Interactive visualization of LICP data through geospatial interface and data downloads for specific insight into places and service territories.

PARTNERS

The LICP Series was developed in collaboration with the Lyndon B. Johnson (LBJ) School of Public Affairs at The University of Texas at Austin and the Environmental Defense Fund (EDF) with the shared goal of supporting utility executives, program administrators, policy makers and regulators, and other direct service providers to improve energy security for low-income communities across Texas.

LBJ Lyndon B. Johnson School of Public Affairs
The University of Texas at Austin

Under guidance from the Ray Marshall Center for the Study of Human Resources, a team of graduate students developed and conducted a statewide survey of more than 2,000 low- to moderate-income residents. They also conducted verbal interviews with residents from several regions of the state. The survey and interviews are essential sources of data in our analysis.

EDF Environmental Defense Fund®
Finding the ways that work

Environmental Defense Fund graciously provided financial support for the LICP and is further leveraging this effort by preparing analysis on opportunities for energy efficiency in Texas low-income communities.

ACKNOWLEDGEMENTS

This report was prepared by TEPRI and written by Dana Harmon and Jacquie Moss. We would like to recognize the following individuals who have contributed significantly through research and other support to the development of this project: Heath Prince, Ph.D., Michelle Pluckett, Ali Adil, Ph.D., and Erik Funkhouser. Thank you also to the essential support from our TEPRI colleagues — Samantha Robledo and Alexa Nizam.

The authors are grateful for the external reviews provided by the following experts. Note that external review and support do not imply affiliation or endorsement.

Kim Campbell, TXU Energy
Robert Cavazos, AEP Texas
Tara Cunningham, One Gas
Katherine Dombrowski, Trimeric Corp.
Jesse Hernandez, CPS Energy
Garry Jones, Oncor
Debbie Kimberly, Austin Energy
Becky Klein, Klein Energy
Denise Kuehn, Austin Energy
Jordan Mendiola, AEP Texas
Steve Mutiso, AEP Texas
Patrick Reinhart, El Paso Electric
Ned Ross, Direct Energy
Sarah Ryan, Environmental Defense Fund

Suggested Citation

Harmon, Dana and Jacquie Moss. 2019. *Low-Income Community Profile Series, Part 1: Texas Overview*. Texas Energy Poverty Research Institute.

ABOUT TEPRI. The Texas Energy Poverty Research Institute (TEPRI) is a collaboration of poverty and energy stakeholders working to inspire lasting energy solutions for low-income populations across Texas. Our efforts support leaders to advance economic opportunity and build healthier communities for all through energy. We work with teams of experts from inside and outside the energy sector to conduct research, build evidence, create tools for practitioners, and partner with local jurisdictions to pilot and test new policies and practices that can scale through effective networks.

FOR MORE INFORMATION PLEASE CONTACT:
Texas Energy Poverty Research Institute
611 South Congress Avenue, Suite 125
Austin, TX 78704

Tel. (512) 707-1009
Email: news@txenergypoverty.org
Website: www.txenergypoverty.org

EXECUTIVE SUMMARY

OBJECTIVES OF THE LICP SERIES

In collaboration with the Environmental Defense Fund (EDF) and Lyndon B. Johnson (LBJ) School of Public Affairs at The University of Texas at Austin, the Texas Energy Poverty Research Institute (TEPRI) conceived of the Low-Income Community Profile (LICP) Series to **reveal insights at the intersection of poverty and energy affordability**. The purpose of the LICP Series is for data and insights to be utilized by TEPRI members and stakeholders to **enhance impact** of low-income energy programs and **reduce barriers** to outreach and education.

As the first installment of the LICP Series, this report narrows its discussion to broad factors that set the stage for finer resolution, regional analysis. In this report, we discuss the interplay between energy poverty and economic hardship, demographic traits, quality of life issues, energy behaviors, housing type, and household composition (ES-1).

With this approach, TEPRI aims to encourage deeper understanding and prompt curiosity and compassion. Peoples' lives are rich and complicated, and we want to respect this complexity by investigating data across multiple variables and varying geographic resolution.

STATEWIDE SURVEY

With TEPRI, a team of 12 LBJ graduate students developed and fulfilled a statewide survey of more than 2,000 low- to moderate-income residents. To validate and provide context to the survey results, TEPRI used the U.S. Department of Energy (DOE) Low-Income Energy Affordability Data (LEAD) Tool, specifically the "2015 Census tract-level data for the state of Texas."

The LEAD Tool provided a wide-range of variables — including income, energy expenditures, tenure (i.e., rent versus own), number of housing units, and fuel prices by fuel type — as average values for each income category.

ES-1. The LICP Series investigates the interplay between energy poverty and multiple factors.

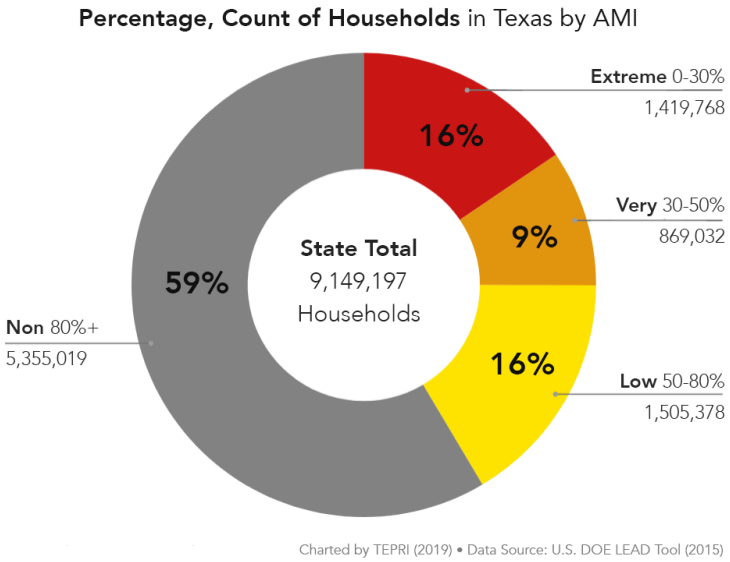
Income Brackets
AMI vs FPL

	Income Levels	AMI Area Median Income	FPL Federal Poverty Line
LOW-INCOME	Extreme	0-30%	Under 100%
LOW-INCOME	Very	30-50%	100-150%
LOW-INCOME	Low	50-80%	150-200%
	Non	80%+	Over 200%

The LICP Series uses AMI to:

1) align with the LEAD Tool

2) account for cost-of-living at local level



ES-2. This report uses the LEAD Tool income categories that are based on Area Median Income (AMI).

According to the 2015 U.S. Census, low-income households totaled 3.8 million in Texas as reported by the LEAD Tool (ES-2). That figure represents 41% of households in Texas at or below 80% of Area Median Income (AMI). In this report, we conform to the LEAD Tool in using income categories based on AMI.

INTERPLAY OF FACTORS

Analysis of the LEAD Tool and LICP Survey data confirmed the complex interplay of factors that contribute to energy poverty. We compared low-income households by both income categories and age groups across a broad range of factors. In this report, we describe certain tendencies in housing, demographics, and behaviors that may be used to enhance programs to meet specific needs. While not all low-income households experience energy poverty, they are the segment that is most vulnerable and for whom we seek long-term, sustainable solutions to achieve access to affordable, reliable energy.

Owner-occupied households are a meaningful energy poverty reduction target. Almost half of low-income households in Texas (46%) are owner-occupied. Among the survey population, the "extreme" households were much more likely to rent compared to those in the "low" group, which may be related to the prevalence of renters (~65%) among the 18- to 34-year-old segment who made up more than half of the "extreme" category. Meanwhile, respondents who identified as 65 or older were much more likely to own their homes (72%).

Renter-occupied households have lower energy expenses, which may obscure need. Low-income owner-occupied households have 40% higher energy expenditures compared to renter-occupied ones, which is likely related to the higher energy expenses associated with single-family homes. To clarify by using LEAD Tool data, the average energy expenditure for a one-unit detached, owner was 87% higher values than a renter residing in a multi-unit structure with 10 or more units ($197 per month compared to $105 per month). If expenditure is the primary tool for determining need, then this population may be at risk of missing opportunities.

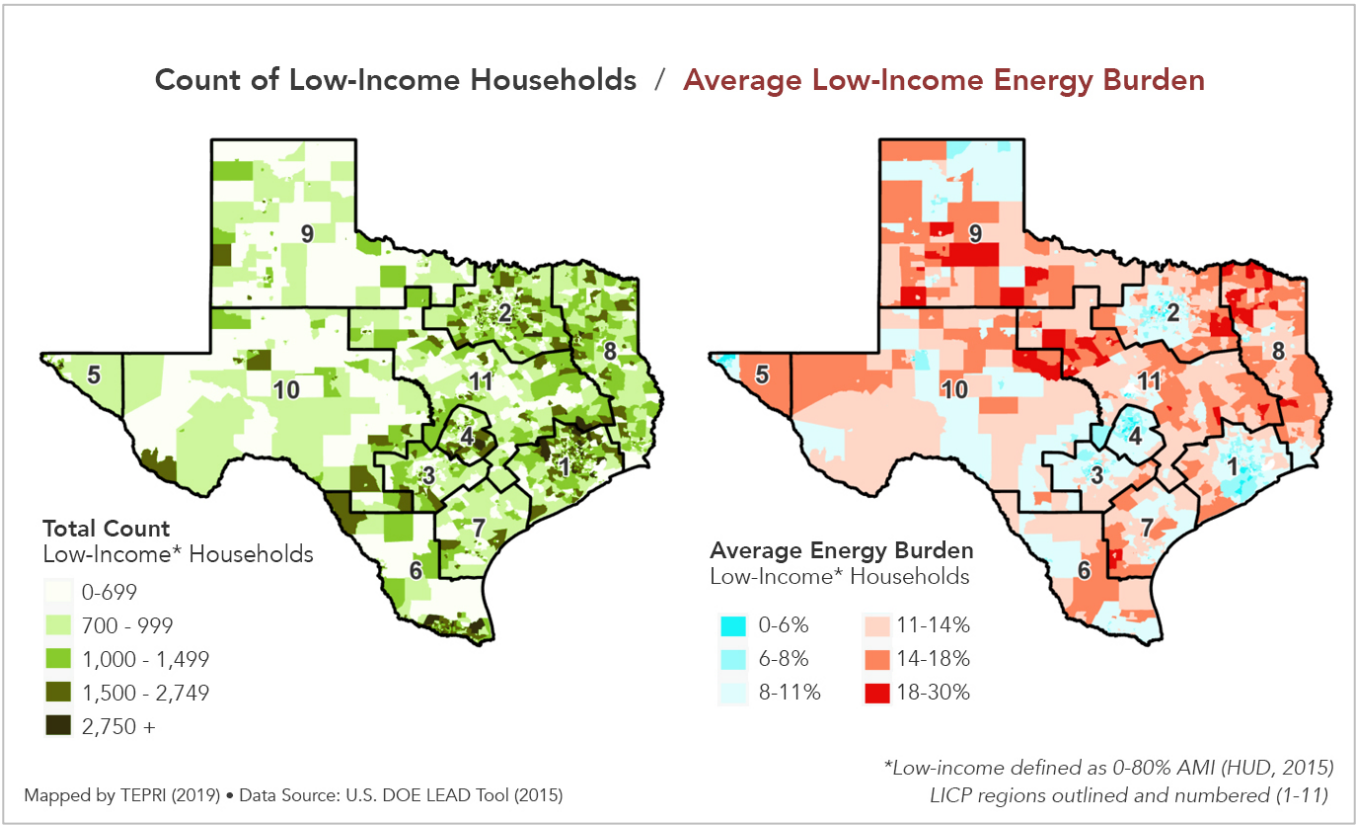
Low-income Texans make difficult trade-offs to balance their household expenditures. Survey respondents agreed on the most common trade-offs that they make to afford their electricity bills — clothing and food. With more extreme hardship, people shared that they sacrifice on transport, medicine and housing.

Low-income customers are engaged with energy, just not with programs. The majority of low-income survey respondents agreed that they review their monthly electricity bills and are able to program their thermostats. Almost half of "extreme" and "very" respondents reported difficulty in paying for their electric and other household bills, compared to just a third of households in the "low" category. Fewer than 25% of respondents were aware of bill assistance, and less than 15% of respondents said that they were aware of efficiency and weatherization programs. Younger respondents (18- to 34-year-olds) were less often aware of programs compared to the other age groups.

