Household Energy Burden Across the United States

Twenty Years of Evidence on Who Pays and How Much

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The households that spend the most on energy are not the households that energy costs hurt the most. New England households spend more on energy than anyone else in the country but carry one of its lightest budget burdens. Households in Mississippi and Alabama spend hundreds of dollars less each year, yet energy claims a larger share of their income than anywhere else in the nation. The difference is income. A low-income household in the East South Central states devotes about 15 cents of every earned dollar to energy. In New England it is only about 12 cents.

Differences of this size are the rule across the U.S. census map, not the exception. The Federal government spends about $4 billion every year through the Low Income Home Energy Assistance Program (LIHEAP) to help low-income households pay their energy bills, and several billion more on weatherization and efficiency programs. The allocation formulas, eligibility rules, and program structures that govern these dollars were largely set in the 1980s. The geography of energy burden in America has shifted considerably since then.

This brief summarizes a new analysis of twenty years of household-level spending data from the U.S. Bureau of Labor Statistics, merged with state-level energy price data from the U.S. Energy Information Administration. The sample covers nearly half a million U.S. households from 2005 through 2024. The brief documents where energy burden falls heaviest, what drives it, how households respond when prices change, and where current federal program structures interact with the patterns the data reveals.

Key Findings

Five findings from the analysis bear directly on energy assistance program design:

1. ***Energy burden is steeply regressive in every region.*** Low-income households spend

11% to 15% of pre-tax income on energy, depending on where they live. High-income households spend 2% to 3% regardless of location.

2. ***The heaviest budget burden is in the South Central and Mountain divisions.*** Low-income households in Mississippi, Alabama, Tennessee, Kentucky, Arkansas, Louisiana, Oklahoma, and Texas, plus the Mountain states, carry the highest energy burden in the country.

