Household Energy Burden in Lawrence, Massachusetts

Mayukh Datta and Natasha Musalem

National Renewable Energy Laboratory

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Notice

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National Renewable Energy Laboratory
15013 Denver West Parkway
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If using this information for future study or analysis, please note:

- *Average energy burden rates presented in this study for different fuel types (natural gas, electricity, fuel oil, wood, bottled gas, etc.) are likely higher today because the LEAD model relies on 2020 fuel consumption and fuel price data.*

- *Rental units utilizing wood as their primary heating fuel are not reported within this analysis's source dataset, the 2020 American Community Survey.*

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Glossary of Key Terms

Please note the following definitions of terms used throughout this report:

- **Housing units** are people's homes, such as townhouses and apartment units.
- **Single-family detached units** are stand-alone units.
- **Single-family attached** units are attached to other structures by one or more walls (such as townhomes).
- **Multifamily homes** are 2+ unit buildings that are part of a larger complex (such as apartments).
- **Heating fuel** is the primary heating fuel for the housing unit (electricity, natural gas, fuel oil, bottled gas, wood, and other).
    - Bottled gas includes propane.
    - The "other" fuel type includes fuel such as biomass, coke, etc.

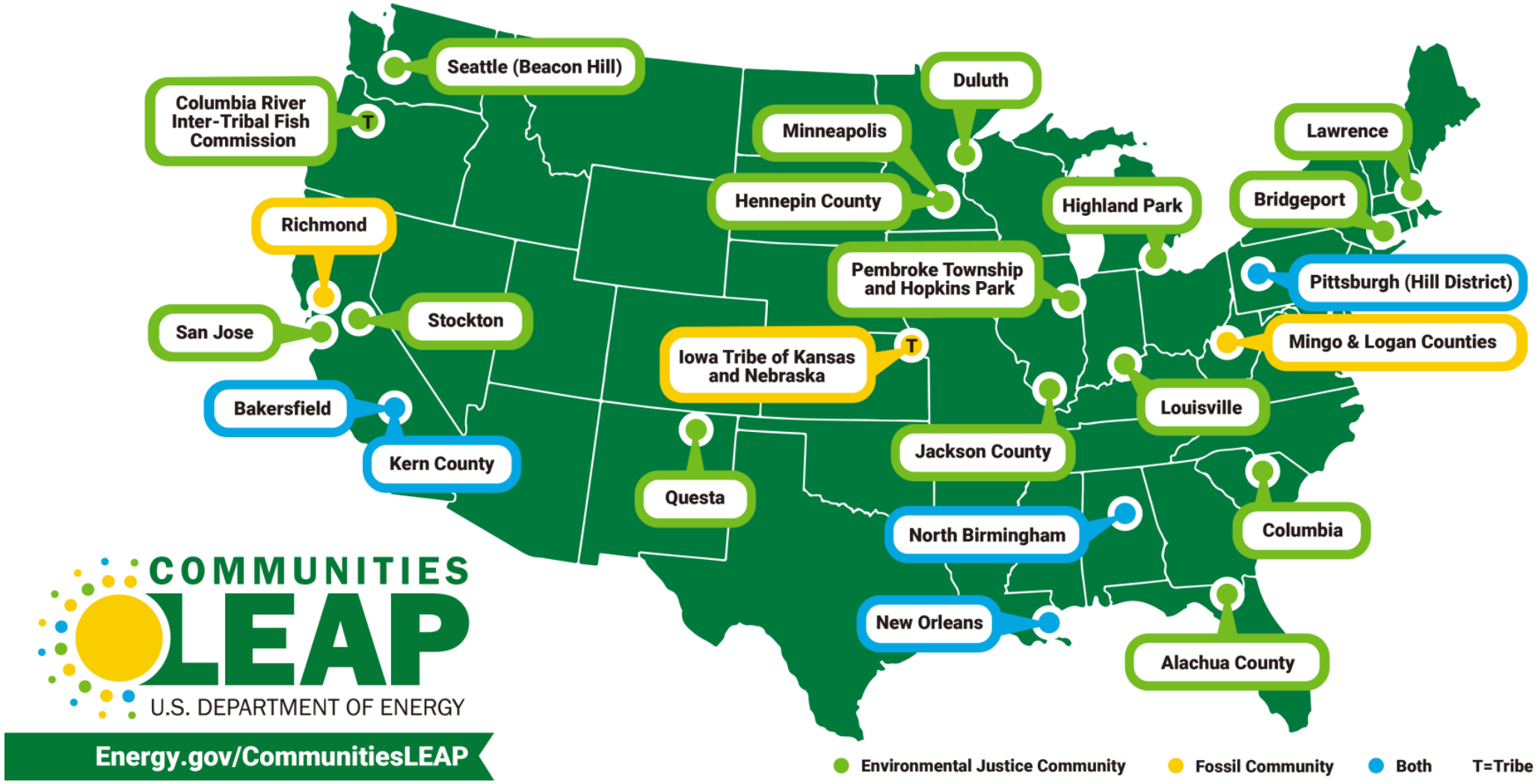
Communities LEAP and Lawrence, MA Background

Communities LEAP Pilot Technical Assistance Opportunity

The Communities Local Energy Action Program (LEAP) Pilot Competitive Technical Assistance opportunity aims to facilitate sustained, community-wide economic empowerment through clean energy, improve local environmental conditions, and open the way for other benefits primarily through the U.S. Department of Energy's clean energy deployment work.

This opportunity was open to low-income, energy-burdened communities that are also experiencing either direct environmental justice impacts or direct economic impacts from a shift away from historical reliance on fossil fuels.

Map of LEAP Communities



The Lawrence Stakeholders Coalition

The Lawrence Stakeholders Coalition (LSC) consists of:

- Browning the Green Space (Lead organization)
- All In Energy
- Groundwork Lawrence
- The City of Lawrence

Other supporting members:

- Mass Developments
- Mill City Investments
- ChargerHelp!
- Energize Andover

Lawrence Stakeholders Coalition Energy Burden Reduction and Electrification Goals

The City of Lawrence consists of 18 census tracts, of those, 9 census tracts have an average energy burden (the percent of income spent on energy bills) of 6% or greater. The Lawrence Stakeholders Coalition's (LSC) main goal is to "Reduce energy burden and create well-paying local jobs and businesses by increasing the distribution and use of sustainable technologies such as heat pumps, community and rooftop solar, and weatherization." As part of that goal, the LSC is interested in understanding Lawrence's pathway to electrification, specifically through the building sector.

This technical assistance aims to assist the LSC's electrification and energy burden reduction planning by:

- Identifying the most energy-burdened households by owner-occupied and renter-occupied housing status.
- Identifying and quantifying the characteristics of the most energy-burdened housing units by housing type, age, and heating fuel type.
- Identifying the tenure and housing types of the most energy-burdened and prevalent households for subsequent ResStock™ analysis of cost-effective efficiency upgrades.

Lawrence, MA Communities LEAP Project

	Lawrence, MA*	Essex County	Massachusetts
Total population	87,798	804,598	6,991,852
% Not identifying as "White alone"	62%	26%	20%
% Foreign born	42%	18%	17%
% Individuals with income below 200% poverty level	15%	7%	7%
% With a disability	14%	12%	12%
% 65 years and over	10%	17%	17%
% Language other than English spoken at home	74%	28%	24%
% Speak English less than very well	36%	12%	10%
% Renter-occupied housing units	70%	36%	36%
% Owner-occupied housing units	30%	64%	64%

- Compared to Essex County and the state of Massachusetts, Lawrence has a significantly higher share of marginalized community members:
  - 62% of individuals in Lawrence, Massachusetts, identify has “non-White,” compared to the county average of 26% and the state average of 20%.
  - 15% of households in Lawrence are below 200% of the poverty level, more than twice the state and county averages.
  - 36% of individuals in Lawrence report that they do not speak English very well, compared to the 12% county average.
  - Lawrence also has a far higher share of renters, with 70% of households being renter-occupied compared to 36% in Essex County and Massachusetts.

Source of data: 2021 American Community Survey’s 5-year estimates

***The percentages are sourced from the 2021 American Community Survey’s 5-year estimates and are tabulated only for the census tracts of interest: 2501 to 2518.**

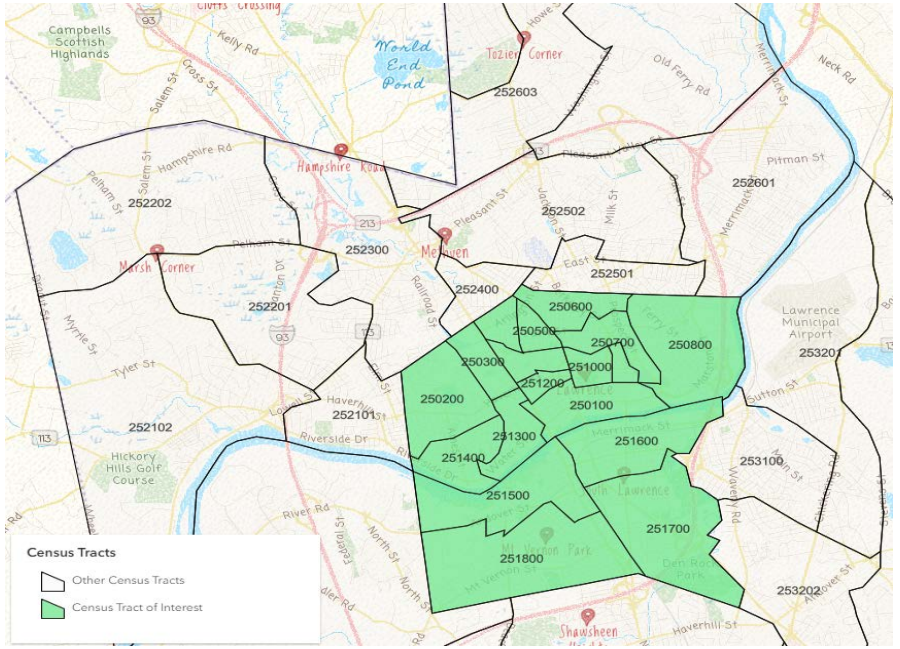
Low-Income Energy Affordability Data (LEAD) Tool Analysis for Lawrence, MA

LEAD Tool and Lawrence, MA Overview

- The Low-Income Energy Affordability Data (LEAD) tool maps household energy burden, the percentage of a household's income spent on energy costs, by census tract (Ma et al. 2019).
- Households paying more than 6% of their income on household energy costs are defined as having a high energy burden (or as "*highly burdened*"). Those paying more than 10% of their income are defined as having a severe energy burden (or as "*severely burdened*") (Drehobl et al. 2020).
- This analysis for Lawrence, Massachusetts, is limited to 18 census tracts: Census Tracts 2501 to 2518.
- There are five income levels within the LEAD tool. The Lawrence, Massachusetts, median incomes for each level are as follows.

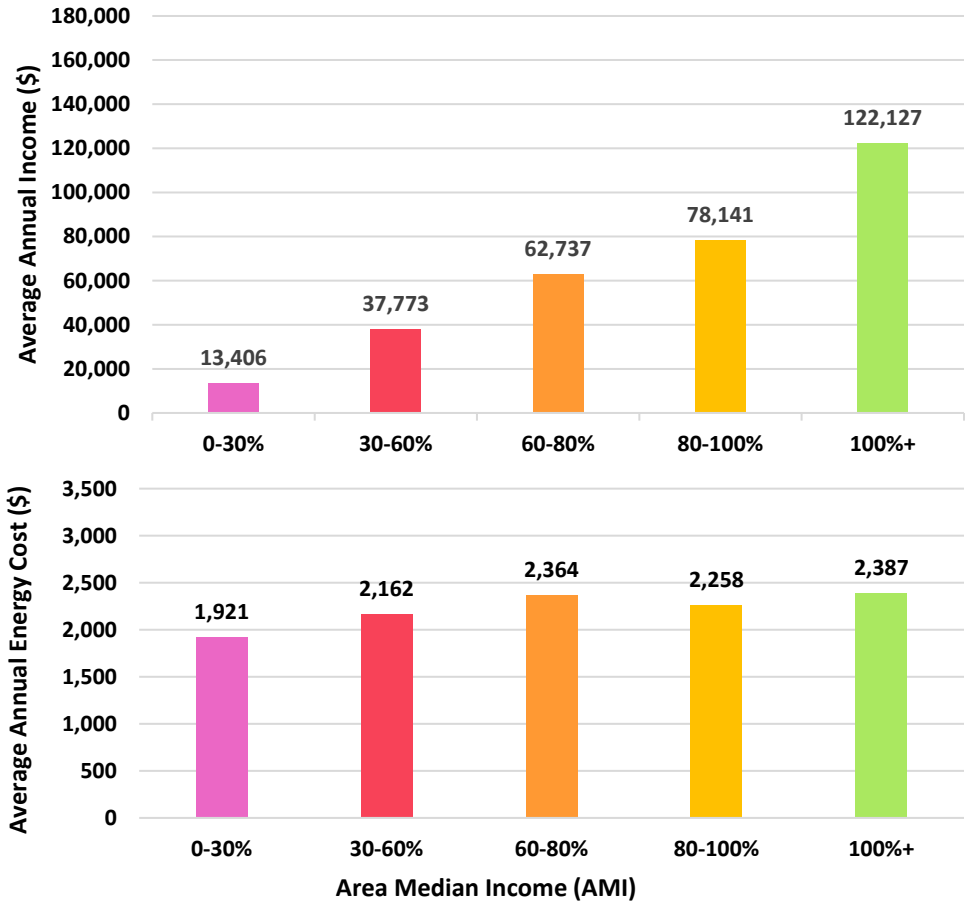
Area Median Income (AMI) Levels (percent of AMI)	Income Thresholds (calculated for an average household size of 2.75 in Lawrence, MA)
0% to 30%	$16,295
30% to 60%	$40,653
60% to 80%	$62,013
80% to 100%	$74,649
100% +	$137,812+