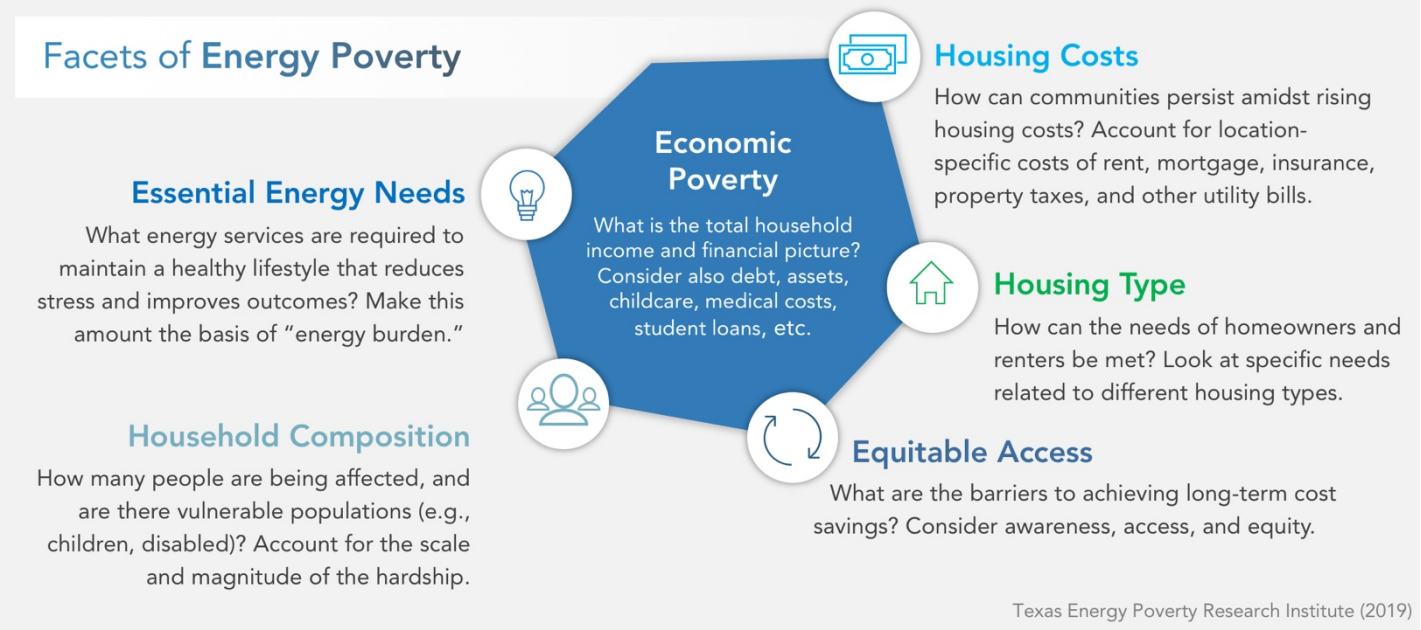
Energy burden is a useful metric, but not a sufficient signal of energy poverty. Energy burden describes the amount households spend on energy relative to income. Low-income households had an average energy burden of 10% compared to 2% for non-low-income.

In our spatial analysis, we found that high energy burden does not always occur in the poorest communities. Referring to ES-3 below, the major metropolitan areas (e.g., the Houston (1) and Austin (4) regions) as well as the Brownsville area (6) had pockets with large total low-income households (dark green on left-hand map) with relatively small energy burden (blue on the right-hand map). Note that the numbers on these maps represent the regional delineation that TEPRI and LBJ devised for the survey segmentation. The regional definition is meant to facilitate analysis at a regional scale and allow cross-comparison between areas of the state.

Energy burden does not tell us who is going without basic energy services whether because of affordability, awareness, or accessibility. Income may constrain energy use both implicitly because of housing characteristics (smaller homes, multi-unit housing, etc.) but also with explicit choices such as going without energy services.



ES-3. Sum of Low-Income Households Compared to Average Energy Burden of Low-Income Households, Texas



ES-4. Energy poverty happens at the intersection of economic hardship and a complex web of factors.

RECOMMENDATIONS

With a better understanding of low-income communities across Texas, we may collectively develop solutions to alleviate suffering at the intersection of energy and poverty. To serve the state's most distressed communities, we recommend that energy burden be considered in combination with other factors — including presence of vulnerable household members, size of household, and health considerations (ES-4). To design programs that lead to long-term savings, it is important to understand life circumstances and behavioral attitudes. With these goals in mind, we offer the following suggestions for acting on findings from this study.

Evaluation. Use multi-factor geospatial tools to identify distressed communities. Explore how energy expenditures compare to the regional median and to housing characteristics, comparing like-to-like. Evaluate criteria at regular intervals (i.e., longitudinal study) to understand how factors shift with age, region, and other variables.

Program Design. Discern between reaching the largest number of people or reaching the poorest communities. Use market segmentation to align program design with life circumstances and behavioral attitudes. Prioritize programs that contribute to long-term savings and self-sufficiency by serving critical needs. Consider tying weatherization and energy efficiency to the higher awareness programs, such as bill payment and payment arrangements.

Outreach. Collaborate with community partners to connect with hard-to-reach segments. Structure outreach to speak to age-specific life stressors. Invest in early energy literacy to decrease energy burden of young adults and to imprint good habits.

CONTINUATION OF THE LICP SERIES

TEPRI will further investigate these variables and others as we develop regional reports, a geospatial tool, and as we build support for a longitudinal regional study to evaluate how these energy poverty indicators, and others, change over time.

INTRODUCTION

Energy Poverty. In the context of our work at TEPRI, we describe energy poverty as a situation in which a household cannot meet its basic energy needs to maintain a healthy lifestyle. Energy poverty may occur because a household does not have access to essential energy services or if it cannot afford these services, despite having access. It may also occur because the household members are unaware of how to decrease their usage or lower their costs. **More broadly, the study of energy poverty explores the intersection of energy access and economic poverty.**

TEPRI and our members seek deeper understanding of the energy needs of low-income households in Texas. As an outcome of our 2017 Energy Poverty Research Landscape Analysis,[1] we identified that customer engagement was the most evident opportunity to improve service to low-income households. Demographic and contextual factors that impact low-income customer behavior, program participation, and response to intervention are dramatically understudied, in particular regarding interplay with housing type, household composition, and health considerations. To this end, the LICP Texas Overview represents a statewide comparative analysis of multiple variables at the intersection of household energy and economic hardship.

STUDY QUESTIONS

- What is the interplay between energy poverty and housing type, household composition, health considerations, and socio-demographics?
- What do behavioral patterns tell us about opportunities for customer engagement and program design?
- Are there key differences within these factors that suggest different approaches?

Goals and Objectives

The purpose of this report is for data and insights to be utilized by members and stakeholders to:

- Increase effectiveness of low-income energy programs
- Reduce barriers to outreach and education
- Evaluate policy and funding requirements
- Explore opportunities for renewable energy and distributed energy resources to help improve energy security

[1] The "TEPRI Energy Poverty Research Landscape Analysis" is available online at: http://www.txenergypoverty.org/sdm_downloads/tepri-energy-poverty-landscape-analysis

INCOME LEVEL CATEGORIES

TABLE 1 (right) describes the income level categories that are referenced throughout this report. We include a rough translation of Area Median Income (AMI) categories to the Federal Poverty Line (FPL) guidelines. Our analysis uses AMI for two important reasons: 1) to align with our primary external dataset, the Department of Energy's Low-Income Energy Affordability Data (LEAD) Tool; and 2) AMI accounts for cost-of-living in its assignment of median values. The Department of Housing and Urban Development (HUD) calculates the median income for defined regions. For our analysis, we used AMI at the county-level.

TABLE 1. This table compares the income categories by Area Median Income (AMI) and Federal Poverty Line (FPL). AMI is defined at the regional level. FPL is defined at the federal level for all of the U.S. (with a couple of exceptions).

	Income Levels	AMI Area Median Income	FPL Federal Poverty Line
LOW-INCOME	Extreme	0-30%	Under 100%
	Very	30-50%	100-150%
	Low	50-80%	150-200%
	Non	80%+	Over 200%

ENERGY POVERTY FACTORS

The LICP Series focuses its analysis on five energy poverty factors as described in TABLE 2 (below).[2] Each factor is an observable or measurable component that helps to build our understanding of energy poverty. The survey design and analytical framework for this study are based on the complete set of factors; however, the findings in this report are specific to those for which data was sufficient and that we found to be most statistically meaningful at the statewide resolution.

TABLE 2: Brief description of energy poverty factors used in this report

FACTOR	DESCRIPTION
Economic	Income, energy expenditures, housing costs (e.g., mortgage, rent, other utility bills), health insurance, and other household expenses (e.g., clothing, education, childcare)
Housing Structure	Tenure of residence (e.g., own versus rent), number of units, age and condition of housing structure, age and type of appliances (e.g., air conditioning, furnace, water heater and refrigerator), primary fuel type
Demographics	Key characteristics that describe the household and surrounding community including age, race, marital status, educational attainment, as well as industry and employment
Household Composition	Household size and age of full-time residents, relationships between house members (e.g., family members versus cohabitating adults), presence of vulnerable populations (i.e., elderly, children and disabled persons)
Quality of Life	Mental and physical discomfort related to temperature of residence, financial stress from utility and other bills, serious disability, respiratory condition, or other serious health conditions

[2] This chart was adapted from: Drehobl, Ariel and Lauren Ross. 2016. "Lifting the High Energy Burden in America's Largest Cities: How Energy Efficiency Can Improve Low Income and Underserved Communities." American Council for an Energy-Efficient Economy (ACEEE).

ENERGY BURDEN

Energy burden is the percentage of household income that is spent on energy expenses (FIGURE 1). Energy burden is commonly used to distinguish the energy expenditures of low-income households relative to non-low-income. For instance, The American Council for an Energy-Efficient Economy (ACEEE) conducted an extensive analysis of energy burden in America's largest cities and summarized its findings: "Our research determined that the overwhelming majority of single-family and multifamily low-income households (those with income at or below 80% of area median income), minority households, low-income households residing in multifamily buildings, and renting households experienced higher energy burdens than the average household in the same city."[3]

ACEEE and other sources consider an energy burden of more than six percent (6%) to be unaffordable.[4] The basis for this 6% figure is historically rooted in the concept of measuring energy burden relative to household income alone; however, this report aims to show the necessity of using a regional median, where the definition of "region" is dependent upon the specific problem and scope that is being addressed.

Energy burden does not tell us who is going without basic energy services whether because of affordability, awareness, or accessibility. **We intend to demonstrate the usefulness of energy burden, but caution that reliance on it as a singular measure may lead to overlooking some of the state's most distressed communities.**

FIGURE 1: Energy burden is the percentage of household income that is spent on household energy (including electricity, utility gas, and bottled fuel). It does not incorporate transportation energy costs. Commonly, a household energy burden that exceeds 6% is considered "high."

[3] Drehobl, Ariel and Lauren Ross. 2016. "Lifting the High Energy Burden in America's Largest Cities: How Energy Efficiency Can Improve Low Income and Underserved Communities." American Council for an Energy-Efficient Economy (ACEEE).

[4] Many U.S. researchers, including ACEEE, reference: Fisher, Sheehan & Colton (FSC), "Housing analysts consider an energy burden of more than six percent (6%) to be unaffordable." Accessed online at: http://www.homeenergyaffordabilitygap.com

METHODOLOGY

To gain a deeper understanding of drivers and effects of energy poverty, we pursued multiple approaches. First, we developed an analytical framework based on our 2017 Energy Poverty Research Landscape Analysis. These five categories — financial circumstances, housing characteristics, socio-demographics, household composition, and quality of life — were described previously in TABLE 2.

In coordination with TEPRI, a team of 12 graduate students at the Lyndon B. Johnson (LBJ) School of Public Affairs at the University of Texas at Austin developed and fulfilled a statewide survey of more than 2,000 low- to moderate-income residents. The team also conducted and transcribed qualitative interviews with additional participants.

To validate and provide context to the survey results, TEPRI used the U.S. Department of Energy (DOE) Low-Income Energy Affordability Data (LEAD) Tool, specifically the "2015 Census tract-level data for the state of Texas."[5]

This section will explain the two primary sources of data used in our analysis.

1. TEPRI LICP Series Survey
2. U.S. Department of Energy (DOE) Low-Income Energy Affordability Data (LEAD) Tool

LICP Series Survey

The team designed the survey to provide an accurate representation of Texas, to achieve the highest feasible resolution, to reflect unique Texas communities, and to represent a cross-section of low-income Texans. We planned the segmentation framework to reflect the variety of demographic and sociographic groups and to cover broad geographic expanse.

We started by defining 11 geographic regions (FIGURE 2). The regional definition is meant to facilitate analysis at a regional scale, to allow cross-comparison between areas of the state, and to reduce bias towards the major population centers. Using U.S. Census data, we formed eight regions by identifying counties associated with Texas' major metropolitan areas, taking into consideration service territories of energy providers. We sorted the remaining counties into three regions based on population, spatial relationships, and climate zones.