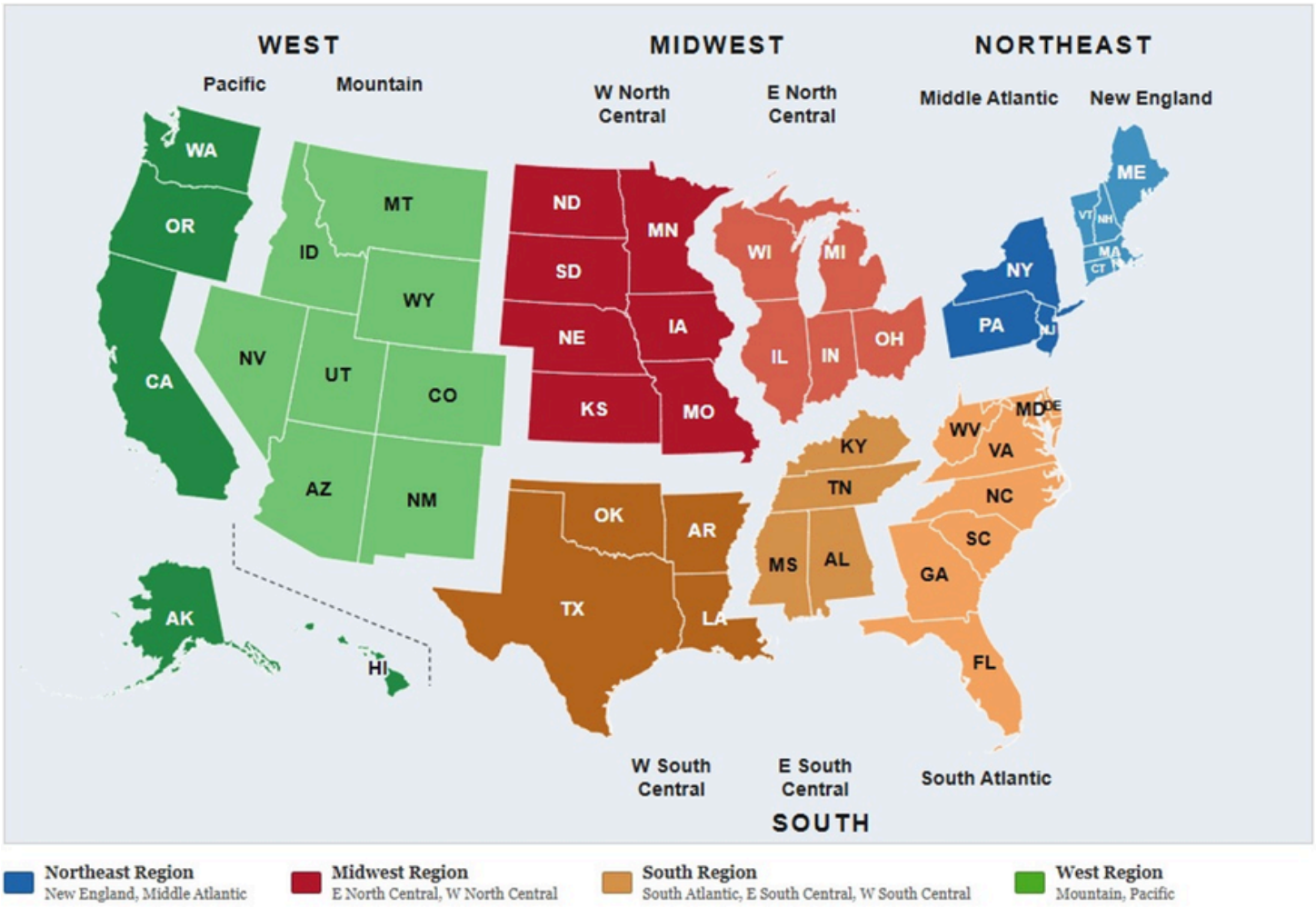
3. ***Real energy spending fell sharply between 2008 and 2020.*** Median household energy spending fell 25% to 35% in real terms from peak years around 2008 and 2012 to a trough around 2020. The dominant driver was the shale revolution and the collapse in natural gas prices that followed. Spending rebounded somewhat since 2020 but remains well below peak levels.

4. ***Households respond little to price changes.*** A 10% increase in the price of electricity, natural gas, or gasoline reduces consumption by only 2% to 5%. Most of the price increase shows up as a higher bill, not as a behavioral adjustment.

5. ***Higher-income households respond more to price changes than lower-income ones for natural gas and gasoline but not electricity.*** Higher-income households have more options to substitute, such as buying a fuel-efficient vehicle, weatherizing their home, or replacing appliances. Lower-income households face the same price increases with fewer ways to respond.

The Data

Figure 1. U.S. Census Divisions



Source: U.S. Census Bureau

The Bureau of Labor Statistics Consumer Expenditure Survey collects detailed spending data from approximately 30,000 households each year, including spending on six common energy sources: electricity, natural gas, heating oil, propane, gasoline, and diesel. The U.S. Energy Information Administration State Energy Data System reports state-level energy prices for most of these fuels back to the 1970s. Merging these two data sources produces a dataset of energy spending and prices covering all 50 states from 2005 through 2024.

Energy burden is defined as household energy spending divided by pre-tax household income. Income deciles divide households into ten equally sized groups ranked from lowest to highest income. The first decile, the poorest 10% of households, is excluded from the burden analysis because households in that decile frequently report expenditures exceeding reported income, which suggests measurement issues in either income or spending rather than genuine burden. All other deciles are included. Prices and spending are expressed in real 2024 dollars.

Energy Spending

Households in different parts of the country spend different amounts on energy. They use different fuels in different combinations. Table 1 reports mean annual energy spending by census division, pooled across the most recent five years of data, for each of the six fuels. The table presents means rather than medians because for some fuels and regions the median is zero.