Census Tracts of Interest in Lawrence, MA

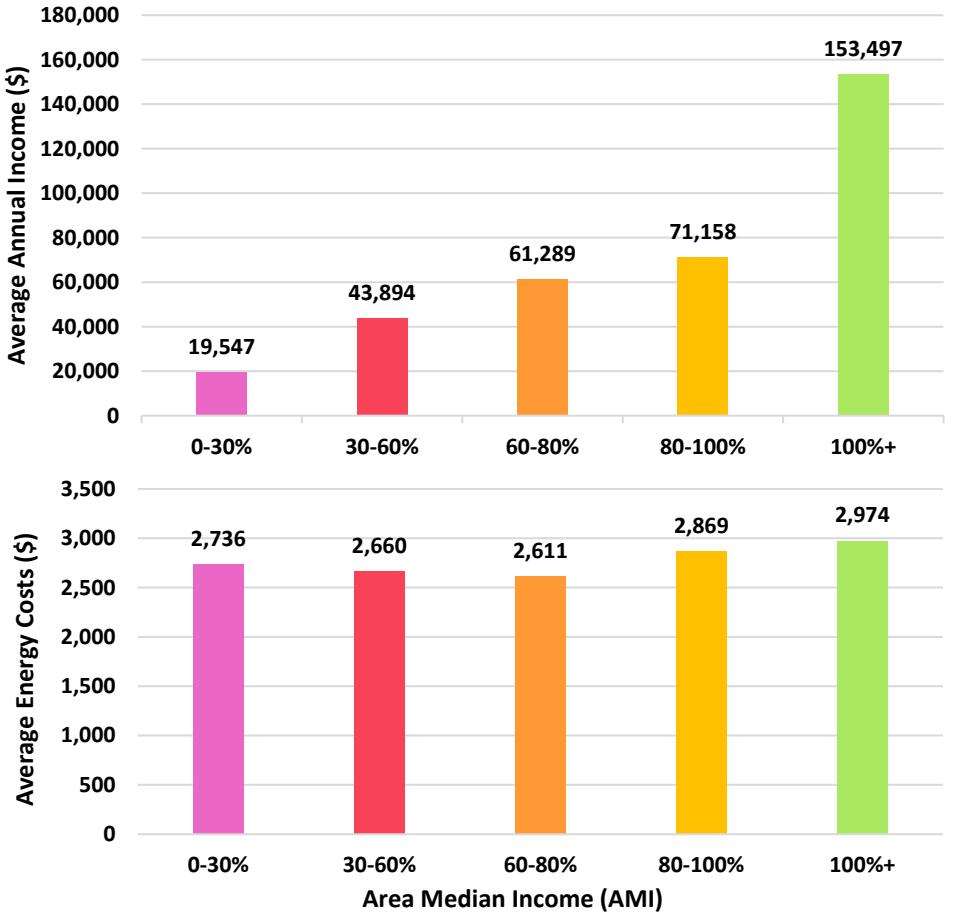


Energy Costs and Income in Renter- vs. Owner-Occupied Units in Lawrence, MA

Average Energy Cost and Annual Income for Renter-Occupied Households throughout Lawrence, MA



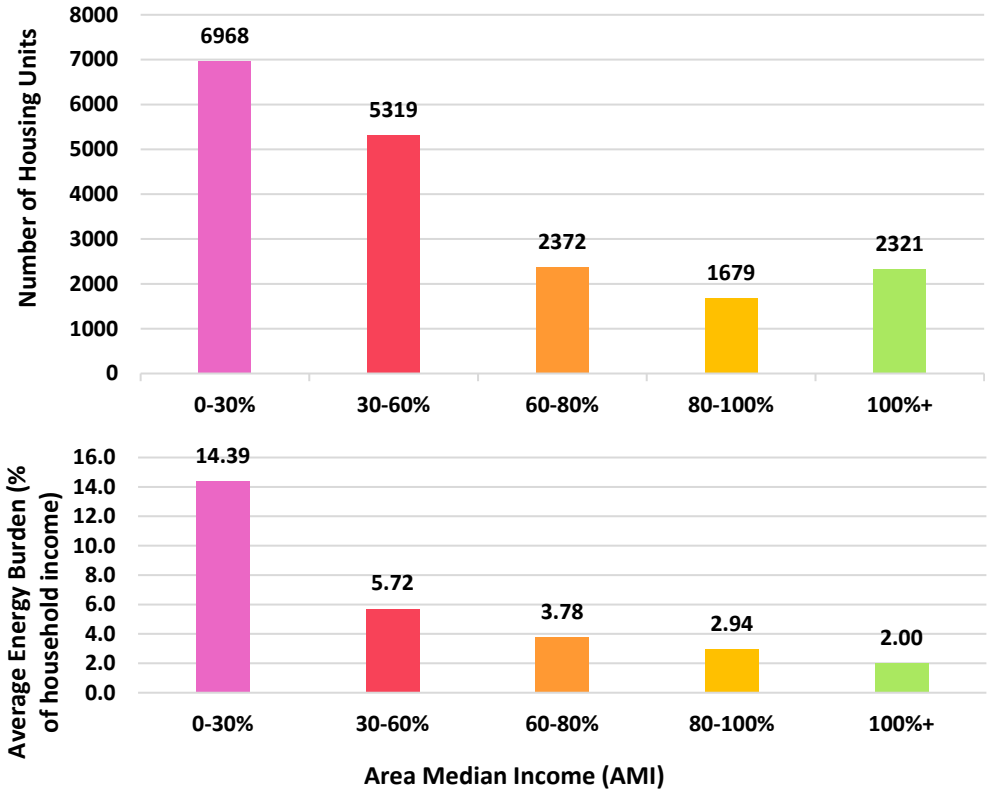
Average Energy Cost and Annual Income for Owner-Occupied Households throughout Lawrence, MA



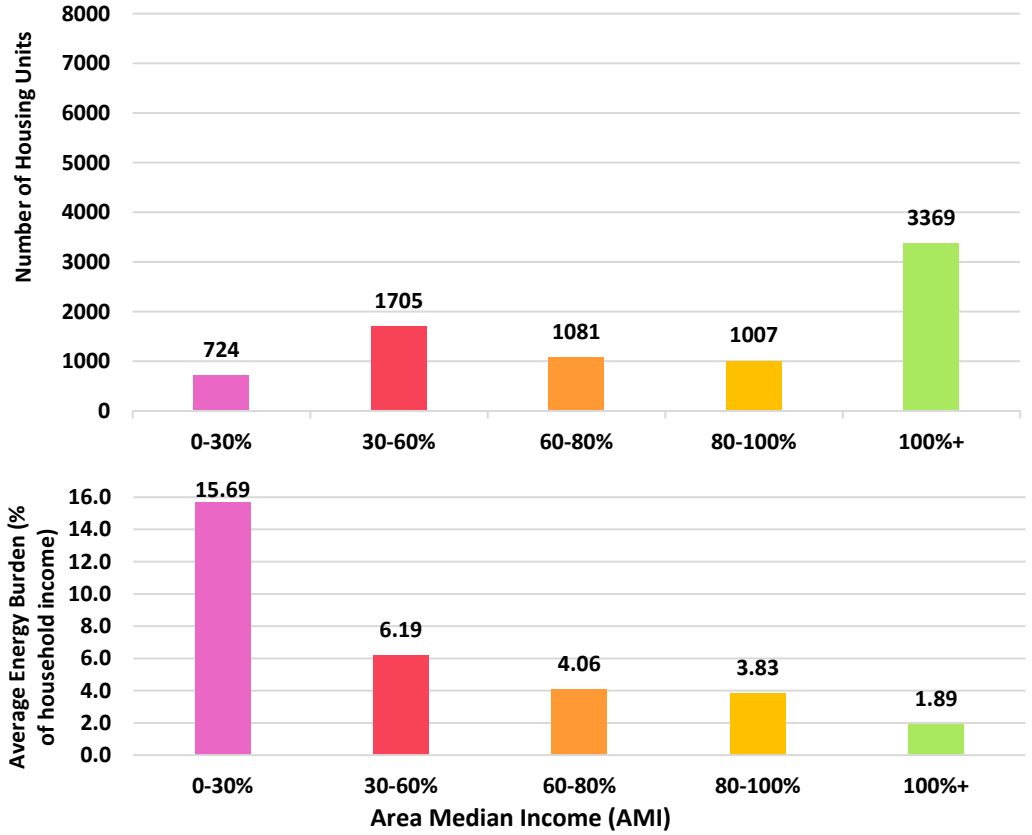
- While income varies substantially, energy costs are relatively consistent within renters and within homeowners, meaning the main driver of energy burden is income.
- Very low-income homeowners spend an average of $815 more per year on energy bills than renters of the same income group, consistent with state and national trends.

Energy Burden in Renter- vs. Owner-Occupied Units: All Income Levels in Lawrence, MA

Average Energy Burden and Housing Count for Renter-Occupied Households throughout Lawrence, MA



Average Energy Burden and Housing Count for Owner-Occupied Households throughout Lawrence, MA

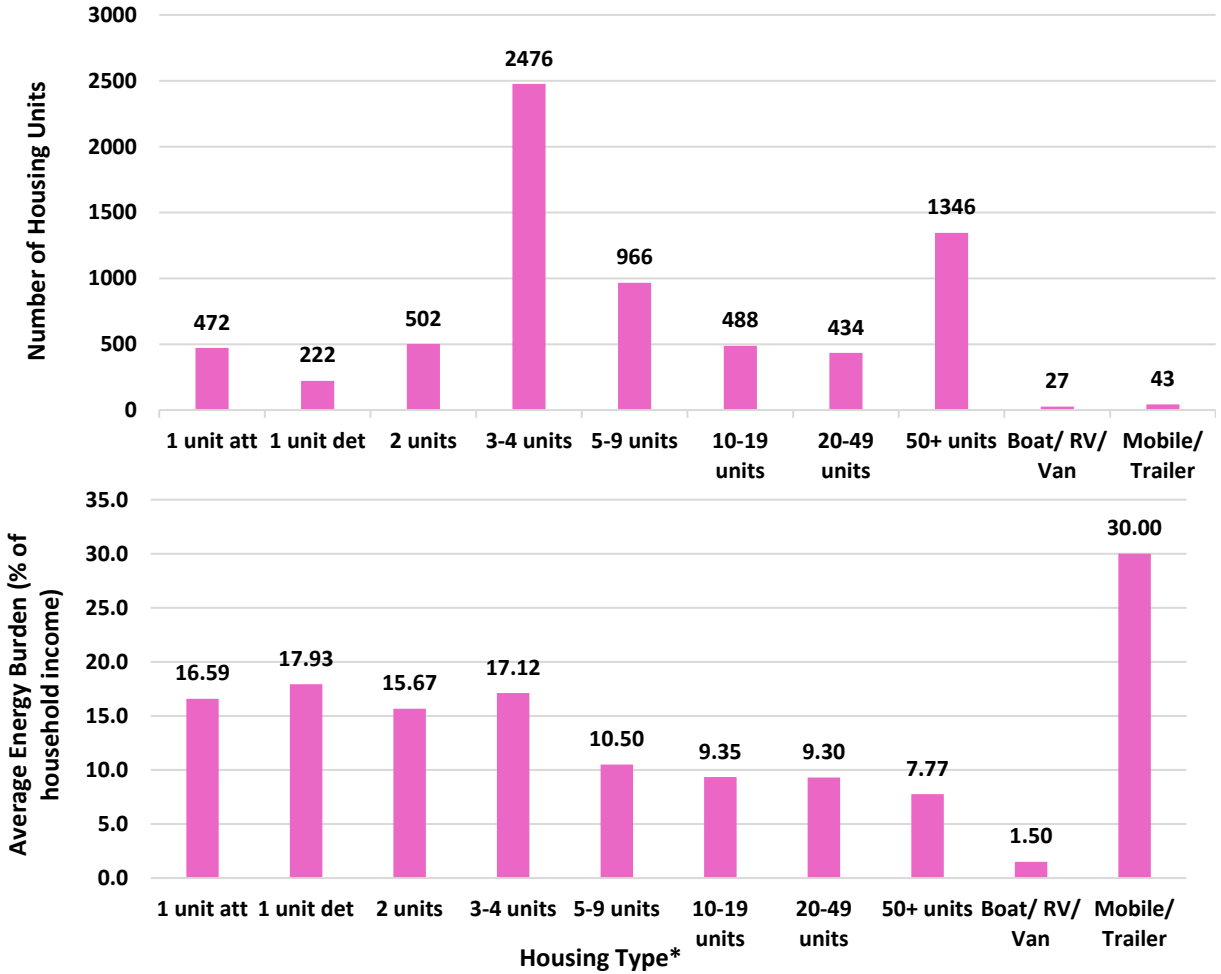


- Of all renter-occupied homes, those within the 0% to 30% AMI category face the highest energy burden (at 14.4%), and these households make up approximately 38% of the rental housing stock in Lawrence, Massachusetts.
- Of all owner-occupied households, those within the 0% to 30% AMI category also face the highest energy burden (at 15.7%), and these households make up approximately 10% of the owner-occupied housing stock in Lawrence, Massachusetts.