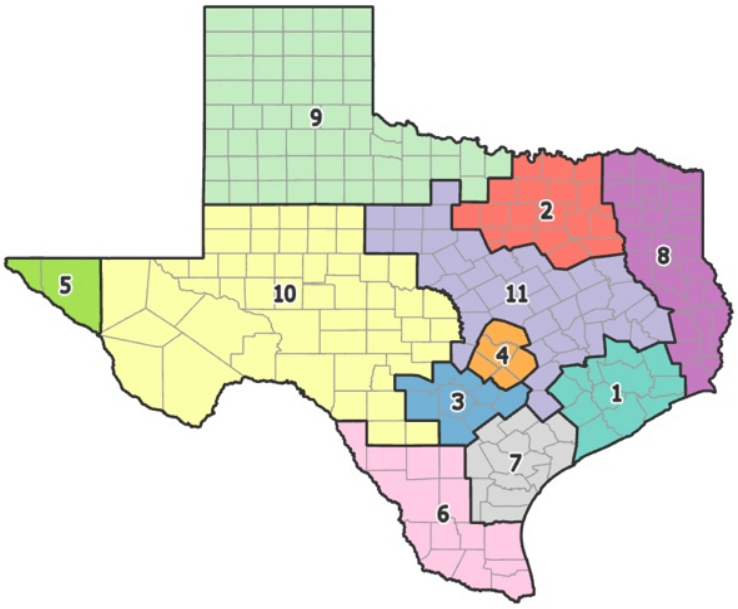


FIGURE 2: Eleven distinct regions are the basis of the LICP Series survey design and analytical approach — ensuring a variety of demographic representation and allowing for inter- and intra-regional comparisons.

[5] Accessed March 26, 2019, from: https://openei.org/doe-opendata/dataset/celica-data

The LBJ team produced the survey questionnaire using Qualtrics, a web-based data collection and analysis tool. The survey instrument was disseminated through a commercial panel provider with experience fielding surveys among energy consumers.[6] The team set the sample size for each region in proportion to the total population of the region (TABLE 3). With a total of 2,020 survey responses, we achieved the goal of a statistically significant sample size with a 95% confidence level (TABLE 3). Respondents met the following criteria:

- Head of the household over the age of 18
- Made household energy management decisions
- Lived in Texas for six months or more
- Annual household income was under $75,000 before taxes in 2017

By cross-referencing their self-reported household income, zip code, and household size to the median income by household size per county from ACS five-year estimates (2017),[7] respondents were categorized into four AMI categories: "extreme" (0-30%), "very" (50-80%), "low" (50-80%), and "non" (over 80% AMI). There was a total of 1,396 households in the survey population who were at or below 80% of AMI. For the remainder of this report, this subset of the survey respondents is referred to as the "Low-Income Survey Population."

TABLE 3: Household population in Texas based on LEAD using 2017 U.S. Census data with LICP study regions' survey population size and confidence interval (CI). Based on the total survey population size as a representation of all households, the average confidence interval (CI) for the survey is 95% with a margin of error of 5%.

Region	Territory Description	Sum of All Households[8] (1000s)	Below 80% AMI[9] (1000s)	Total Survey Population	Low-Income Survey Pop.	CI / Margin of Error
1	Houston	2,198	899	385	273	95/5
2	Dallas, Fort Worth	2,547	1,024	385	284	95/5
3	San Antonio	785	315	271	185	95/5
4	Austin	686	276	208	156	95/10
5	El Paso	260	116	68	38	80/10
6	McAllen, Brownsville, Laredo	470	253	97	55	85/10
7	Corpus Christi, Victoria	259	102	68	44	85/10
8	Beaumont, Tyler, Longview	577	246	97	70	85/10
9	Amarillo, Lubbock	388	162	165	108	95/10
10	Abilene, Midland, Odessa, San Angelo	317	127	208	143	95/10
11	College Station, Killeen, Waco	631	274	68	40	80/10
	Totals	9,120	3,794	2,020	**1,396**	**95/5**

[6] The original research questionnaire and validation methodology are explained in more detail in the associated LICP report published by the LBJ School of Public Affairs, the "Texas Energy Poverty Profiles Project," available online at: https://repositories.lib.utexas.edu/handle/2152/74292

[7] Because the survey was collected in the Fall of 2017, TEPRI categorized the survey populations using the 2017 ACS.

[8] U.S. Department of Energy (DOE) Low-Income Energy Affordability Data (LEAD) Tool, "2015 Census tract-level data for the state of Texas," accessed March 26, 2019, from: https://openei.org/doe-opendata/dataset/celica-data

[9] Ibid.

Low-Income Energy Affordability Data (LEAD) Tool

The DOE Better Building's Clean Energy for Low Income Communities Accelerator (CELICA) launched in 2016 to help state and local partners across the nation meet their goals for increasing uptake of energy efficiency and renewable energy technologies in low- and moderate-income communities. As part of that initiative, DOE created the Low-Income Energy Affordability Data (LEAD) Tool to improve understanding of low- to moderate-income community characteristics.

Using Excel and ArcGIS to statistically and spatially analyze the data, we incorporated the following variables from the LEAD Tool: annual income, energy expenditures (i.e., total), energy expenditures separated by fuel type (e.g., electric, natural gas, and other fuels), year built, tenure (i.e., rent versus own), number of housing units, and fuel prices by fuel type. See FIGURE 3. These data sets were available as average values for each income category — "extreme," "very," "low," and "non" — down to the resolution of census tract. The LEAD Tool divided the non-low-income households into two bins 80-100% AMI and 100%+. TEPRI consolidated these groups into 80%+, referring to them collectively as "non."

According to the project documentation,[10] DOE determined housing type, tenure, and household composition data by cross-tabulating U.S. Census housing data at the census tract level. DOE calibrated these estimates to electric and natural gas data collected by the U.S. Energy Information Administration (EIA) surveys.[11]

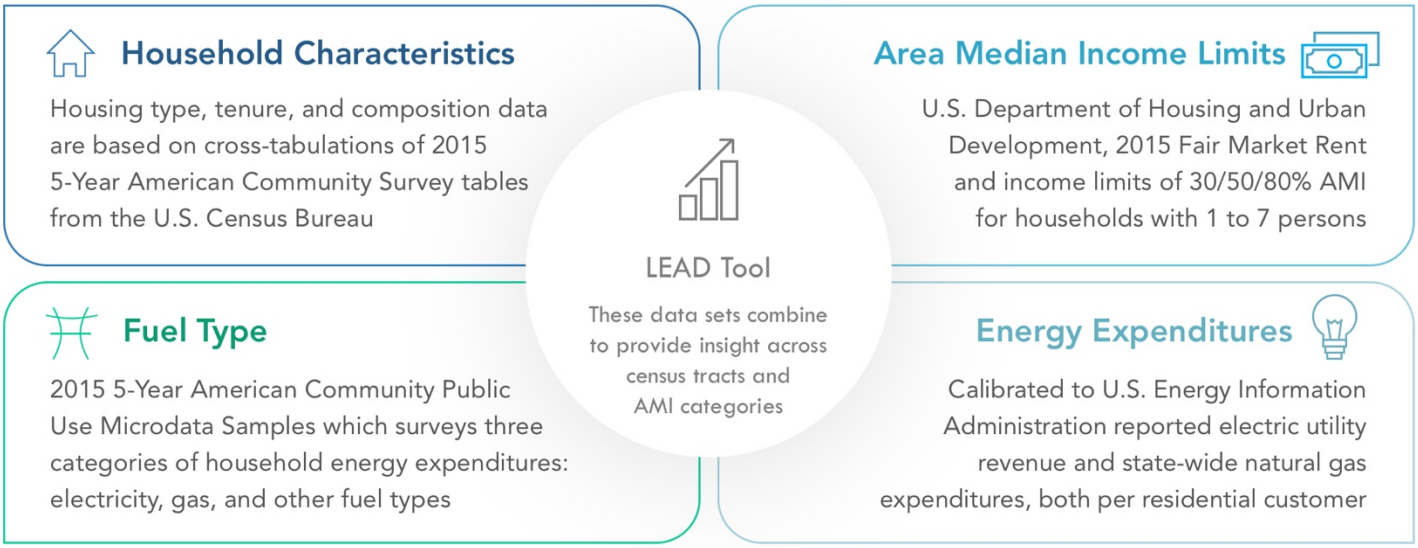


FIGURE 3. DOE created the Low-Income Energy Affordability Data (LEAD) tool to assist partners with understanding their low- to moderate- income community characteristics. We used its breakdown based on fuel type, building type, and construction year as well as average monthly energy expenditures and energy burden (percentage of income spent on energy).

[10] Access the LEAD Tool and documentation online at: https://openei.org/doe-opendata/dataset/celica-data

[11] Through EIA Form 861 — Residential electricity sales (MWh) by indexed by Utility ID, Energy-Only Service, Bundled-Service, and Delivery Service; and, EIA Form 176 — Residential natural gas volume (McF) indexed by Utility ID, Bundled Service, and Transport Service).

LIMITATIONS OF STUDY

The LICP Survey asked respondents to estimate their electric bills. To analyze statewide and regional trends in estimated energy burden, TEPRI found that these self-reported expenditures were unreliable and chose to use the LEAD Tool energy expenditure estimates which were based on actual, albeit generalized, residential sales. The LEAD Tool gathered energy expenditures, rather than energy consumption. The expenditure data from ACS included the full utility bill including any fixed charges. The electricity and gas expenditures were taken for a single, non-specified month, which limits how well the expenditures represent all months of the year. Households with combined electricity and natural gas bills or energy expenditures included with other housing costs were removed from the averaging, which can bias the statistical sample. To model the energy costs for master-metered multifamily buildings, the LEAD Tool assumed that the energy expenditures for those housing units was the same as those of similar housing units which pay utility bills directly.

The LEAD Tool presented average values for each income category and did not include household number, age of household members, or demographic information in its analysis. In the LICP survey, a majority of survey respondents (64%) declined to indicate race; likewise, questions about the number of occupants under the age of 18 and over 65 also had significant gaps. Both of these factors were excluded from our analysis. Furthermore, in the less populated areas of the state, there were areas with little to no representation from survey respondents (FIGURE 4). For future studies, hard-to-reach communities may be more effectively recruited in coordination with a local community partner, for instance connecting with homebound individuals in partnership with Meals on Wheels.

The LEAD Tool cross-referenced U.S. Census, U.S. U.S. Department of Housing and Urban Development (HUD), and EIA data products from 2015; whereas, the LICP Survey was conducted in the fall of 2017. The LEAD Tool was used to set context for the LICP Survey data; we did not use it to perform cross-analysis.

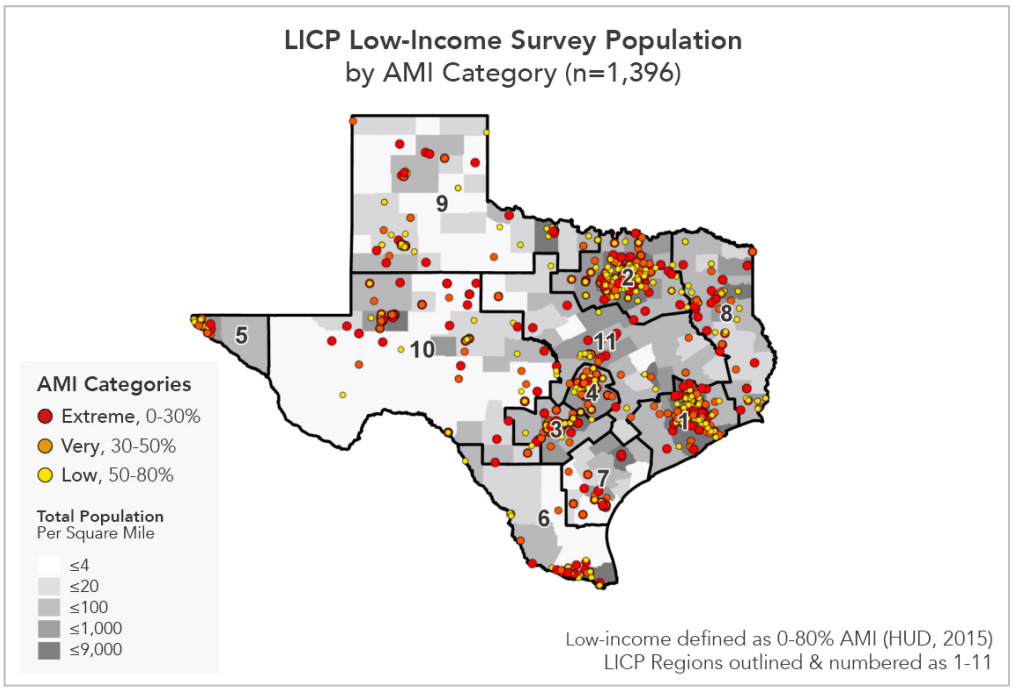


FIGURE 4. LICP survey respondents were geocoded to a point based on their self-reported zip code. This map shows that the 1,396 survey respondents who qualified as "low-income" (0-80% AMI) were distributed across the state. There were some rural patches of Texas with little to no representation.