Table 1. Mean Annual Residential Energy Spending by Census Division (Real 2024 Dollars)

Division	Income	Electricity	Nat. Gas	Heat. Oil	Propane	Gasoline	Diesel	N
New England	$137,423	$1,779	$573	$505	$116	$2,256	$7	4,335
Pacific	$131,403	$1,479	$446	$15	$36	$2,670	$8	16,526
Middle Atlantic	$124,488	$1,495	$706	$190	$50	$1,928	$8	9,284
Mountain	$115,238	$1,572	$467	$6	$18	$2,661	$10	6,738
South Atlantic	$109,912	$1,722	$259	$19	$46	$2,251	$9	16,848
W North Central	$109,646	$1,350	$626	$11	$48	$2,122	$11	5,702

Table 1. (Continued)

Division	Income	Electricity	Nat. Gas	Heat. Oil	Propane	Gasoline	Diesel	N
E North Central	$109,583	$1,386	$729	$16	$43	$2,306	$10	10,531
W South Central	$100,411	$1,951	$299	$3	$24	$2,546	$8	8,009
E South Central	$95,526	$1,835	$283	$4	$48	$2,492	$12	3,644

Notes: Pooled 2020-2024. Income deciles 2 through 10. All values in real 2024 dollars. Spending columns show mean annual spending by fuel among households reporting positive spending on that fuel. Heating oil and propane spending appears near zero in divisions where almost no households use those fuels. N is the count of household-year observations. Source: Consumer Expenditure Survey, 2020-2024.

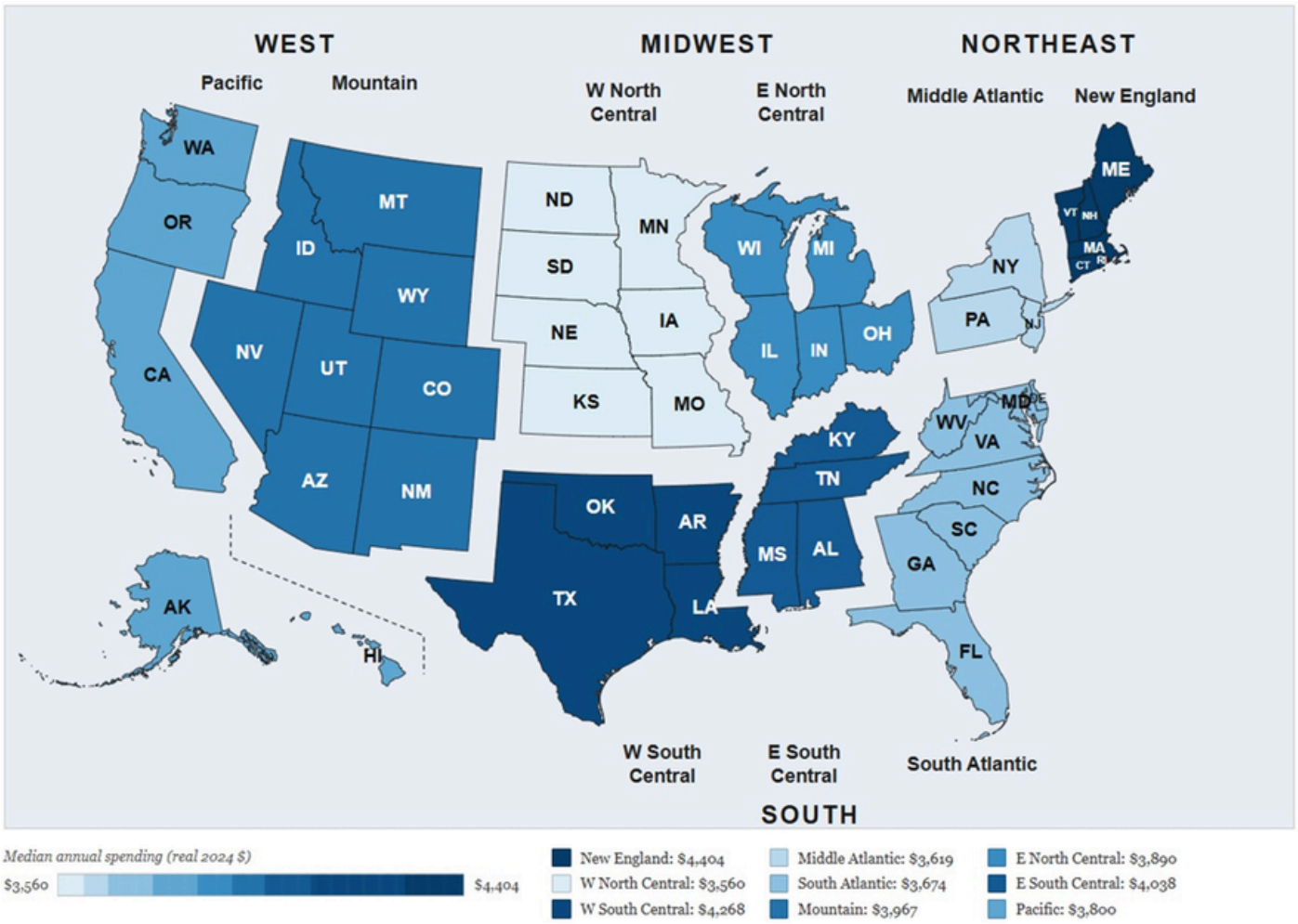
New England households spent the most on energy in dollar terms, with about $5,200 in mean annual spending across all six fuels. The East South Central division spent the least at about $4,700. The gap between highest and lowest division is about $850 per year.