Energy Burden by Housing Type in Lawrence, MA

Energy Burden by Housing Type for Renter-Occupied Units: 0% to 30% Area Median Income

Average Energy Burden and Housing Count by Renter-Occupied Housing Types at 0%–30% AMI

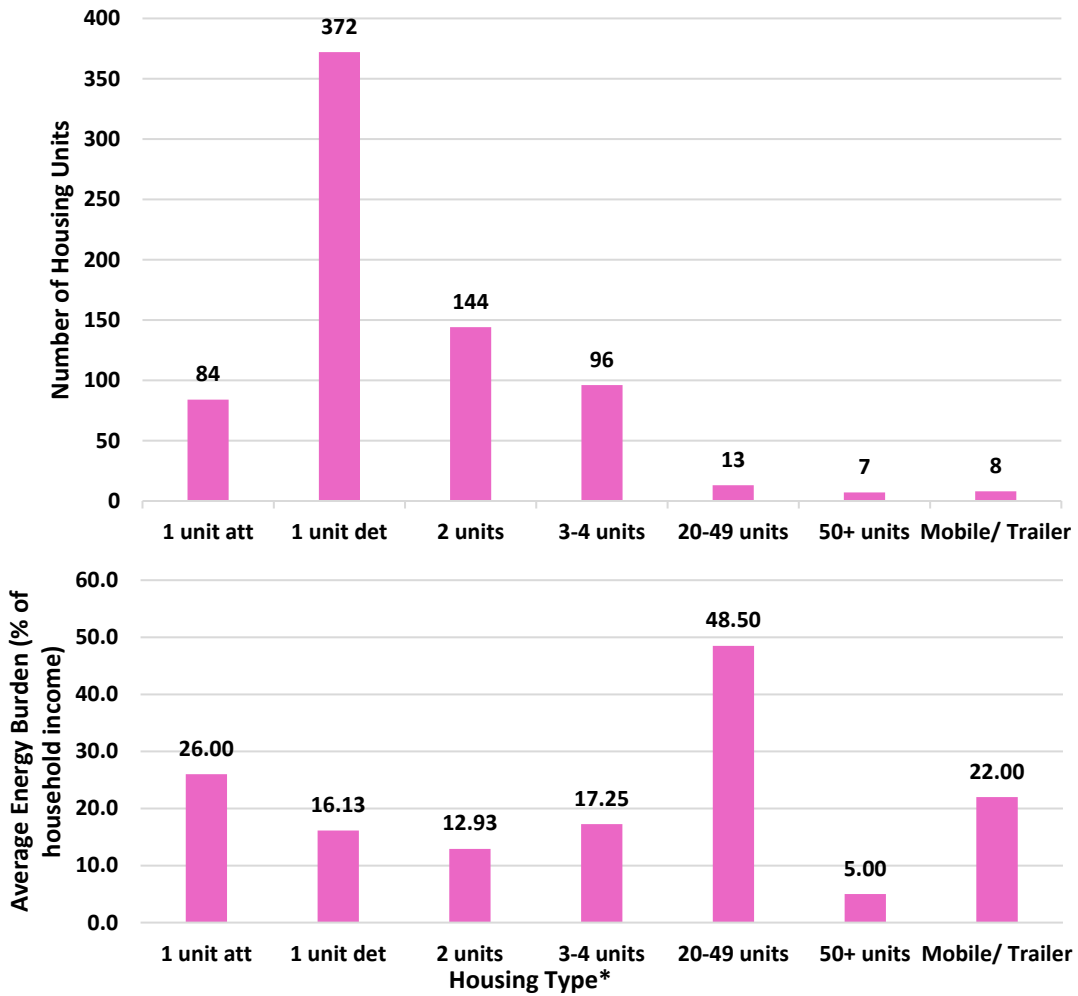


*"1 unit det" and "1 unit att" refers to single-family detached and single-family attached units, respectively.

- **Buildings with 3–4 units are the most common rental properties for households earning 0%–30% of AMI in Lawrence (2,476 units). These renters face an energy burden of 17.12% and are considered *severely energy burdened*.**
- On average, mobile home renters (~43 households) face the highest energy burden (at 30%) of all rental housing types within the 0% to 30% AMI category. These households are *severely energy burdened*.
- The ~222 0%–30% AMI households renting single-family detached homes and ~472 renting single-family attached homes have the second and fourth highest energy burdens in Lawrence, at 17.9% and 16.6%, respectively, and are *severely energy burdened.*

Energy Burden by Housing Type for Owner-Occupied Units: 0% to 30% Area Median Income

Average Energy Burden and Housing Count by Owner-Occupied Housing Types at 0%–30% AMI



*"1 unit det" and "1 unit att" refers to single-family detached and single-family attached units, respectively.

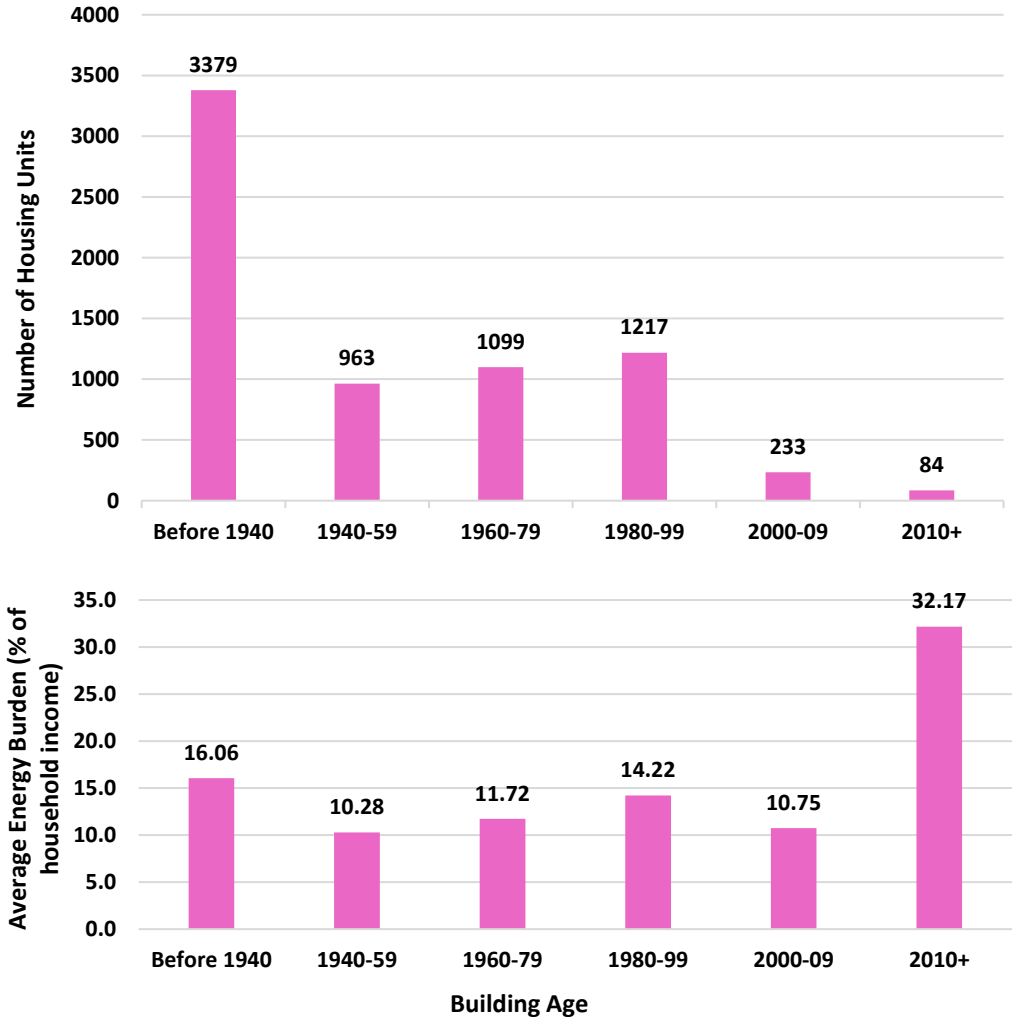
- **The ~84 0%–30% AMI single-family attached homeowners face an energy burden of 26%, and ~372 single-family detached homeowners face an energy burden of 16.1%. Both are *severely energy burdened.* In total, these housing types make up 63% of the owner-occupied housing stock within this AMI group.**

- The ~13 0%–30% AMI homeowners in 20-to-49-unit buildings face the highest energy burden (at 48.5%) of all the owner-occupied homes within this AMI group and are *severely energy burdened.*

Energy Burden by Building Age in Lawrence, MA

Energy Burden by Building Age for Renter-Occupied Units: 0% to 30% Area Median Income

Average Energy Burden and Housing Count by Renter-Occupied Building Ages at 0%–30% AMI



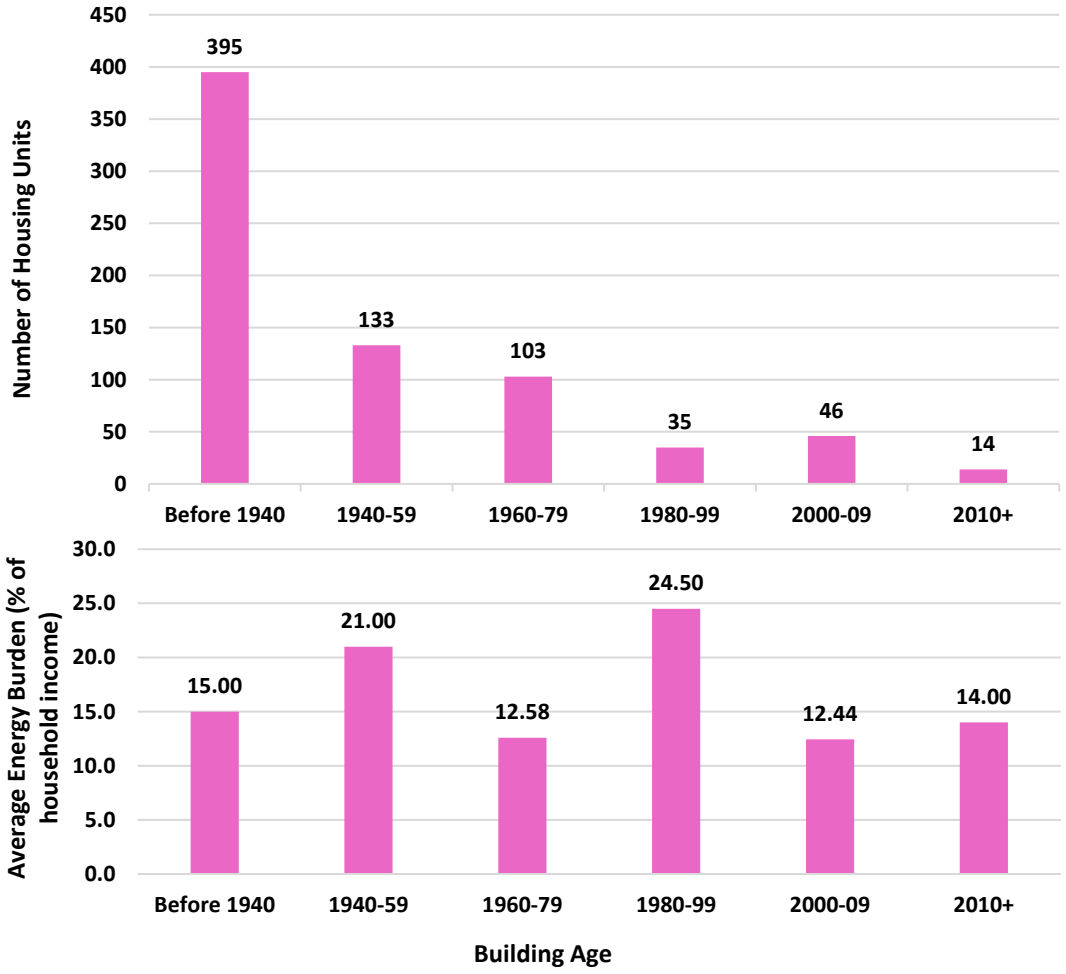
- **~84 0%–30% AMI renter households in homes built at or after 2010 have the highest energy burden (32%) within this AMI group.** These households are *severely energy burdened.*

- **More than 3,300 0%–30% AMI renter households in buildings built before 1940 face the second highest energy burden (16.1%), making up approximately 50% of the rental housing stock.** These households are *severely energy burdened.*

- 0%–30% AMI renters in the more than 1,200 units built between 1980 and 1999 have the third highest energy burden (14.2%) within this AMI group.