ANALYSIS

LEAD Tool

The LEAD Tool provides general context for the LICP Survey data. Based on 2015 U.S. Census ACS 5-year estimates, 41% of Texas households qualify as low-income when defined as 0-80% AMI, representing 3.8 million households out of a total of 9.1 million. The "extreme" and "very" populations represented 25% of the total household count (FIGURE 5).

We compared two methods for segmenting households in Texas, as shown in FIGURE 6.

1. **Sum of low-income households.** The largest numbers of low-income households reside in more densely populated census tracts.
2. **Share of all households.** There are communities that have a high percentage of low-income households, but the overall population numbers are not large, so they do not show up on the first map.

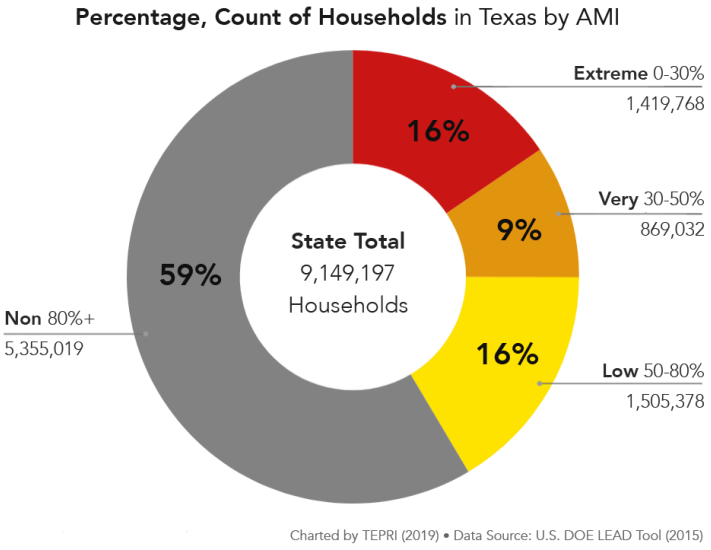


FIGURE 5. Breakdown of statewide population by AMI Category, according to the LEAD Tool (using 2015 U.S. Census data). The "extreme" and "very" population represented 25% of the total household count.

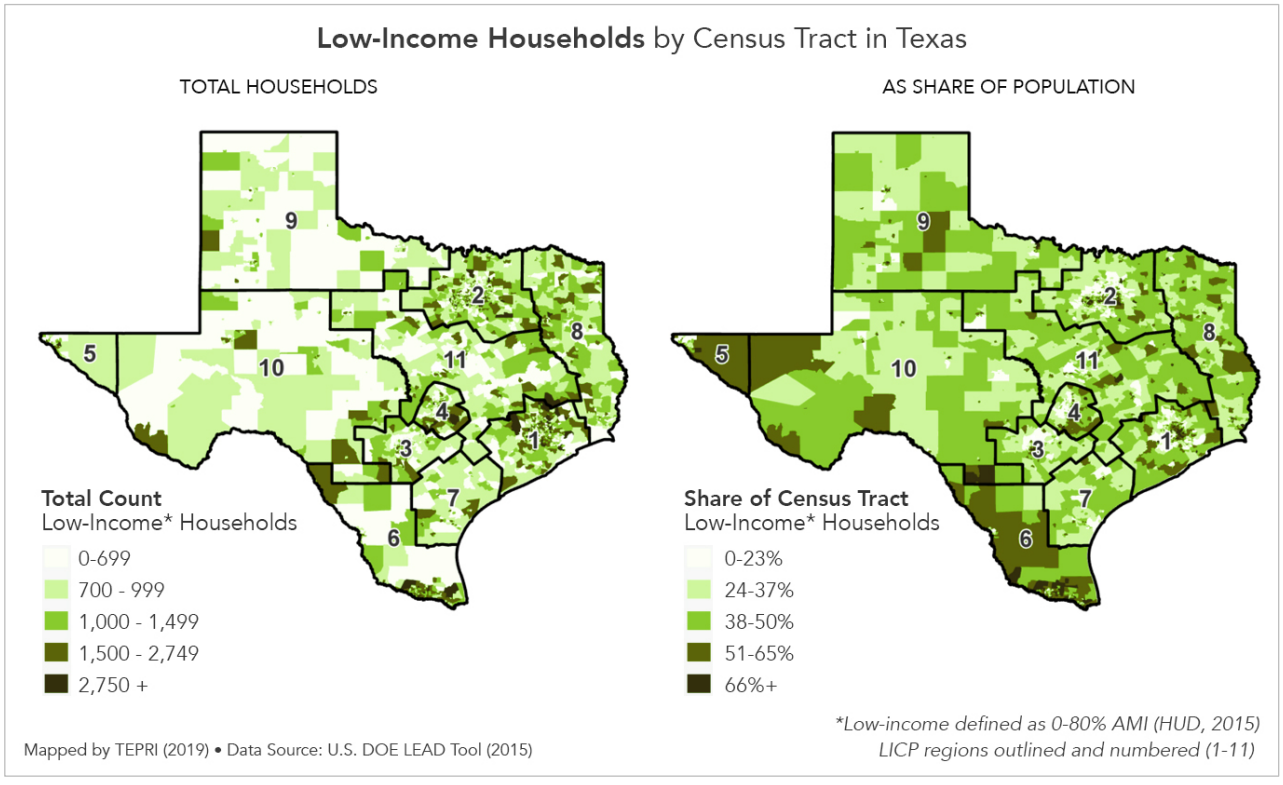


FIGURE 6. Maps comparing sum of low-income households to percentage of low-income households relative to sum of all households by census tract. As elsewhere in this report, low-income is defined as 0-80% AMI using HUD guidelines (2017).

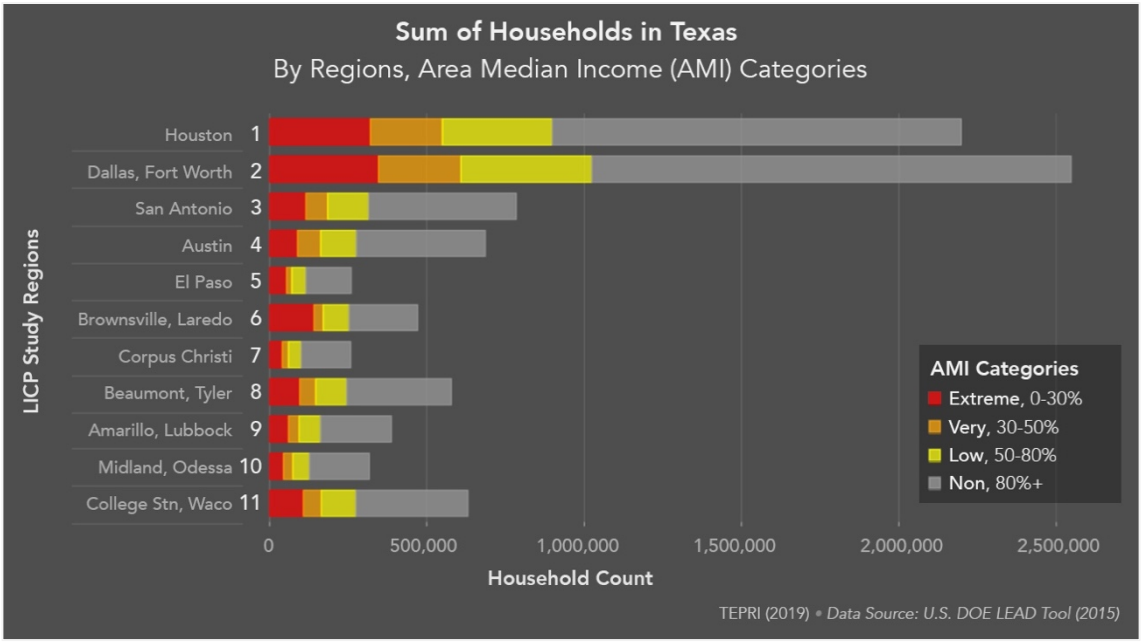


FIGURE 7. This chart shows the distribution of households by income categories across the 11 LICP regions. The largest number of low-income households were in the populous metropolitan areas of Houston (1) and Dallas-Fort Worth (2).

Referring to FIGURE 7 (above), the largest numbers of low-income households were in the urban areas of Houston (1) and Dallas/Fort Worth (2). In the McAllen, Brownsville, Laredo region (6), there were both high numbers of low-income households and a high percentage of the total population was low-income. FIGURE 8 (below) describes the number of low-income households by region on a percentage basis, the regions that had a much higher share of households in the "extreme" and "low" categories were: El Paso (5); Beaumont, Tyler, Longview (8); and College Station, Killeen, Waco (11) with the McAllen, Brownsville, Laredo (6) region significantly surpassing all others, as depicted below.

Percentage of Income Brackets
by LICP Regions

Income Bracket (% AMI)	1	2	3	4	5	6	7	8	9	10	11	State Avg
Extreme (0-30%)	15%	14%	15%	13%	21%	30%	15%	17%	16%	14%	18%	16%
Very (30-50%)	10%	10%	9%	10%	6%	6%	8%	9%	9%	9%	9%	9%
Low (50-80%)	16%	16%	17%	16%	17%	17%	16%	17%	17%	17%	18%	16%
Low-Income Total (0-80%)	41%	40%	41%	39%	44%	53%	39%	43%	42%	40%	45%	41%

Graphed by TEPRI (2019) | Data Source: Low-Income Energy Affordability Data (LEAD), with population data from 2015 5-Year American Community Survey (U.S. Census)

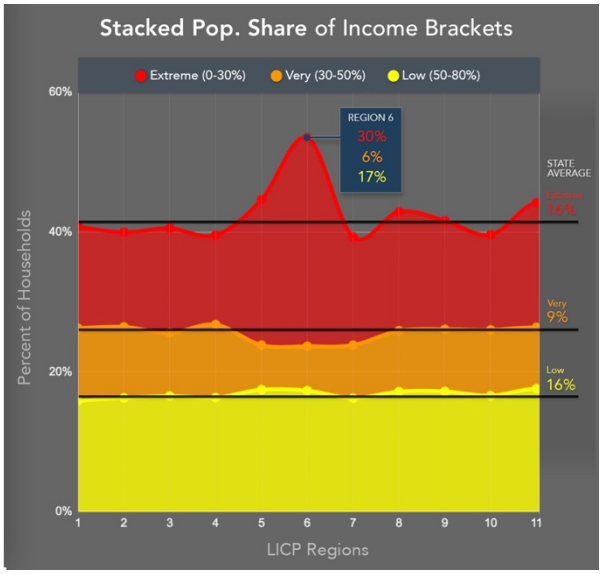


FIGURE 8. The table supports the chart on the right; both show the percentage of low-income households by region. The McAllen, Brownsville, Laredo (6) region had the highest percentage of households in the "extreme" and "low" categories and highest total low-income population (53%), which is depicted by the steep bump in the right-hand chart.

ENERGY BURDEN

The LEAD Tool estimated energy burden for each of the income categories. Referring to FIGURE 9, the red bars (energy burden) demonstrate the striking disparity in the percentage of household income that is spent on energy as household income declines. The average energy burden for the "extreme" group was calculated at 16.5%, stepping down to 8.5% for "very," and 5.7% for "low." For non-low-income households in Texas, the average energy burden was calculated to be 2.2%. The average energy burden for the entire low-income (0-80% AMI) group was 10%. These figures demonstrate the disproportionate share of wallet that low-income households spent on household energy. The blue bars show that energy expenditures increased with income (32% increase from "extreme" to "non").