Figure 2. Median Household Total Energy Spending by Census Division, 2005-2024

Real 2024 dollars, deciles 2 through 10. Source: Consumer Expenditure Survey, 2005-2024.

Figure 2 shows median household energy spending by division over the full twenty-year period. Spending peaked around 2008 and again around 2012, then fell substantially. By 2020 median spending had fallen $1,000 to $1,500 per household in real terms in most divisions, a reduction of 25% to 35% from peak levels. The dominant driver was the collapse in natural gas prices that followed the shale revolution. New England has generally had the highest median spending, and the West North Central the lowest in recent years.

Figure 3. Median Household Energy Spending by Census Division, 2020-2024



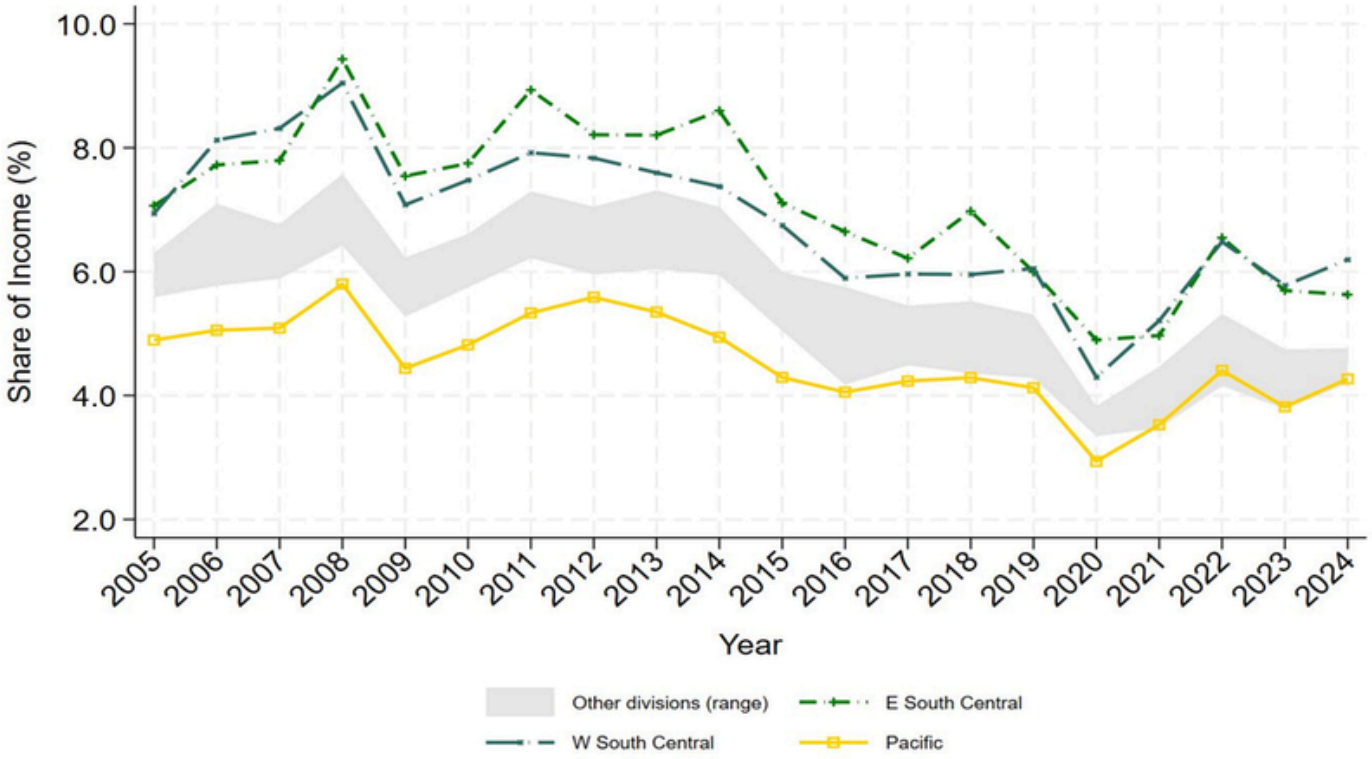
Real 2024 dollars, pooled 2020-2024, deciles 2 through 10. Source: Consumer Expenditure Survey.

Energy Burden

Spending and burden tell different stories. New England spent the most in dollar terms but New England's high household incomes more than offset that spending. The South Central regions spent less in dollar terms, but their lower incomes mean energy claims a larger share of every paycheck. Figure 4 shows median total energy burden by division from 2005 through 2024.