Energy Burden by Building Age for Owner-Occupied Units: 0% to 30% Area Median Income

Average Energy Burden and Housing Count for Different Owner-Occupied Building Ages at 0%–30% AMI



- **~395 housing units owned by 0%–30% AMI households were built before 1940, representing 54% of the housing stock at this income level. These households face the third highest energy burden among the housing age groups (15.0%) and are *severely energy burdened*.**

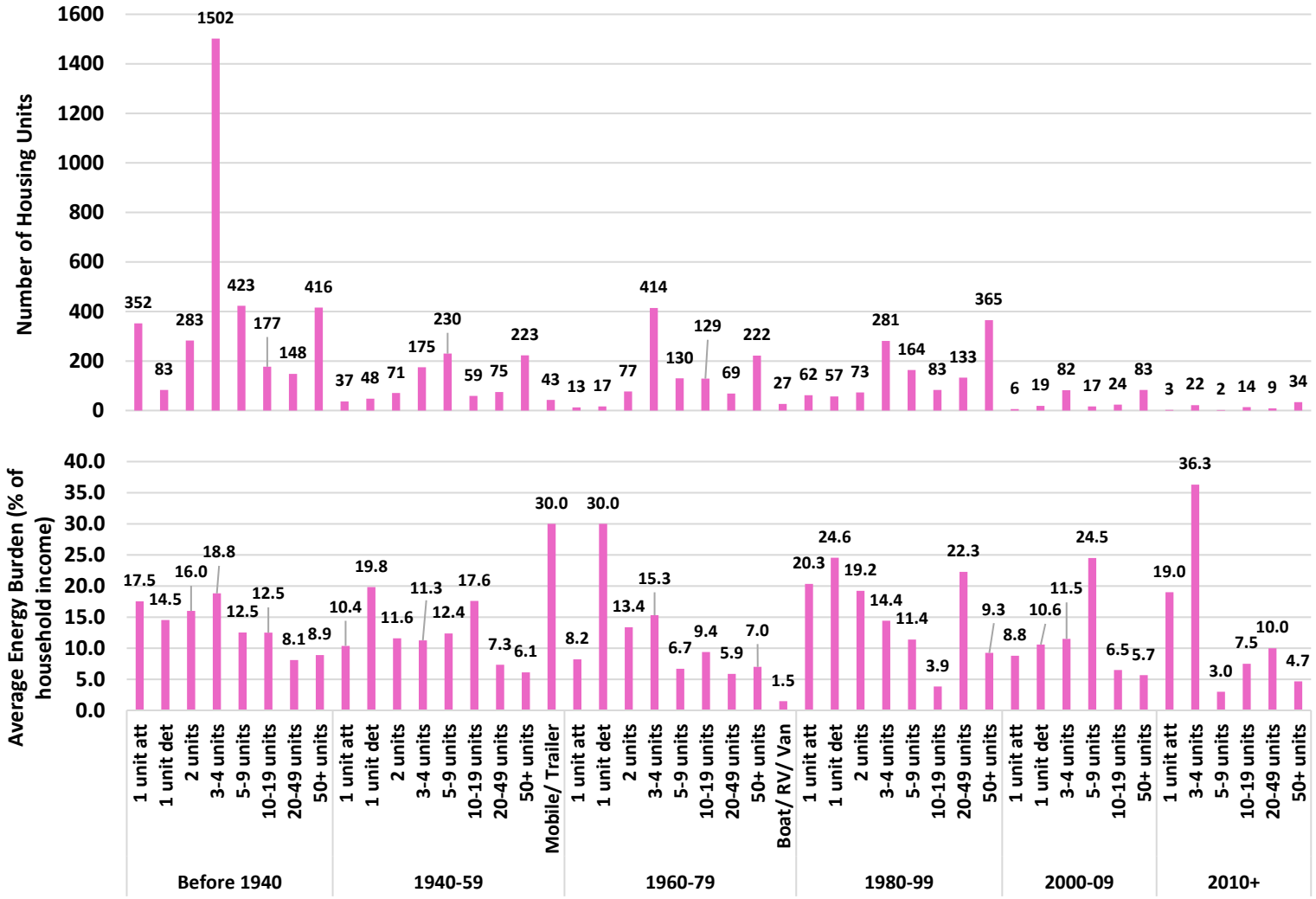
- ~35 housing units built between 1980 and 1999 owned by 0%–30% AMI households have the highest energy burden (24.5%) and make up 5% of the owner-occupied housing stock.

- Units built between 1940 and 1959 owned by 0%–30% AMI households have the second highest energy burden (21.0%) across all building ages within this AMI group, making up 18% of the owner-occupied housing stock within this AMI group.

Energy Burden by Building Type and Age in Lawrence, MA

Building Type, Age, and Energy Burden for Renter-Occupied Units: 0% to 30% Area Median Income

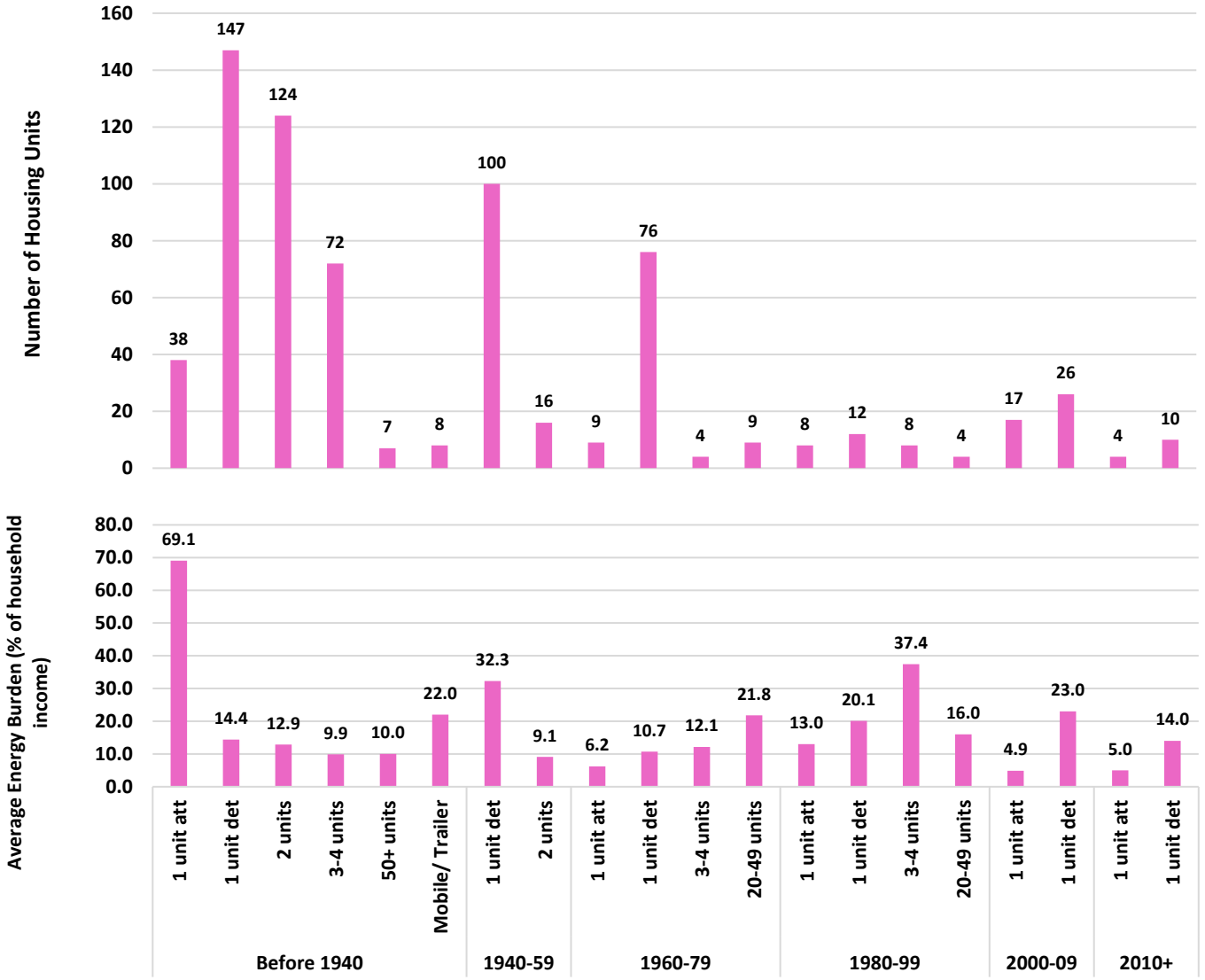
Average Energy Burden and Housing Count by Renter-Occupied Building Ages and Types at 0%–30% AMI



- This graph shows cross data for building type and age and associated energy burden for 0%–30% AMI renters.
- The following renter-occupied buildings are the most commonly energy burdened in the 0%–30% AMI category:
  - **3–4-unit buildings built pre-1940 are the most common among 0%–30% AMI renters in Lawrence (1,502). These households face an energy burden of 18.8%.**
  - Other multifamily buildings (2 and 5+ units) built pre-1940 are the second most common type of building and face high energy burdens, between 8.1% and 16%.
  - Most single-family units, attached and detached, were built pre-1940 and have an average energy burden of 17.5% and 14.5%, respectively.

Building Type, Age, and Energy Burden for Owner-Occupied Units: 0% to 30% Area Median Income

Average Energy Burden and Housing Count by Owner-Occupied Building Ages and Types at 0%–30% AMI