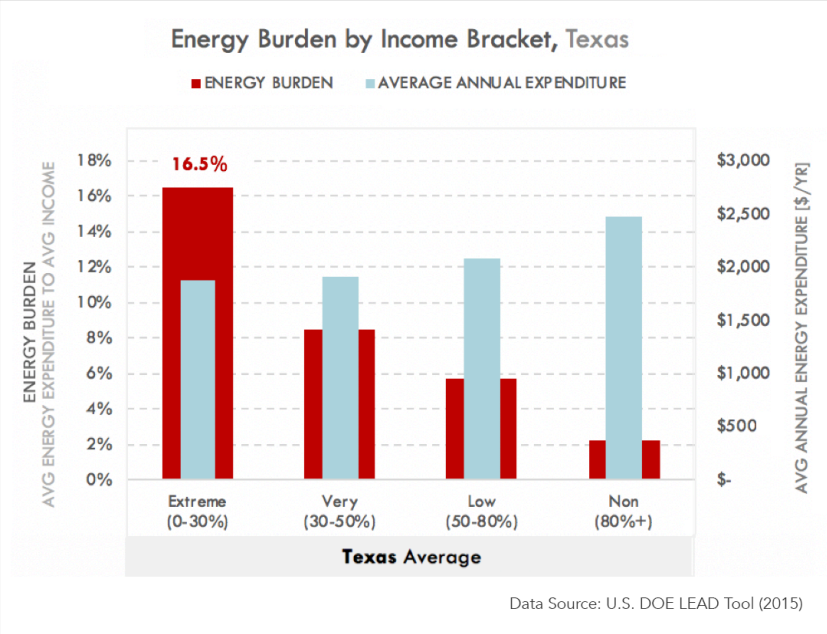


FIGURE 9. The left axis charts the red bars that show the Texas statewide average energy burden by income categories. The right axis charts the blue bars, which show annual energy expenditures. The average energy burden for the "extreme" group was 16.5%, stepping down to ~8.5% for "very," and 5.7% for "low." For non-low-income households in Texas, the average energy burden was 2%.

By the Numbers

The LEAD Tool offers the following insights about low-income households across Texas.

- Low-income households were **46% owner-occupied** (54% renter-occupied); whereas, non-low-income households were 74% owner-occupied. Most owner-occupied households (89%) live in single family homes. Most renter-occupied households live in multi-family buildings (70%).
- Low-income owner-occupied households have **40% higher energy expenditures** compared to renter-occupied ones, which is likely related to the next point.
- There was a strong inverse relationship (R^2=0.84) between **number of units** and energy expenditures (i.e., more units in a building was associated with lower energy expenditures); among low-income households, the average energy expenditure for an owner-occupied, detached unit was **87% higher** than that of a renter residing in a multi-unit structure with 10 or more units ($197 per month compared to $105 per month).
- Low-income households were two times more likely to live in housing that was **built before 1960**. In owner-occupied housing, there was a weak relationship between age of structure and energy expenditures (R^2=0.13); however, there was a stronger relationship between age of structure and energy expenditures for **renter-occupied housing** (R^2=0.53).
- There was a **strong relationship between energy expenditures and fuel prices** (electricity at R^2=0.78 and natural gas at R^2=0.74). However, there was no relationship between energy burden and electricity prices (R^2=.06) for low-income households; the relationship was slightly stronger between energy burden and natural gas prices (R^2=0.20).

SURVEY DATA ANALYSIS

This section describes results of the LICP Survey that we conducted in the fall of 2017 as described in the Methodology section of this report. This report aims to synthesize relevant findings rather than provide a comprehensive inventory of responses. The full anonymized data set is available on request for TEPRI members to analyze in detail.

Characteristics of LICP Survey Population

The 1,396 survey respondents who qualify as "low-income" (0-80% AMI) were distributed across the state as described previously in FIGURE 4. Regarding the income categories, the survey population adequately represented the income categories as shown in FIGURE 10.

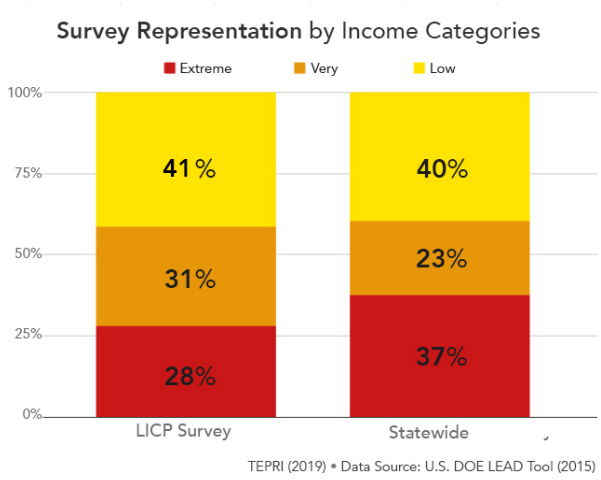


FIGURE 10. This chart describes how closely the LICP Survey Population aligns to the statewide low-income population by income category (according to the LEAD Tool, using 2015 Census data)

Below, FIGURE 11 depicts how well the survey population represented each age bracket. Several insights relate to the age of the survey respondent; therefore, it is important to demonstrate how well each age range was represented. The dark red bars represent the LICP low-income survey population compared to the pink bars which are the statewide estimates for the low-income population. There was reasonably good representation across all brackets with some over-representation among 25- to 34-year-olds and under-representation for those 65 years and older.

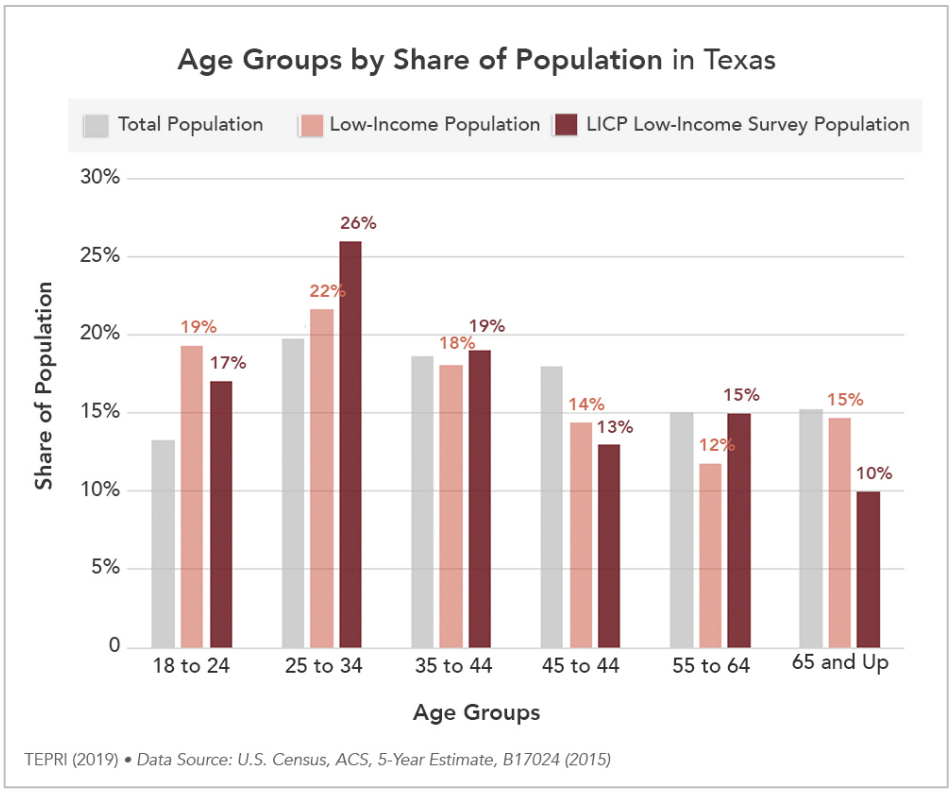


FIGURE 11. This bar chart compares the age distribution of the state population (gray), to the state's low-income population (pink), to the LICP low-income survey respondents (dark red). The 25 to 34 age range is slightly over-represented (26% vs 22%), whereas the "65 and up" age range is somewhat under-represented (10% vs 15%).

HOUSING CHARACTERISTICS AND DEMOGRAPHICS

In this section, we compare responses between the three low-income brackets on questions related to housing characteristics and demographics.[12] We found that there were a number of qualities that distinguished "extreme" households from "low" households. "Very" households were often in the middle of these two categories, further supporting the relationship between %-AMI and a given attribute. Below is a list of key insights. Refer to TABLE 4 in the Appendix for with more detailed accounting of survey responses.

IN THEIR OWN WORDS

A survey participant in Brownsville shared:

"We turn the A/C off at night when the temperature outside is cooler at night. We have a window units and mini-split a/c. We don't have central a/c because it costs a lot of money, like $600."

- The entire low-income survey population average of renters was 52% and owner-occupied was 48%, which is consistent to the LEAD Tool analysis (low-income average owner-occupation is 46%, FIGURE 12). **"Extreme"** households **were 47% more likely** than the "low" segment **to rent.** "Extreme" and "very" households both live in a house more often than any other dwelling type (52-54%), but they were also twice as likely to live in a mobile home compared to "low" households.
- "**Extreme" households were twice as likely to live in a structure built before 1969**, and there was little difference in distribution of income brackets for housing that was built after 1970.
- The majority of survey households had some form of air conditioning. Only 3% of the "extreme" segment reported that they did not have air conditioning. However, the **"extreme" segment was twice as likely to have a window unit** relative to the "low" segment.
- **Income bracket had a positive relationship to age**. As age increased, the %-AMI also increased (i.e., the income category was less extreme). For this reason, we dedicate a section of this report to age.
- There was a **positive relationship between being married and income bracket**. By contrast, there was a negative relationship between being single and income bracket. The other options — divorced, separated, widowed, and other — were much less likely to be selected by respondents and did not vary much between income brackets.

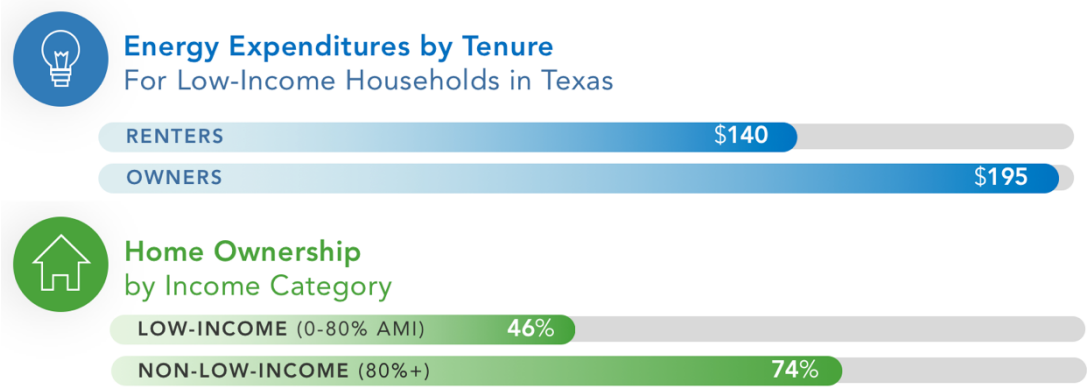


FIGURE 12. (TOP) The LEAD Tool showed that Low-income owner-occupied households have 40% higher energy expenditures compared to renter-occupied ones, which is likely related to the higher energy expenses associated with single-family homes. (BOTTOM) Almost half of low-income households in Texas (46%) are owner-occupied compared to 74% of non-low-income households.

[12] As mentioned in the "Limitations" section of this report, there were some questions for which respondents chose not to answer and for which there is inadequate data, including race as well as quantity of household members under 18 and over 65.

BEHAVIORAL INSIGHTS

Now we turn to energy engagement and quality of life as it relates to energy poverty. To summarize the key findings described in TABLE 5 of the Appendix, a number of behaviors distinguish "extreme" households from "low" households.

- **The majority of low-income respondents reviewed their monthly electricity bill.** There appears to be a slight decrease in engagement with the "extreme" group. In response to being able to reduce their usage, more "extreme" households disagreed (30% compared to 22% of "low"). All income brackets had a large majority who agreed that they understand how to program the thermostat in their home (from 82-91% of respondents).
- When asked about difficulty paying each type of bill, almost half of the "extreme" and "very" households reported **difficulty with both electric bills and other bills for other basic needs** (e.g., food, housing, medicine, etc.). For the "low" group, it was closer to a third of the households (~75% fewer than the other groups).
- In response to the question: "What financial options did you use to pay your electricity bills or meet your household's basic needs," almost half of low-income households reported being able to "use household income." "Extreme" households were more likely to "borrow money from family, friends or peers" compared to the other groups. **Assistance from both utility and government programs was minimal** (3-7%) among all brackets which may be related to awareness.
- **Program awareness, from bill assistance to efficiency rebates, was low across all segments**. "Extreme" and "low" segments were slightly more aware of bill assistance, whereas the "low" segment was slightly more aware of payment plans. Weatherization and energy efficiency rebate programs had very little awareness among all segments (10-15%). Age groups also demonstrated trends in awareness, discussed below.
- In terms of trade-offs,[13] all income brackets shared the top two — clothing and food (FIGURE 13)**. The "extreme" and "very" segment were much more likely to sacrifice on transport, medicine, and housing.** The "extreme" segment was two times more likely to delay its housing payments.