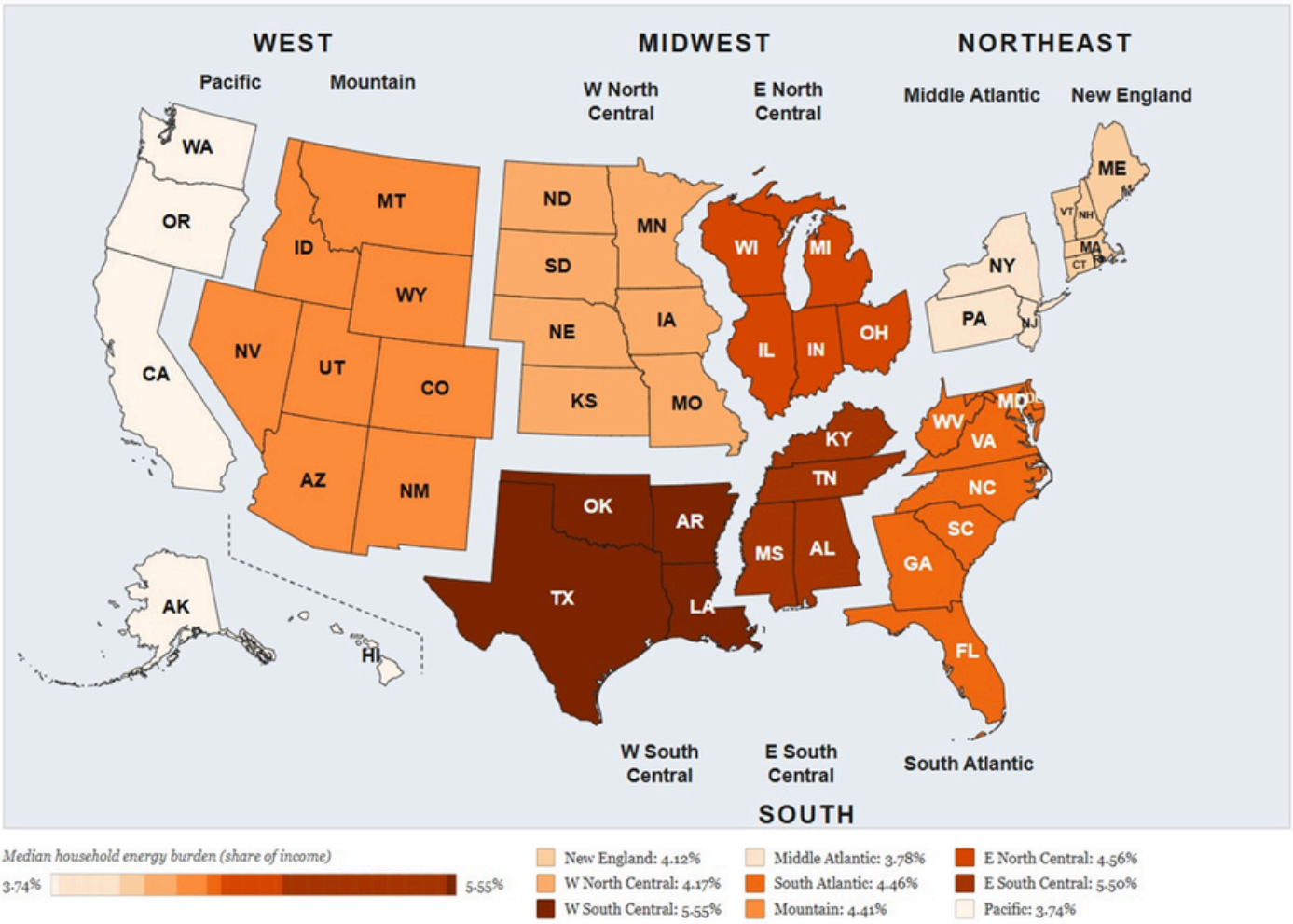
The East South Central and West South Central divisions sit clearly above all other divisions throughout the sample period, with median burdens reaching 8% to 9% of income during peak energy prices around 2008 and 2012 and falling to 5% to 6% by 2020. The Pacific division sits clearly below the other divisions throughout the sample, with median burden of 4% to 5%. The six middle divisions cluster between 4% and 7%. The 2020 trough is visible in every division: median burden converged sharply that year as energy prices collapsed and stimulus payments raised reported income. After 2020, burden levels rose somewhat as energy prices rebounded.

Figure 4. Median Total Energy Burden by Census Division, 2005-2024



Share of household income before taxes, deciles 2 through 10. Source: Consumer Expenditure Survey, 2005-2024.

Figure 5. Median Energy Burden by Census Division, 2020-2024



Share of household income before taxes, pooled 2020-2024, deciles 2 through 10. Source: Consumer Expenditure Survey.

Median burden levels reveal only part of the picture. Within every division, energy burden falls sharply as income rises. Second-decile households in the East South Central division spend 15.2% of income on energy. Tenth-decile households in the same division spend 2.5%. The five-to-seven-fold ratio between low-income and high-income burden is consistent across every division.

- ***Energy burden does not match energy spending. New England households spend the most in dollar terms, but their higher incomes more than offset the cost. The South Central divisions carry the heaviest burden relative to income.***

The Fuel Mix Behind the Burden

Energy burden in the United States doesn't come from one fuel. It comes from different combinations of fuels in different regions. Table 2 shows the share of households reporting positive spending on each fuel by census division.