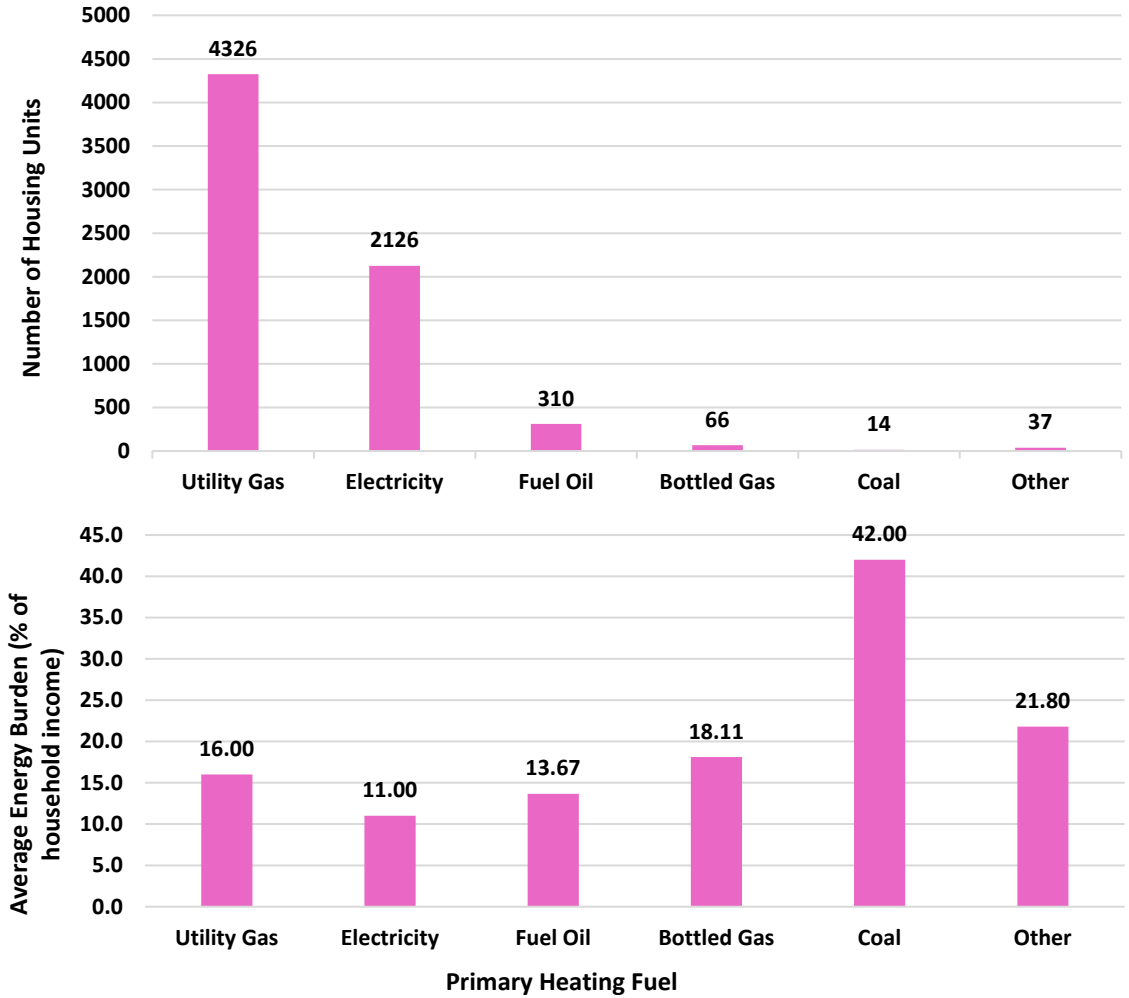


- This graph shows energy burdens by building type and age for owner-occupied units.
- The following owner-occupied buildings are the most common and energy burdened out of all owner-occupied buildings within the 0%–30% AMI category:
  - **Single-family detached homes built pre-1940 (~147) are the most common among 0%–30% AMI owner-occupied households in Lawrence with an average energy burden of 14.4%.**
  - The second most common building type are multifamily units (2- and 3–4 units) built pre-1940 and these units have an energy burden of 12.9% and 9.9%, respectively.
  - **There are ~38 single-family attached units built pre-1940 that face a very high energy burden of 69.1%.**

Energy Burden by Heating Fuel Type in Lawrence, MA

Energy Burden by Heating Fuel Type for Renter-Occupied Units: 0% to 30% Area Median Income

Average Energy Burden and Housing Count by Heating Fuel Types for Renter-Occupied Units at 0%–30% AMI

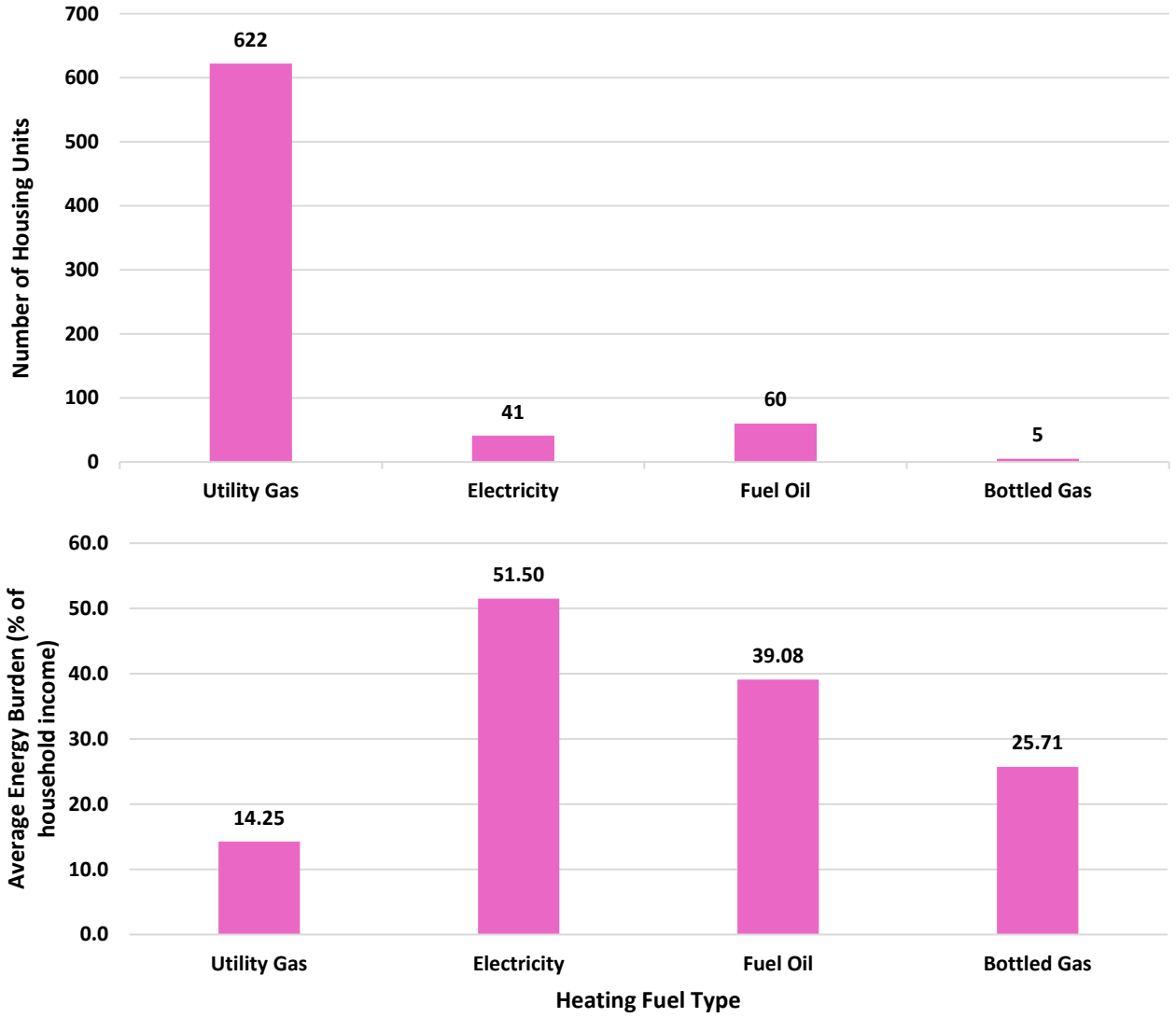


- **Renters who earn between 0% and 30% AMI and use natural gas and electricity as their primary heating fuel face an energy burden of 16% and 11%, respectively, and make up 93.8% of renter-occupied units.** These renters are *severely energy burdened.*

- Renters within this AMI group using coal have the highest energy burden at 42.1%, and those using bottled gas (propane) and other fuel sources, such as wood or biomass, face energy burdens of 18% and 22%, respectively.
  - Collectively, these households make up less than 2% of the rental housing stock within the 0%–30% AMI category.

Energy Burden by Heating Fuel Type for Owner-Occupied Units: 0% to 30% Area Median Income

Average Energy Burden and Housing Count by Heating Fuel Types for Owner-Occupied Units at 0%–30% AMI



- **Owner-occupied homes using utility gas are severely burdened, facing an energy burden of 14.3% and making up more than 85% of the housing stock within this AMI group.**
- **Homeowning households that earn between 0% and 30% AMI and use electricity as their main heating fuel have the highest energy burden at 51.5%** and make up 5.6% of the owner-occupied housing stock.
- Homeowning households that use fuel oil and bottled gas have the second and third highest energy burdens at 39.1% and 25.7%, respectively, within this AMI group.

Conclusion

In Lawrence, Massachusetts, the highest energy-burdened households are in the 0%–30% AMI group (14.4% for renters and 15.7% for owners). The majority of these households are renters and live in multifamily unit buildings built before 1940 that use natural gas and electricity as their primary heating source.

The highest energy-burdened households in this income group that are fewer in numbers are those that live in mobile homes and large 20-to-49-unit buildings that were built before 1940 and after 2000, and use coal, bottled gas, and “other” heating sources, and homeowners that use electricity for heating.

Summary of Key Energy Burden Analysis Takeaways

Income by Renters and Homeowners

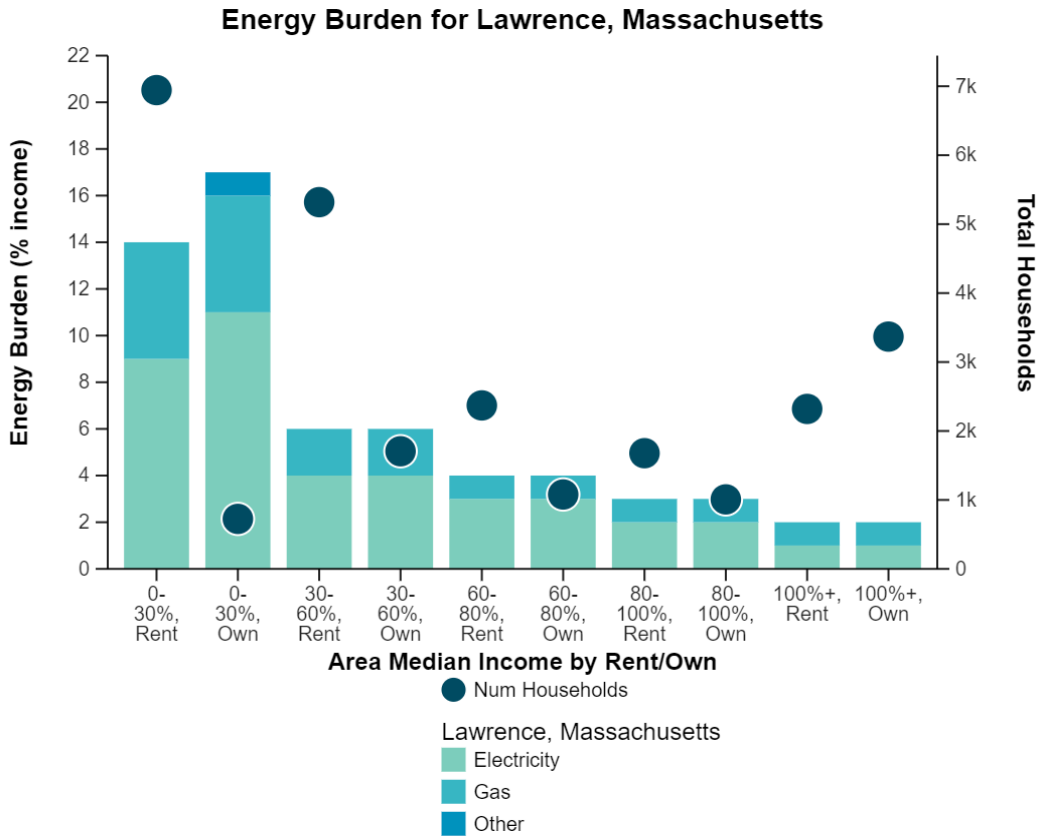
Households earning 0%–30% of the area median income in Lawrence, Massachusetts, are *severely energy burdened,* spending an average of 16% of annual income on energy. While they are fewer in number, homeowners in this income category have higher energy burdens than renters, consistent with national and state trends.

- 0%–30% AMI renters occupy 38% of rental housing and face an energy burden of 14.4%.
- 0%–30% AMI homeowners occupy 10% of owner-occupied housing and face an energy burden of 15.7%.

Heating Fuel Type by Renters and Homeowners

Targeting 0%–30% AMI homeowners using electric resistance heating can address the highest energy burdens identified (51.5%).

- 0%–30% AMI homeowners using fuel oil have average energy burdens of 39.1% and natural gas of 25.7%.
- 94% of 0%–30% AMI renters use natural gas or electricity for heating and have energy burdens of 16% and 11%, respectively.
- ~25 0%–30% AMI renters use coal or wood for heating and have energy burdens of 42% and 22%, respectively, followed by bottled gas (18%).