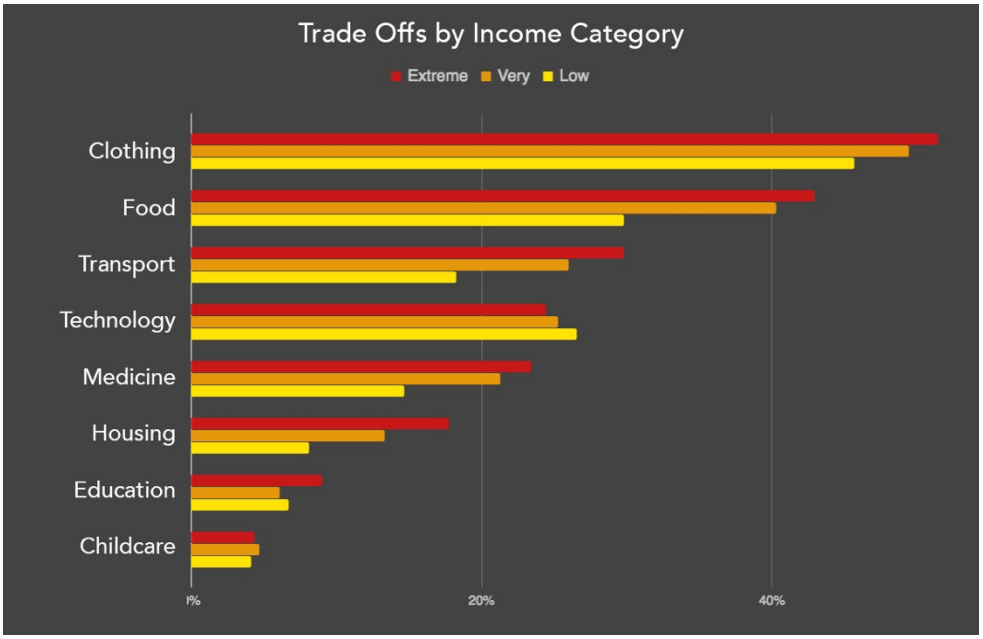


FIGURE 13. In terms of trade-offs, all income brackets shared the top two — clothing and food. The "extreme" and "very" segment were much more likely to sacrifice on transport, medicine, and housing.

[13] Question was presented as, "Do your utility bills cause you to delay or skip necessary spending or payments in any of the following categories? Please select all that apply." This question did not ask about frequency or duration.

SURVEY INSIGHTS BY AGE

As discussed in the previous section, income bracket had a positive relationship to age. This section compares the age groups to better understand which factors are impacting low-income households at different life stages. For more detail on the responses from this section refer to TABLE 6 in the Appendix. To summarize some of the initial findings:

- We found that household size was consistent **from 18- to 44-year-old groups at around 3.5 people per house** and then steadily declines to an average of 2 people per house at 65 & older. For the total low-income population, income peaked at the 35- to 44-year-old segment and went up again at age 65 & older.
- The **18- to 34-year-old groups were far more likely to rent** than the older segments, who were far more likely to own their home.
- Behaviorally, people in the **18- to 24-year-old segment were much less likely to review their electric bill** compared to older people. Likewise, understanding appliance energy usage and activities that increase usage were both more common with older respondents. However, when asked about being able to reduce usage or understand how to program the thermostat, age was not a factor.
- Financially, the **35- to 54-year-old groups expressed the most difficulty with bills (electricity and other) — as well as the most bill stress**. One possible explanation may be household size. Only 35% of single-member homes reported bill stress compared to 58% of households with six members (with a fairly consistent trend line from one end to the other). Households who included a disabled member were 50% more likely to report bill stress.
- Regarding health and stress, the **18- to 24-year-old and 45- to 54-year-old groups, most commonly expressed feeling unhealthy and stressed** from the temperature of their home.
- Awareness of the different programs varied with age range (FIGURE 14). The 35- to 44-year-old group was most aware of bill assistance. The 65 & older group was more aware of energy efficiency rebates than of any other programs. **Weatherization had the lowest overall awareness across all groups.** To reiterate from earlier, "extreme" and "low" segments were slightly more aware of bill assistance, whereas the "low" segment was slightly more aware of payment plans.

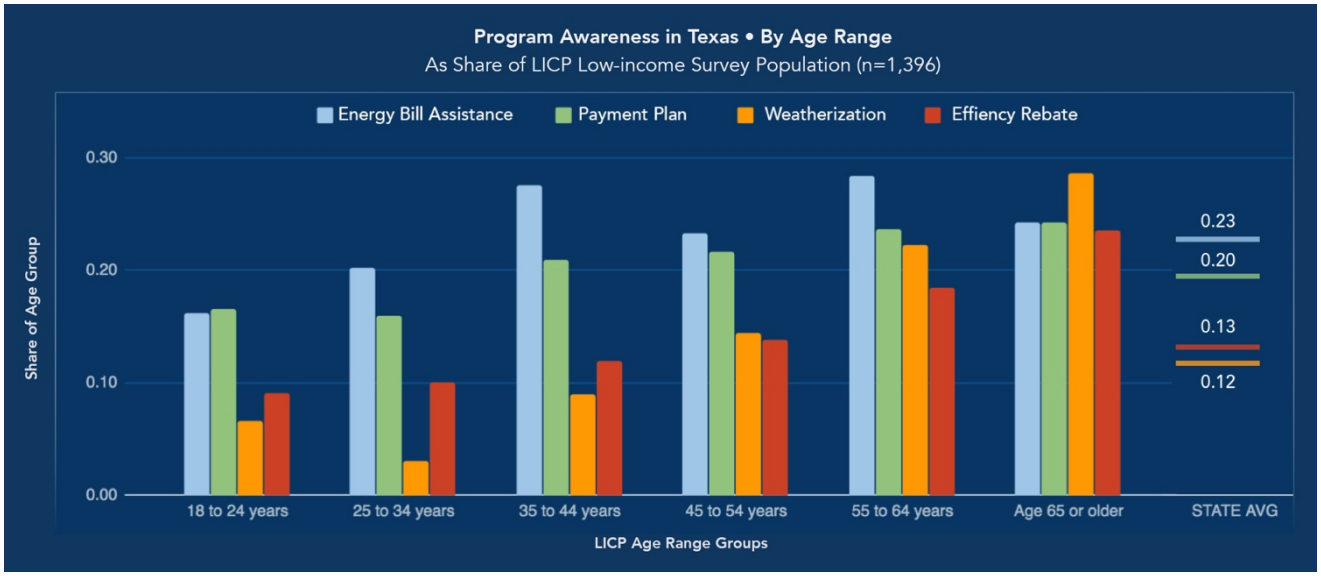


FIGURE 14. This bar chart describes the level of awareness for each age group. The 35- to 44-year-old group was most aware of bill assistance. The 65 & older group was more aware of energy efficiency rebates than of any other programs. Weatherization had the lowest overall awareness across all groups.

DISCUSSION

In this section, we discuss our findings from the statewide analysis. TEPRI aims to encourage deeper understanding and prompt curiosity and contemplation. While we strive to synthesize findings and interpret statistical relationships, we also want to avoid generalizations and definitive cause-effect associations. As the first installment of the LICP Series, this report narrows its discussion to factors that set the stage for finer resolution, regional analysis.

In our spatial analysis, **we found that high energy burden does not always occur in the poorest communities** (FIGURE 15). There are a number of areas of the state where the sum of low-income households was great (dark red on the left-hand map), but the average energy burden among low-income households was low relative to other parts of the state (blue on the right-hand map). For instance, we see this distinction in large parts of the major metropolitan areas — Houston (1), Dallas/Ft. Worth (2), San Antonio (3), and Austin (4) — as well as the Brownsville area (6).

IN THEIR OWN WORDS

A survey participant in Brownsville explained the priority they gave to paying their electricity bill:

"If we didn't have the lights/energy, for me, we won't be able to be in the house if it's too hot, we won't have a fridge and the food will go bad. And, if I have medicine that I just purchased, if they need to be in the fridge, that affects me medically with the medicines of my kids and you can't sleep the same since you don't have fans, air conditioner, or anything. So, primarily it's the light/energy bill as the primary bill to pay."

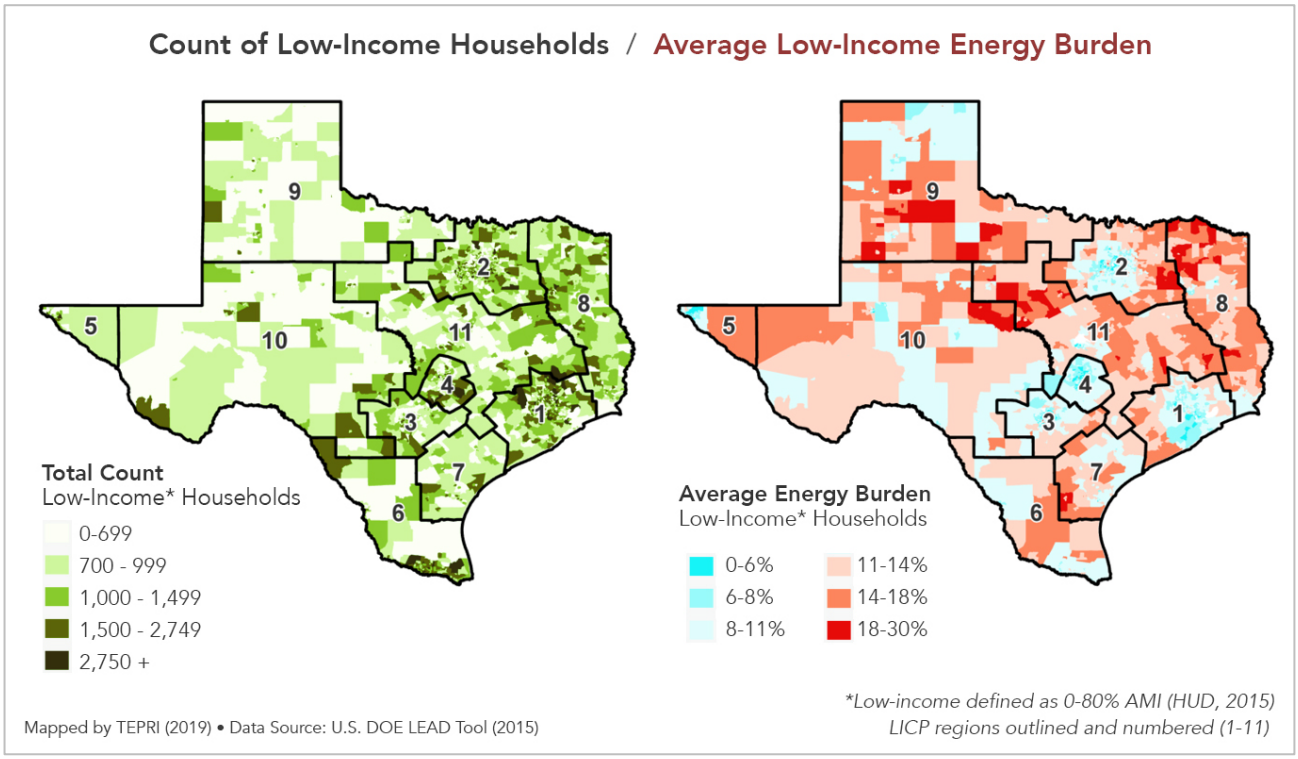


FIGURE 15. The major metropolitan areas (e.g., Houston (1) and Austin (4) regions) as well as the Brownsville area (6) had pockets with large total low-income households (dark green on left-hand map) with relatively small energy burden (blue on the right-hand map).