Table 2. Share of Households Reporting Positive Energy Spending by Census Division

Division	Electricity	Nat. Gas	Heat. Oil	Propane	Gasoline	Diesel
New England	83.7%	40.9%	17.0%	5.8%	83.4%	20.4%
Pacific	84.0%	56.4%	0.5%	3.0%	84.7%	21.7%
Middle Atlantic	83.5%	58.6%	5.3%	3.3%	75.7%	17.6%
Mountain	85.3%	60.5%	0.3%	3.9%	86.6%	26.7%
South Atlantic	87.1%	28.4%	0.8%	2.8%	85.6%	19.8%
W North Central	86.9%	66.9%	0.2%	4.0%	86.9%	25.0%
E North Central	87.5%	70.5%	0.5%	3.5%	85.1%	21.1%
W South Central	87.5%	39.3%	0.2%	3.2%	87.1%	16.8%
E South Central	88.9%	38.9%	0.3%	5.1%	87.2%	23.8%

Notes: Pooled 2020-2024, income deciles 2 through 10. Households whose energy costs are bundled into rent or otherwise not separately reported appear as non-users. Source: Consumer Expenditure Survey, 2020-2024.

Three patterns stand out. Natural gas use concentrates in cold-climate divisions, with 60% to 70% of households using it in the East North Central, West North Central, Mountain, and Pacific divisions, compared to less than 40% in the South Atlantic and South Central divisions. Heating oil is almost entirely a New England phenomenon, with 17% of New England households reporting positive heating oil expenditure compared to less than 1% in seven of the nine divisions. Propane use is more dispersed but tends to concentrate in rural areas where natural gas service isn't available. New England, the East South Central, the West North Central, and the Mountain divisions have the largest propane-using populations.

The fuel mix interacts with price trends to drive the geographic burden pattern. Natural gas prices fell roughly 50% in real terms from their 2008 peak. Cold-climate divisions where households burn natural gas captured most of that benefit. Electricity prices fell much less and have risen in some regions. Warm-climate divisions that rely on electricity for both cooling and some heating captured less of the natural gas decline. Gasoline prices follow global oil markets and vary little across divisions, so divisions where households drive longer distances spend more on gasoline regardless of region.

How Households Respond When Prices Change

When energy prices rise, do households reduce consumption enough to offset the price increase? The answer matters for any policy that operates through the price channel, including carbon pricing, rate increases, and regulatory mandates. Price elasticity is the percentage change in consumption that follows from a percentage change in price, estimated here for the three most commonly used fuels: electricity, natural gas, and gasoline.

All three fuels show inelastic demand across every income group, meaning a 10% increase in price reduces consumption by only 2% to 5%, with the rest of the price increase translating into higher household spending. Inelastic demand has direct implications for any analysis of how price changes affect household budgets. Models that assume larger consumption responses will overstate the conservation gains from price increases and understate the increased costs.

For natural gas and gasoline, higher-income households respond to price changes more

than lower-income households do. The pattern is most pronounced for gasoline: a 10% increase in gasoline prices reduces consumption by approximately 9% for households in the tenth income decile, but only 3% for households in the second decile. For natural gas, the gradient is similar in direction though smaller in magnitude. For electricity, no significant income difference is detectable.

The pattern is consistent with the economic story that higher-income households have more substitution options. They can invest in fuel-efficient or electric vehicles, upgrade heating equipment, weatherize their homes, switch from natural gas to electric heat pumps, or work from home more often. Lower-income households are more likely to rent rather than own and have less access to credit for energy efficiency investments. They face the same price increases but have fewer ways to respond. Electricity is the exception due to electricity's lack of close substitutes for its core uses. Lighting, refrigeration, cooking, electronics, and cooling are hard to substitute away from regardless of income.