Source: https://www.energy.gov/scep/slsc/lead-tool

Summary of Key Energy Burden Analysis Takeaways (Continued)

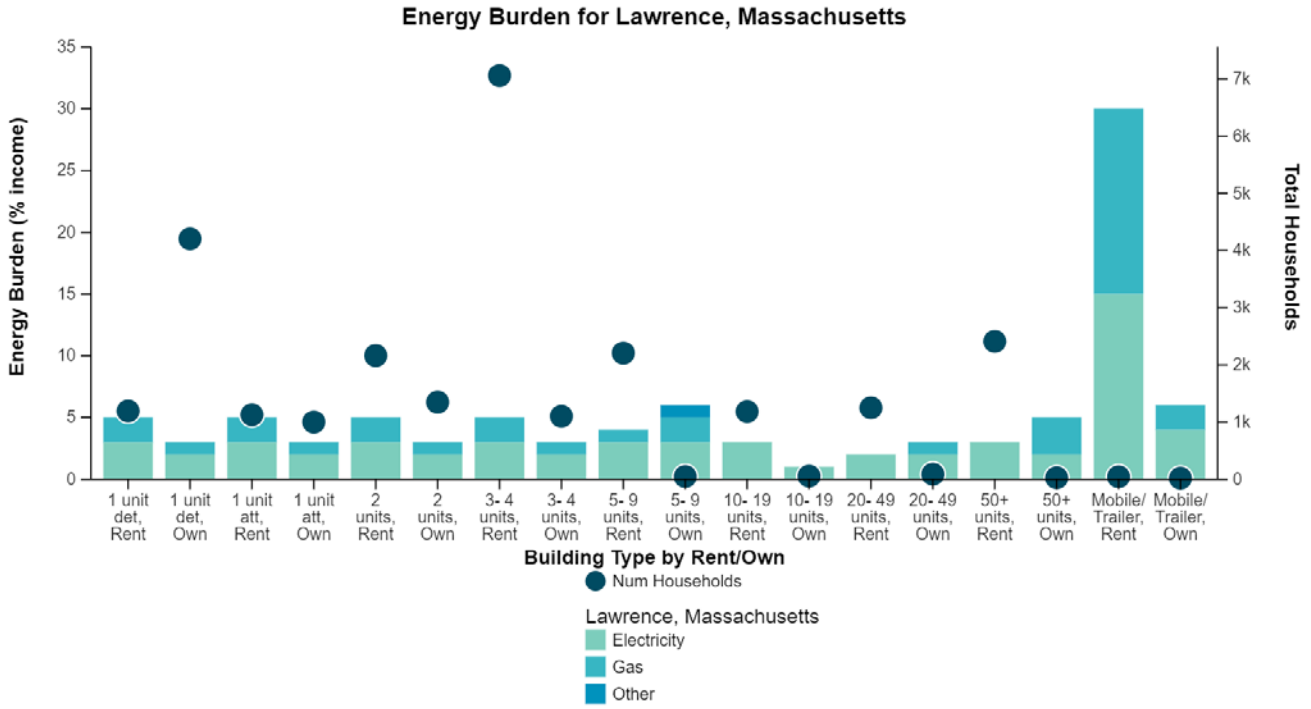
Housing Type by Renters and Homeowners

0%–30% AMI households renting mobile homes (43 units) have the highest average energy burden at 30%, followed by single-unit detached households (222 units) at 17.9%, and buildings with 3-4 units (2,476) at 17.12%.

Housing Age by Renters and Homeowners

While there are more low-income households that live in buildings built before 1940 than those built in other time periods, building age does not appear to be a consistent metric for targeting high energy burdens.

- 0%–30% AMI owner-occupied housing units built between 1980 and 1999 have the highest energy burdens at 24.5%, followed by homes built between 1940 and 1959 at 21.0%, and those built before 1940 at 15.0%. Units built before 1940 represent 54% of 0%–30% AMI owner-occupied housing.
- Renter-occupied housing units in the 0%–30% AMI group built at and after 2010 (84 units) face an energy burden of 32%, followed by more than 3,300 homes built before 1940, constituting around 48% of the rental housing stock, that face an energy burden of 16%.



Source: ttps://www.energy.gov/scep/slsc/lead-tool

How the LEAD Tool Informed the ResStock Tool Analysis

The ResStock analysis tool uses residential large-scale data to identify home energy improvements that can lead to monetary energy savings as well as reduced greenhouse gas emissions.

ResStock can analyze specific housing stock characteristics, and for this analysis four segments were identified.

The results of this LEAD tool analysis were utilized to determine which segments would be analyzed using ResStock, which are as follows:

- Segment 1: Multifamily buildings with 2–4 units, pre-1940.
- Segment 2: Multifamily buildings with 5+ units, pre-1940.
- Segment 3: Mobile homes, 1940–1979.
- Segment 4: Single family (attached and detached), pre-1940.

These segments prioritize the most energy-burdened households and the housing types with the most housing units in Lawrence.

References

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Thank you!

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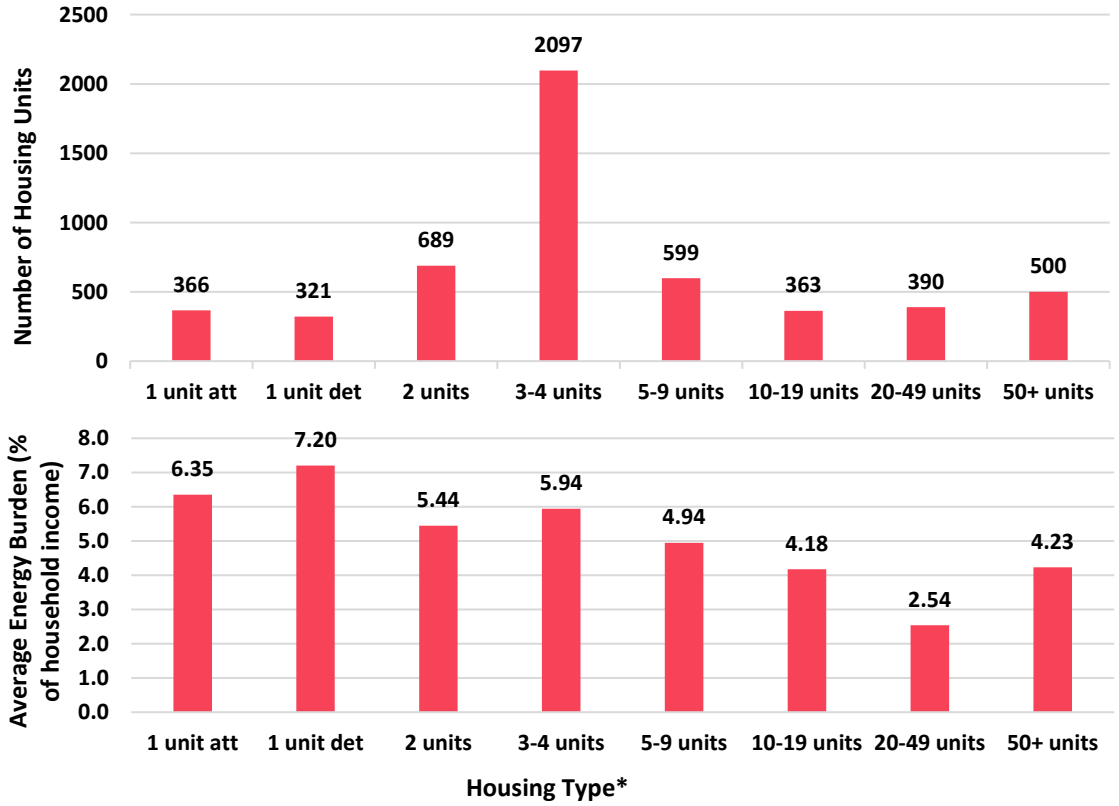
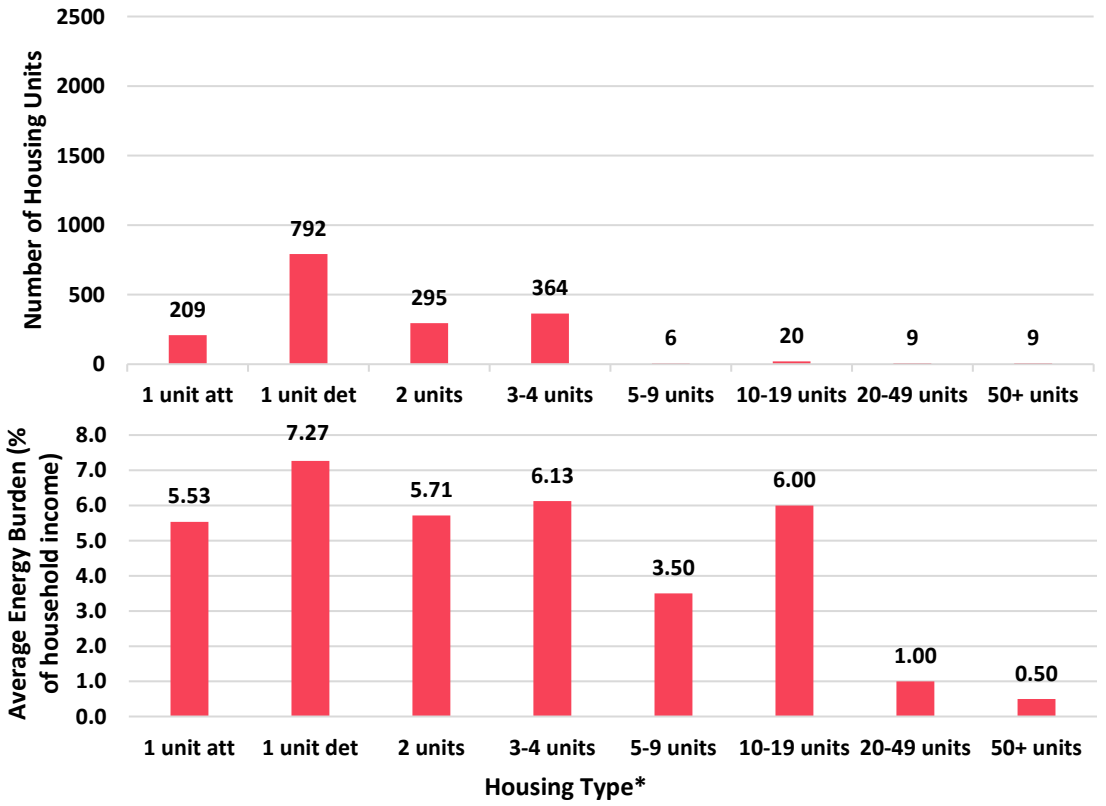
Appendix

Appendix 1: Energy Burden by Housing Type for 30% to 60% Area Median Income

Average Energy Burden and Housing Count by Building Types for Renter-Occupied Units at 30%–60% AMI



Average Energy Burden and Housing Count by Building Types for Owner-Occupied Units at 30%–60% AMI

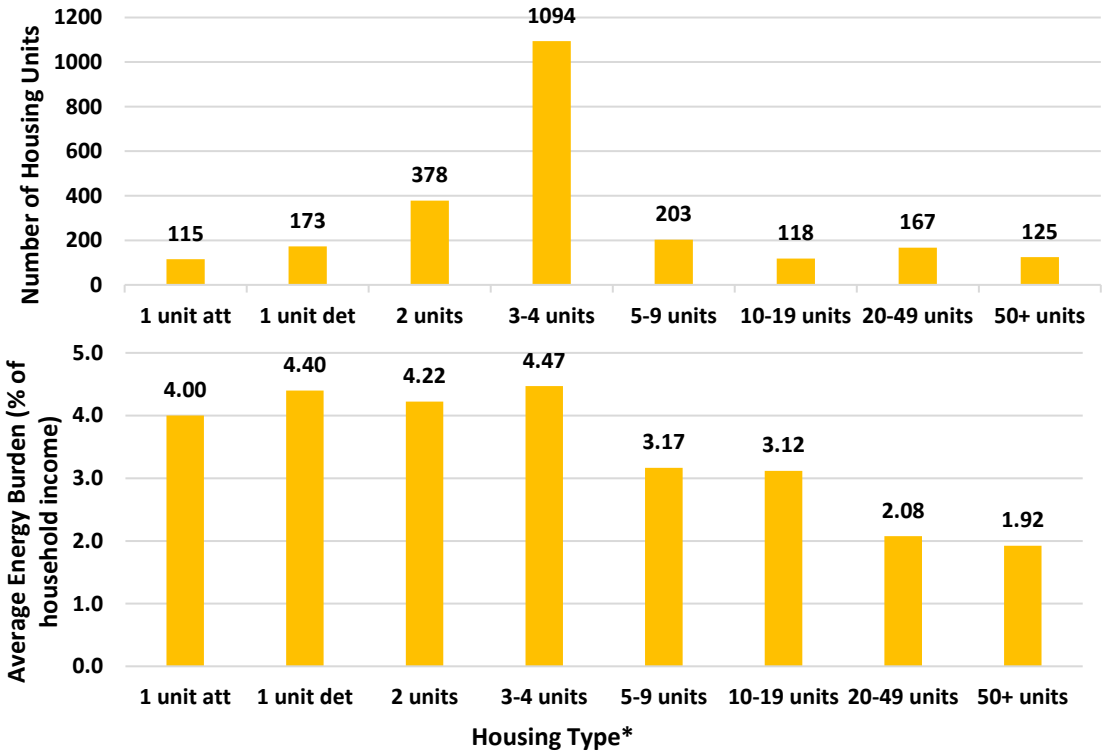


- Within the 30%–60% AMI group, single-unit detached homes for both owner-occupied and renter-occupied households have the highest energy burden at approximately 7% and are considered *highly energy burdened,* representing 6% of the rental-housing stock and 12% of the owner-occupied housing stock at this AMI.
- For renter-occupied households, single-unit attached buildings and 3-to-4-unit buildings face the second highest energy burden at 6.35% and 5.94%, respectively. These two housing types respectively represent 7% and 39% of the rental housing stock in this AMI group.
- For owner-occupied households, 3-to-4-unit and 10-to-19-unit housing types face the second highest energy burden at 6.13% and 6%, respectively. These groups are considered *highly energy burdened.* These groups respectively represent 21% and 1% of the owner-occupied housing stock at this AMI group.