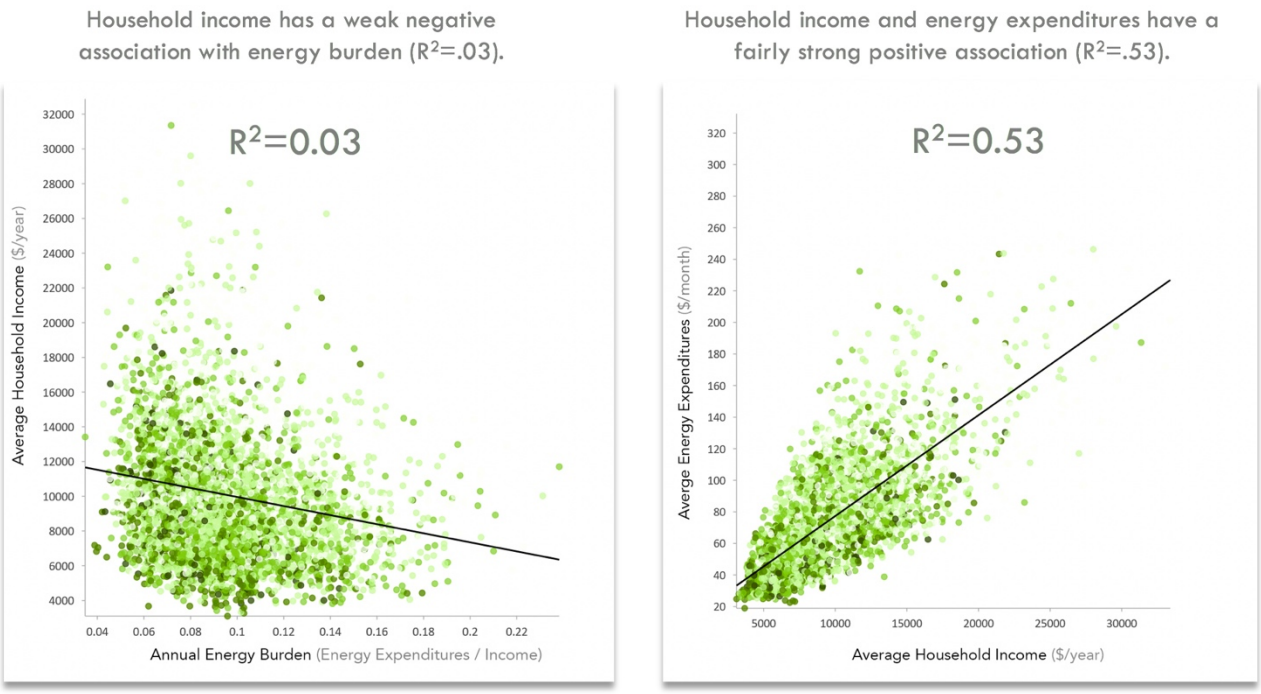


FIGURE 16. These charts show data from the LEAD Tool. For the statewide, low-income population (0-80% AMI), there was a very weak relationship between household income and energy burden (R^2=0.03), and there was a stronger relationship between energy expenditures and household income (R^2=0.53). Despite the close relationship between household income and energy expenditures, low-income households still had an energy burden that was as much as three-times higher than non-low-income households.

We found there was only a weak relationship (R^2=0.03) between household income and energy burden; whereas, the relationship between average energy burden and energy expenditures was stronger (R^2=0.25). Meanwhile, household income and energy expenditures had a much stronger positive association (R^2=0.53). Refer to FIGURE 16.

We offer several ideas to explain these findings. One possibility is that low-income households reduced their energy usage or went without energy services because of income constraints. It may also be explained by housing characteristics, such as the likelihood to live in a smaller residence or to live in multi-unit housing (both of which are associated with lower energy expenditures). If either of these explanations was adequate, there would not be such a huge disparity in average energy burden between the income categories. Finally, it is logical that higher energy expenditures are associated with more people per household, who may also have higher total income. Income category is determined by total household income relative to the number of household members. Household size is not included in the LEAD Tool. There is opportunity for deeper analysis to compare household size to energy expenditures.

There was no relationship between energy burden and electricity prices (R^2=0.06) for low-income households. The relationship was slightly stronger between energy burden and natural gas prices (R^2=0.20). However, there was **a very strong relationship between energy expenditures and fuel prices** (electricity at R^2=0.78 and natural gas at R^2=0.74). From a statewide perspective, higher fuel prices did lead to higher energy expenditures, but it did not translate into higher energy burden. This factor will be important to investigate at the regional level.

To summarize, energy burden describes the amount spent on household energy relative to income. Energy expenditures and income are both likely to increase with household size. Income may constrain energy use both implicitly because of housing characteristics (smaller homes, multi-unit housing, etc.) but also with explicit choices such as going without energy services.

INTERRELATED FACTORS

Low-income households, at or below 80% AMI, made up 41% of households in Texas. The "extreme" and "very" segments together amount to 25% of households. While not all low-income households experience energy poverty, they are the segment that is most vulnerable and for whom we seek long-term, sustainable solutions to achieve access to affordable, reliable energy. Analysis of the LICP Survey data in the context of the LEAD Tool confirmed the complex interplay of factors that contribute to energy poverty (FIGURE 17). This report supposes how some of these variables relate to one another by comparing across the income categories, age brackets, and tenure (i.e., rent vs. own).

Energy burden is a useful metric, but not a sufficient signal of energy poverty. Energy burden describes the amount households spend on energy relative to income. Low-income households had an average energy burden of 10% compared to 2% for non-low-income. In our spatial analysis, we found that high energy burden does not always occur in the poorest communities. There were a number of areas of the state where the sum of low-income households was large, but the average energy burden among low-income households was small relative to other parts of the state. This finding provokes a number of questions for our regional analysis.

Low-income Texans make difficult trade-offs to balance the disproportionate amount that they spend on energy. Survey respondents agreed on the most common trade-offs that they make to afford their electricity bills — clothing and food. With more extreme hardship, people shared that they sacrifice on transport, medicine and housing. Bill stress was most frequent among people in the 35- to 44-year-old group (as was difficulty in paying bills). This group also tends to have a higher average household size.

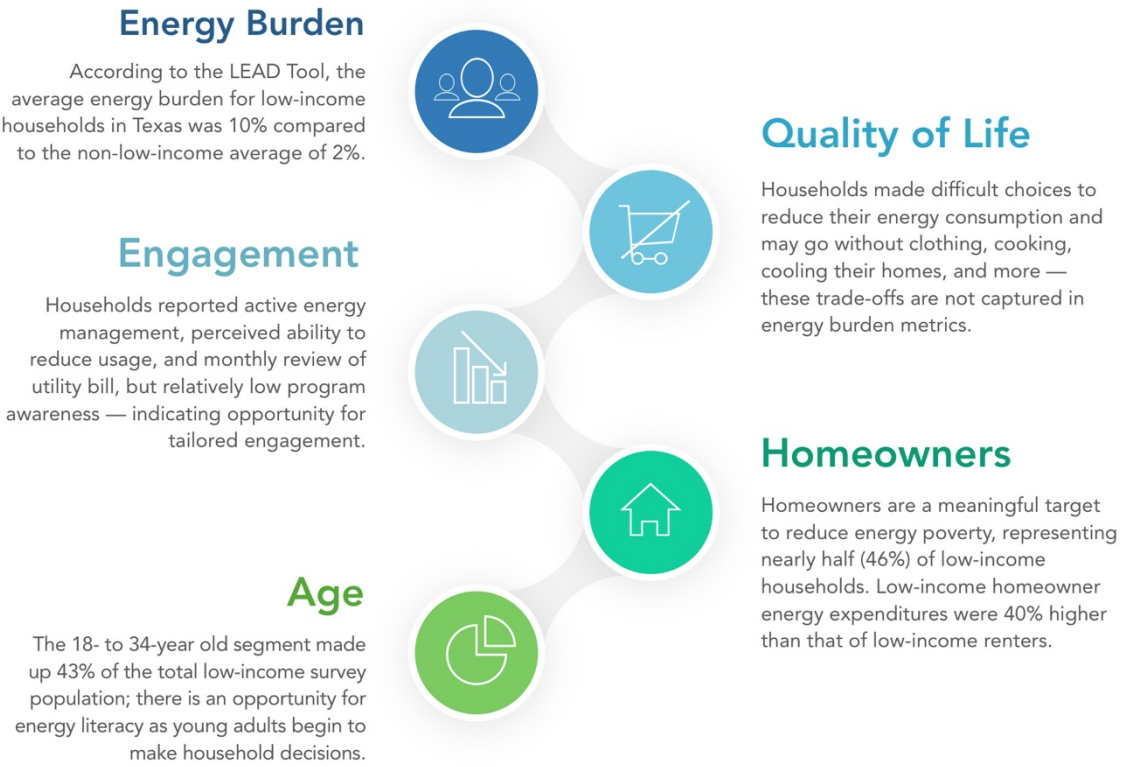


FIGURE 17. Our analysis reveals not a single driver but rather a confluence of interrelated factors corresponding with higher energy burden and ultimately energy poverty.

Low-income customers are engaged with energy, just not with programs. The majority of low-income survey respondents reported reviewing their monthly electricity bills and being able to program their thermostats. Almost half of "extreme" and "very" respondents reported difficulty in paying for their electric and other household bills, compared to just a third of households in the "low" category. Fewer than 25% of respondents were aware of bill assistance, and less than 15% of respondents said that they were aware of efficiency and weatherization programs. Younger respondents (18- to 34-year-olds) were least aware of programs.

Owner-occupied households are a meaningful energy poverty reduction target. Almost half of low-income households in Texas (46%) are owner-occupied. Among the survey population, the "extreme" households were much more likely to rent compared to those in the "low" group, which may be related to the prevalence of renters (~65%) among the 18- to 34-year-old segment who made up more than half of the "extreme" category. Meanwhile, respondents who identified as 65 or older were much more likely to own their homes (72%).

Renter-occupied households have lower energy expenses, which may obscure need. Low-income owner-occupied households have 40% higher energy expenditures compared to renter-occupied ones, which is likely related to the higher energy expenses associated with single-family homes. To clarify by using LEAD Tool data, the average energy expenditure for a one-unit detached, owner was 87% higher values than a renter residing in a multi-unit structure with 10 or more units ($197 per month compared to $105 per month). If expenditure is the primary tool for determining need, then this population may be at risk of missing opportunities.

FURTHER INQUIRY

A few of the questions that we want to explore as a result of this work include:

- The average energy burden among low-income households was relatively small in urban areas in comparison to more rural parts of the state. When considering each of the facets of energy poverty, what are the main drivers of this distinction?
- Are there parts of the state where high sum of low-income households and low energy burden reveals a success story of people having the energy that they need at a rate they can afford?
- What are the best examples of indicators that are relevant to Texas to augment or replace energy burden as a quantifiable, more encompassing measure of need?
- How does the inclusion of more comprehensive demographic data — including race, employment, and educational attainment — deepen our understanding of energy poverty?
- With rising housing costs in Texas' metropolitan areas, what is the relationship between housing burden and ability to afford essential energy services?
- What is the impact of energy poverty on children? What are families not doing and how often are they making trade-offs that impact the health, well-being, and educational outcomes of their children?

CONCLUSION

Through a better understanding of how energy poverty is experienced by people across Texas, we may collectively develop solutions to alleviate suffering. This report confirms that low-income Texas make difficult trade-offs and experience quality of life impacts. It also reveals how certain factors impact segments of the population differently, making way to reach more people with the most effective solutions and messaging.

KEY TAKE-AWAYS

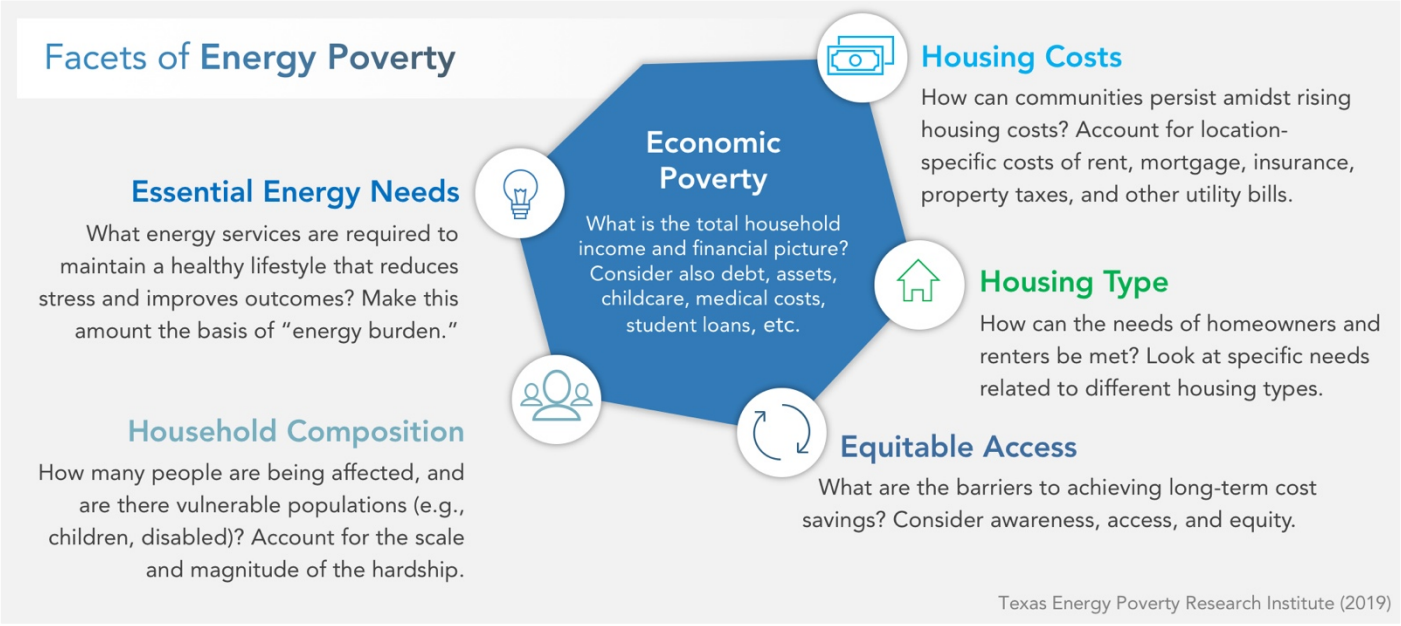
Energy poverty is a complex and multi-dimensional phenomenon and solutions must be designed accordingly. Among the many factors that contribute to energy poverty, this report discusses the links to housing characteristics, number and age of household members, income, household bills, and energy-related behaviors. Solutions designed to address energy poverty must consider the interplay of factors.