- Lower-income households face the same energy price increases as higher-income households, but with fewer options to substitute. A given price increase therefore raises the budget burden more at the bottom of the income distribution than at the top.

What These Patterns Imply for Energy Assistance Programs

1. ***Allocation formulas and where the burden falls***

LIHEAP allocates roughly $4 billion annually across the states using a formula that has been largely unchanged since 1984. The formula weights heating-degree days heavily and gives less weight to cooling, transportation, and the current geographic distribution of low-income households. The data shows that the highest burden is now in the South Central and Mountain divisions, where heating loads are moderate but cooling, driving, and lower incomes drive total burden.

2. ***The scope of authorized assistance uses***

Energy assistance programs typically assume that the central problem is winter heating.

In some regions that's consistent with the data. In the South and Southwest, summer cooling and gasoline costs drive total energy burden more than does heating. Electricity burden in the East South Central division at the second income decile is 7.4% of income, larger than total natural gas burden in any division. Gasoline burden at the bottom of the income distribution in the West and East South Central divisions reaches roughly 8% of income. Programs that only target winter heating costs will reach a different share of the burdened population than programs that address cooling, weatherization, and transportation.

3. ***The choice between price-based and investment-based programs***

Carbon pricing and similar price-based policies generate conservation by raising the cost of consumption. This data shows that price-based conservation policies produce most of their consumption response from higher-income households, who have more options to substitute, while imposing most of their cost on lower-income households who have fewer options. Efficiency investment assistance such as weatherization, energy efficiency tax credits, and electric vehicle rebates fund substitution options directly. They can reach lower-income households who can't finance those investments on their own.

4. ***Distributional analysis of energy regulations***

Federal regulatory impact analyses of energy related rules typically estimate how rules will affect household costs and household behavior. Many of these analyses assume that demand response to price changes is the same across the income distribution. The data shows that this assumption isn't consistent with observed behavior for natural gas and gasoline. Higher-income households respond more. Impact estimates that assume uniform response will under estimate budget burdens on lower-income households and overestimate the consumption reductions.

5. ***Fuel-specific versus flexible programs***

Energy burden in the United States has different drivers in different regions. Natural gas burden is highest in the East and West North Central divisions where heating needs are heaviest. Heating oil burden is concentrated in New England and the Middle Atlantic. Gasoline burden is highest in the South Central divisions. Electricity burden is heaviest in the South Central divisions. A federal program that authorizes only one type of

assistance or that allocates funds based on one fuel's price will reach a different share of the burdened population in different regions. Programs that authorize broader sets of uses or that allow state-level allocation flexibility will distribute differently than fuel-specific programs.

Closing

Twenty years of household data show a consistent set of patterns in U.S. energy budget burden. Burden is regressive everywhere. Geographic concentration of low-income burden is in the South Central and Mountain divisions. Household demand response to price changes is limited. Higher-income households respond more than lower-income households for natural gas and gasoline, but not for electricity. The fuel composition of burden differs substantially across regions.

These patterns are relevant to energy assistance program design. They show the distribution of need, the distribution of price response, and the composition of energy burden across the country. The patterns are based on widely available public data and can be updated annually as new survey years are released.

Policymakers, agency analysts, and program administrators can use these patterns to inform decisions about formula structures, authorized uses, the comparative effects of different policy instruments, and the methodology of distributional impact analysis. The specific decisions reflect normative judgments about program goals and acceptable trade-offs. The empirical patterns reflect what the data from approximately half a million U.S. households show.

Sources

Findings in this brief are drawn from an academic paper “Household Energy Burden Across the Income Distribution: Geographic Variation and Price Responsiveness” analyzing Consumer Expenditure Survey microdata merged with state-level energy price data. The estimation sample contains approximately 490,000 household-year observations from 2005 through 2024 across all nine U.S. census divisions. Full technical detail, including elasticity estimates by income decile, statistical tests for income gradients, and robustness checks across alternative specifications, is available in the underlying paper.

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