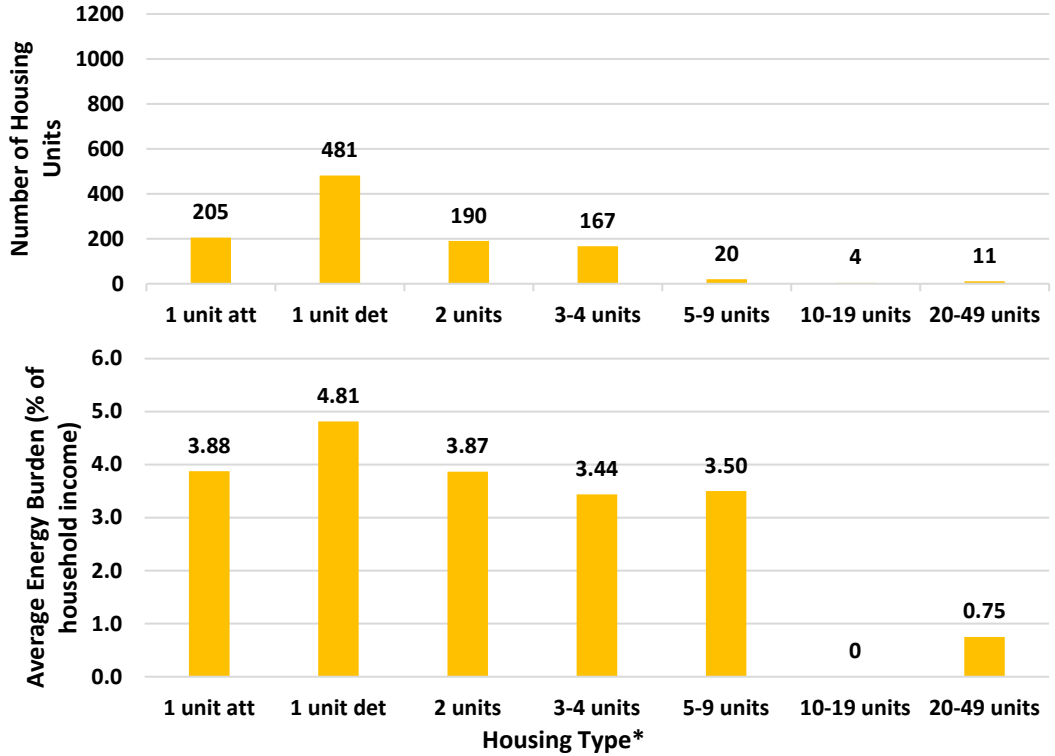
***"1 unit det" and "1 unit att" refers to single-family detached and single-family attached units, respectively.**

Appendix 2: Energy Burden by Housing Type for 60% to 80% Area Median Income

Average Energy Burden and Housing Count by Building Types for Renter-Occupied Units at 60%–80% AMI



Average Energy Burden and Housing Count by Building Types for Owner-Occupied Units at 60%–80% AMI



- For owner-occupied households, single-unit detached housing types face the highest energy burden at 4.8% within the 60%–80% AMI category.
- For renter-occupied households, housing types with 3–4 units face the highest energy burden at 4.5% within this AMI category. Single-unit attached homes and 2-unit housing types face the second highest energy burden for renter-occupied and owner-occupied households.
- While the data within the LEAD tool shows that owner-occupied households with 10–19 units have a 0% energy burden, that is unlikely, meaning that the energy burden data was likely underreported within the LEAD tool.

***"1 unit det" and "1 unit att" refers to single-family detached and single-family attached units, respectively.**

Appendix 3: Energy Burden by Building Age for 30% to 60% Area Median Income

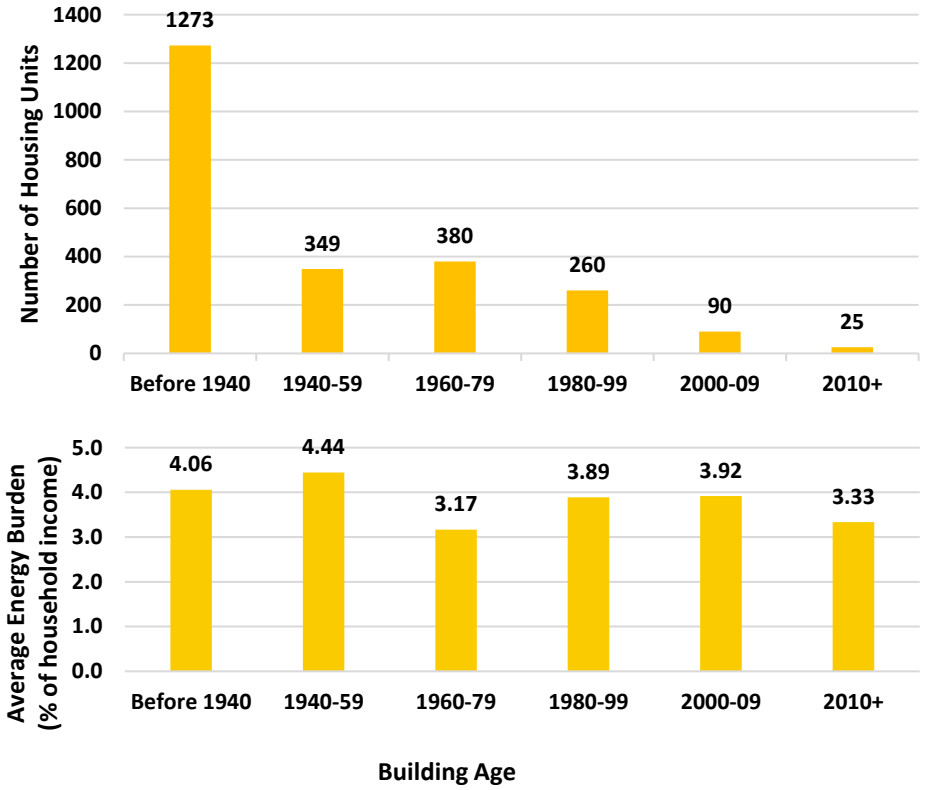
Average Energy Burden and Housing Count by Building Ages for Renter-Occupied Units at 30%–60% AMI

Average Energy Burden and Housing Count by Building Ages for Owner-Occupied Units at 30%–60% AMI

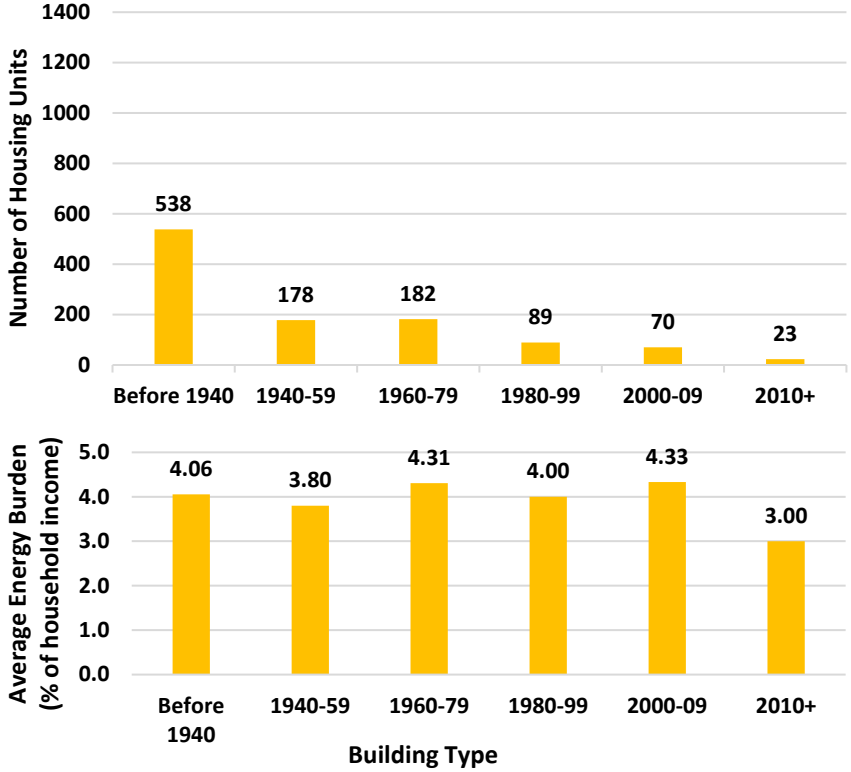
- Within the 30%–60% AMI group, 777 renter-occupied units built between 1940 and 1959 face the highest energy burden at 6.6%, making up nearly 15% of the renter-occupied housing stock and are *highly energy burdened*. Buildings built before 1940 represent almost 50% of the renter-occupied housing stock and are close to highly energy burdened at 5.56%.
- Within this AMI group, 60 owner-occupied units built at or after 2010 have the highest energy burden at 6.8%, making up less than 4% of the owner-occupied housing stock. Owner-occupied units built before 1940 represent almost 55% of this housing group and have a high energy burden of 6.25%. Both groups are *highly energy burdened*.

Appendix 4: Energy Burden by Building Age for 60% to 80% Area Median Income

Average Energy Burden and Housing Count by Building Ages for Renter-Occupied Units at 60%–80% AMI



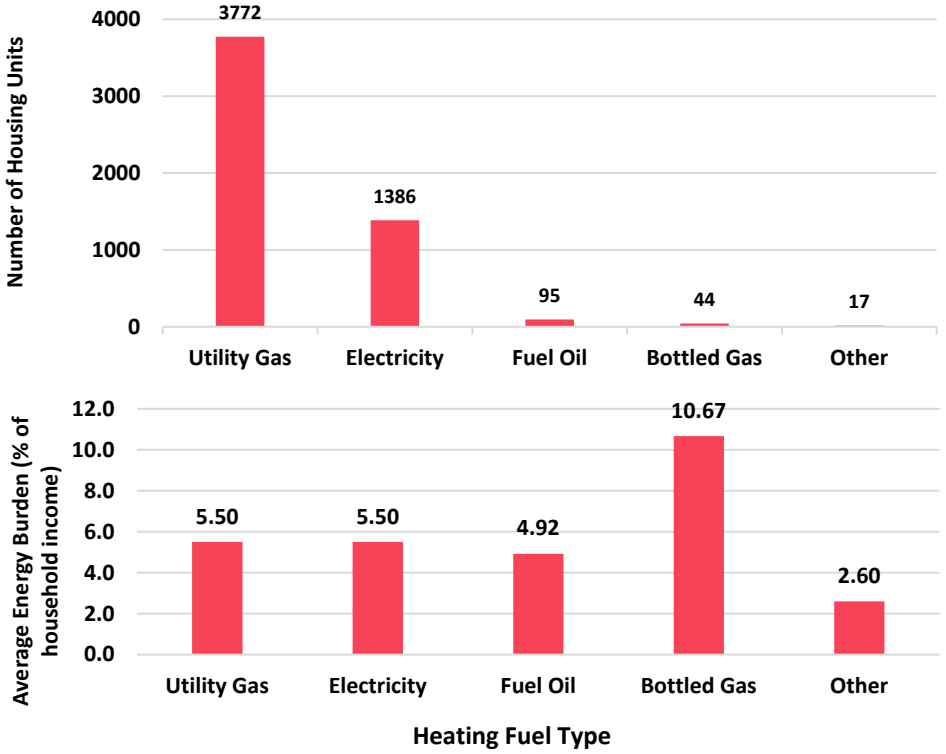
Average Energy Burden and Housing Count by Building Ages for Owner-Occupied Units at 60%–80% AMI