Energy burden is a useful metric, but not a sufficient signal of energy poverty. Energy burden does not account for housing costs, health effects, going without essential energy services, comfort level, or how many people are affected.

Further segmentation is instructive. Further segmenting low-income households into "extreme," "very," and "low," reveals nuances of housing, demographics, and behaviors that can be used to tailor programs and products to meet specific needs. Likewise, engagement and behavior vary significantly by age group.

Low-income consumers are engaged with energy, just not programs. From bill assistance to efficiency rebates, program awareness is low across all segments. However, respondents reported energy engagement activities such as actively managing thermostat settings and reviewing utility bills.

Owner-occupied housing is important. Owner-occupied housing accounted for 46% of the low-income households in Texas, and this group had 40% higher energy expenditures compared to low-income renter-occupied housing (which tends to correspond with multifamily housing). Because this group is not limited by landlord incentive issues, homeowners are able to make energy efficiency investment decisions.



RECOMMENDATIONS

In evaluating how to serve the state's most distressed communities, we recommend that energy burden be considered in combination with other factors — including presence of vulnerable household members, size of household, and health considerations. To design programs that lead to long-term savings, it is important to understand life circumstances and behavioral attitudes — for example, awareness of weatherization for homeowners, energy literacy for young adults, and efficiency tips or payment plans for busy parents.

Evaluation

- Use multi-factor geospatial tools to identify distressed communities
- Explore how energy expenditures compare to the regional median and to housing characteristics
- Use energy burden, but include other quality of life criteria — including presence of vulnerable household members, size of household, and health factors
- Evaluate criteria at regular intervals (i.e., longitudinal study) to understand how factors shift with age, region, macroeconomic phenomena, and weather patterns

Program Design

- Discern between reaching the largest number of people or reaching the most distressed communities
- Prioritize programs that contribute to long-term savings and self-sufficiency by serving critical needs
- Use market segmentation to align program design with the life circumstances and behavioral attitudes
- Tie weatherization and energy efficiency, which both have very low awareness, to the higher awareness programs, such as bill payment and payment arrangements

Outreach

- Collaborate with community partners to connect with hard-to-reach segments who may be isolated or lack time or mental space to seek out information
- Structure outreach to speak to age-specific life stressors
- Invest in early energy literacy, even as early as grade school, to decrease energy burden of young adults and to imprint good habits

NEXT STEPS IN THE LICP SERIES

The purpose of the LICP Series is for data and insights to be utilized by members and stakeholders to enhance impact of low-income energy programs and reduce barriers to outreach and education. This report is limited to discussing variables that were statistically meaningful at the statewide resolution. In our regional analysis, TEPRI will further investigate these variables as well as identify those that demonstrate significant trends at a finer scale. The geospatial tool will provide TEPRI members with an interactive platform that combines publicly available datasets with the LICP Series data into easily digestible dashboards of information. Furthermore, TEPRI endeavors to build support for a longitudinal regional study to evaluate how these energy burden indicators, and others, change over time.

APPENDIX

TABLE 4. Housing and Socio-demographic results of LICP Survey (n=1,396).
Percentage values represent the share of each income bracket that responded positively to each attribute.

	EXTREME	VERY	LOW	SUMMARY
POPULATION SIZE				
Sum of Household Count	1,419,768	869,032	1,505,378	The sum of low-income households was 3,794,178 (41% of the state total of 9,149,197). The "low" (50-80% AMI) was the largest group but "extreme" was not much less.
Percentage of Low-Income Count	37%	23%	40%	
Survey Population Low-Income	389	427	580	The total low-income survey population represented 1,396 households. The "extreme" population was under-represented, and the "very" population appeared over-represented.
Percentage of Survey Pop.	28%	31%	42%	
TENURE				
Renter-occupied	63%	56%	43%	"Extreme" households reported renting 50% more often than the "low" group.
Owner-occupied	37%	44%	57%	"Low" households were more likely to own their home.
HOUSING TYPE				
House	52%	54%	66%	"Low" households were slightly more likely to live in a house.
Mobile home	14%	12%	7%	"Extreme" and "very" households lived in mobile homes almost twice as often as the "low" group.
Apartment	32%	33%	25%	"Extreme" and "very" households were slightly more likely to live in an apartment compared to the "low" group.
OTHER HOUSING CHARACTERISTICS				
Structure built before 1969	23%	15%	14%	Older housing was more common for "extreme" households.
Central A/C	66%	76%	82%	Most respondents had some form of A/C, and central A/C was most common.
Window-mounted A/C	28%	20%	14%	"Extreme" households were twice as likely to have a window-unit relative to the "low" segment.
AGE RANGE				
18 to 34	56%	40%	36%	The 18- to 34-year-old age group made up more than half of the "extreme" group (they were 43% of the total low-income survey population).
35 to 55	31%	31%	34%	There was little difference in this middle age band.
55 and older	13%	29%	31%	As age increased, the %- AMI also increased.
MARITAL STATUS				
Married	26%	38%	49%	There was a positive relationship between marriage and income bracket.
Single (Never Married)	48%	35%	27%	By contrast, there was a negative relationship between being single and income bracket.
Disabled individuals in home	35%	29%	24%	There was slightly higher likelihood that an "extreme" household had a member of its household who is disabled.

TABLE 5. Energy engagement and program awareness results of LICP Survey (n=1,396).
Percentage values represent the share of each income bracket that responded positively to each behavior.

	EXTREME	VERY	LOW	SUMMARY
ENERGY ENGAGEMENT				
Review monthly elec. bill	77%	84%	85%	Most people responded that they reviewed their monthly electricity bill.
Able to reduce usage	70%	73%	78%	70% of "extreme" households reported being able to reduce their usage, versus 78% of the "low" group.
Program thermostat	82%	88%	91%	Most people reported understanding how to program their thermostat.
BILL STRESS				
Difficulty w/ electric bills	45%	42%	31%	Almost half of "extreme" households reported difficulty paying both electric and other bills, compared to approximately a third of "low" households.
Difficulty w/ other bills	50%	49%	38%	
PAYMENT STRATEGIES				
Use household income	55%	73%	73%	"Extreme" households reported being 33% less likely to use household income compared to "very" and "low."
Borrow money (friend/family)	31%	22%	16%	The "extreme" group was almost twice as likely to borrow money to pay bills.
Reduce energy usage	26%	27%	30%	"Reduce usage" was pretty similar across all groups.
Credit card	19%	21%	26%	More "low" households used credit cards compared to the other segments. Whereas, slightly more "very" and "extreme" people reported using short-term loans.
Short-term loan	11%	12%	9%	
Assistance from government	9%	7%	4%	Assistance from both utility and government programs was minimal among all brackets. Awareness of assistance programs is described at the bottom of this table.
Assistance from utility	7%	4%	3%	
None of the above	13%	7%	7%	The "extreme" population had "none of the above" responses twice as often as other segments.
TRADE-OFFS				
Clothing	51%	49%	46%	In terms of trade-offs, all groups shared the same top two — clothing and food. Food was identified 50% more often for the "extreme" group compared to "low."
Food	43%	40%	30%	
Transport	30%	26%	18%	Transport, medicine, and housing were selected more frequently by both the "extreme" and "very" groups, with housing being 67% more common for the "extreme" group relative to "low."
Medicine	23%	21%	15%	
Housing	18%	13%	8%	
PROGRAM AWARENESS				
Bill assistance	24%	24%	22%	Bill assistance had the highest awareness of all the programs that were included in the survey. Weatherization had the least awareness. There was little difference between awareness and income segment. When we compared awareness to age, we did find a trend, discussed below.
Payment plan	19%	19%	21%	
Energy efficiency rebate	13%	15%	12%	
Weatherization	10%	14%	12%	

TABLE 6. Age breakdown of demographic attributes, energy engagement and program awareness (n=1,396).
Percentage values represent the share of each age group that responded positively to each attribute or behavior.

	18 to 24	25 to 34	35 to 44	45 to 54	55 to 64	65 & older	SUMMARY
HOUSEHOLD							
Average household size	3.4	3.4	3.4	2.8	2.3	2.0	Household size was consistent from the ages of 18 to 44 and then steadily declines.
Average income	$22K	$29K	$31K	$29K	$30K	$31K	In our low-income survey population, income peaked at the 35- to 44-year-old group and went up again at age 65 & older.
Average %-AMI	36	43	44	45	49	52	This value relates to the AMI brackets — 0-30% AMI is "extreme,"30-50% is "very," and 50-80% is "low."
Rent	66%	64%	51%	49%	37%	28%	The 18- to 24-year-old group and 25- to 34-year-old group were far more likely to rent than the older segments, who were far more likely to own their home.
Own	34%	36%	49%	51%	63%	72%	
Disabled individuals	15%	20%	29%	44%	45%	26%	People in the 45- to 64-year-old range were most likely to respond that there was a member of the household with a disability or serious condition.
ENERGY ENGAGEMENT							
Review monthly bill	51%	71%	69%	68%	73%	81%	People in the 18- to 24-year-old segment were much less likely to review their electric bill compared to older people.
Able to reduce usage	52%	59%	57%	54%	55%	55%	Age did not appear to be a factor in being able to reduce usage nor in understanding how to program the thermostat.
Understand thermostat programming	65%	73%	71%	62%	75%	73%	
Understand appliance energy usage	57%	57%	61%	59%	71%	73%	Understanding of appliance energy usage and understanding activities that increase usage were both more common with older respondents.
Understand activities that increase usage	57%	62%	65%	68%	73%	82%	
FINANCIAL SITUATION							
Difficulty w/ electric Bills	36%	40%	49%	43%	28%	23%	The 35- to 44-year-old group, followed closely by the 45- to 54-year-old group, expressed the most difficulty with bills (electricity and other). There was a general pattern that "other bills" caused more stress than electric, except for the 18- to 24-year-old group where they were matched.
Difficulty w/ other Bills	36%	46%	54%	53%	40%	34%	
HEALTH & COMFORT							
Sick or unhealthy	28%	21%	21%	25%	19%	10%	Of the people who answered "yes" to feeling unhealthy, 67% also responded "yes" to feeling stressed. The 18- to 24-year-old group, followed closely by 45- to 54-year-old group, most commonly expressed feeling unhealthy and stressed from the temperature of their home.
Stress or mental discomfort	32%	27%	26%	32%	27%	13%	
Bill stress	42%	45%	52%	42%	40%	28%	Bill stress was most common among the 35- to 44-year-old group (as was difficulty with bills, above).
PROGRAM AWARENESS							
Bill assistance	16%	20%	28%	23%	28%	24%	The 35- to 44-year-old group was most aware of bill assistance, followed closely by the 55- to 64-year-old group.
Payment plan	16%	16%	21%	22%	24%	24%	Payment plan awareness was positively associated with age; awareness was more common as age increased.
EE rebate	7%	3%	9%	14%	22%	29%	The 65 & older group was more aware of energy efficiency rebates than of any other programs.
Weatherization	9%	10%	12%	14%	18%	24%	Weatherization had the lowest overall awareness across all groups.

ACRONYMS USED IN THIS REPORT

ACRONYM	MEANING
ACEEE	American Council for an Energy-Efficient Economy
ACS	American Community Survey
AMI	Area Median Income
CELICA	Clean Energy for Low Income Communities Accelerator
DOE	U.S. Department of Energy
EDF	The Environmental Defense Fund
EIA	U.S. Energy Information Administration
FPL	Federal Poverty Line
HUD	U.S. Department of Housing and Urban Development
LBJ	The Lyndon B. Johnson School of Public Affairs at The University of Texas at Austin
LEAD Tool	Low-Income Energy Affordability Data Tool (from DOE)
LICP	Low-Income Community Profile (TEPRI Study)
PUMS	Public Use Microdata Sample
TEPRI	Texas Energy Poverty Research Institute