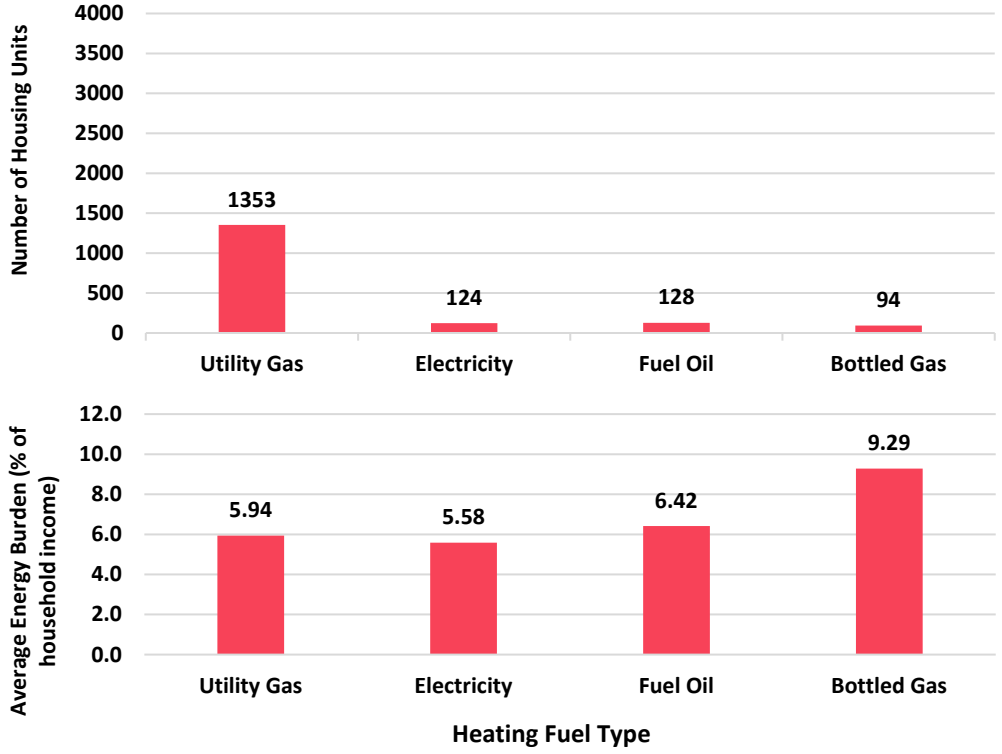
- Within the 60%–80% AMI group, renter-occupied units built between 1940 and 1959 have the highest energy burden of 4.4%, and these households make up almost 15% of this housing stock group. Units built before 1940 represent 53.5% of this housing stock group and face an energy burden of 4.06%.
- Owner-occupied units built between 1960 and 1979 and between 2000 and 2009 have the highest energy burden of 4.3%, and these households collectively make up 23% of the owner-occupied housing stock within this AMI group.

Appendix 5: Energy Burden by Heating Fuel Type for 30% to 60% Area Median Income

Average Energy Burden and Housing Count by Heating Fuel Types for Renter-Occupied at 30%–60% AMI



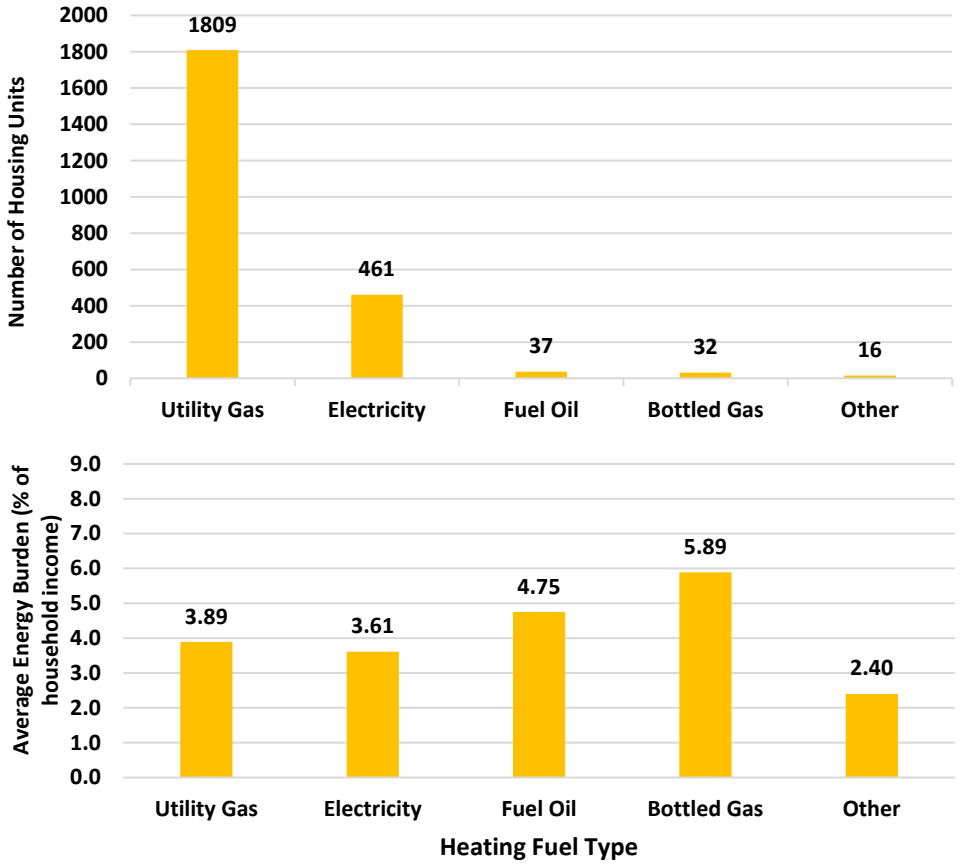
Average Energy Burden and Housing Count by Heating Fuel Types for Owner-Occupied Units at 30%–60% AMI



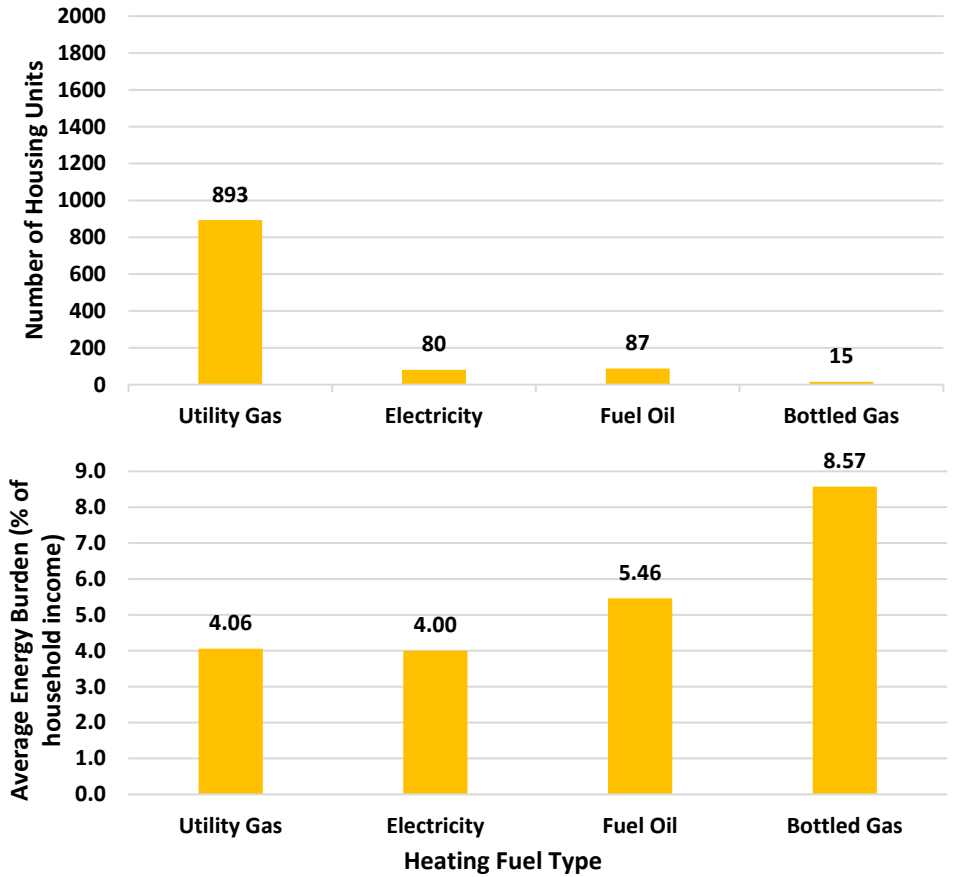
- Within the 30%–60% AMI group, both renter-occupied and owner-occupied units that use electricity and utility gas (natural gas) face an energy burden of close to 6%.
- Renter- and owner-occupied units in this AMI group that use bottled gas for heating face the highest energy burden at 10.6% and 9.29%, respectively, and are *severely* and *highly energy burdened,* respectively.
- Within this AMI group, no homes use wood as their primary heating fuel.

Appendix 6: Energy Burden by Heating Fuel Type for 60% to 80% Area Median Income

Average Energy Burden and Housing Count by Heating Fuel Types for Renter-Occupied Units at 60%–80% AMI



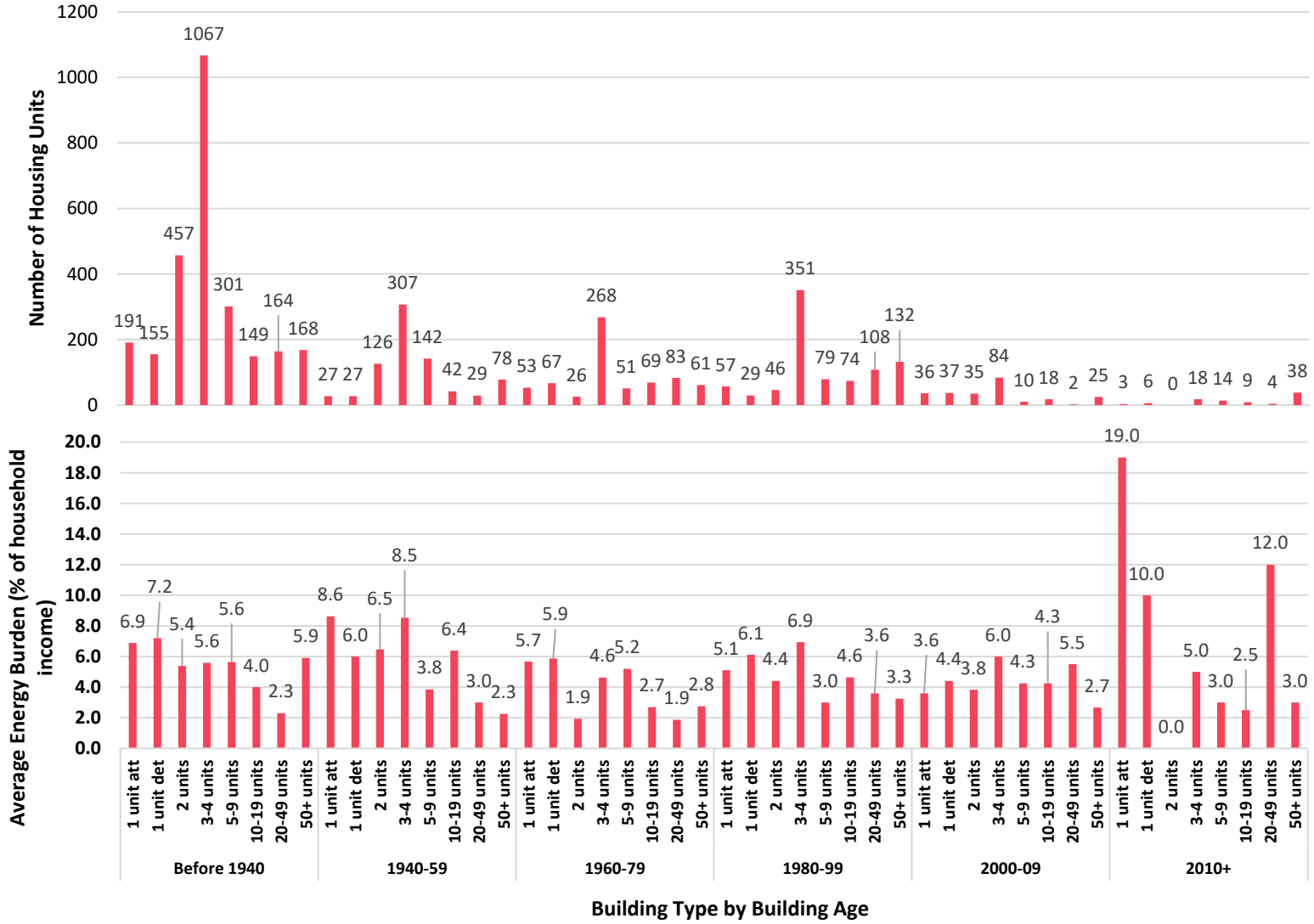
Average Energy Burden and Housing Count by Heating Fuel Types for Owner-Occupied Units at 60%–80% AMI



- Both renter-occupied and owner-occupied units within the 60%–80% AMI group that use utility gas (natural gas) or electricity have an energy burden around 4%.
- For renter-occupied units that are within this AMI group, bottled gas and fuel oil have the highest energy burdens of 5.9% and 4.8%, respectively. For owner-occupied households, those using bottled gas have the highest energy burden at 8.6% and are *highly energy burdened*.

Appendix 7: Building Type, Age, and Energy Burden for Renter-Occupied Units at 30% to 60% Area Median Income

Average Energy Burden and Housing Count for Renter-Occupied Building Ages and Types at 30%–60% AMI

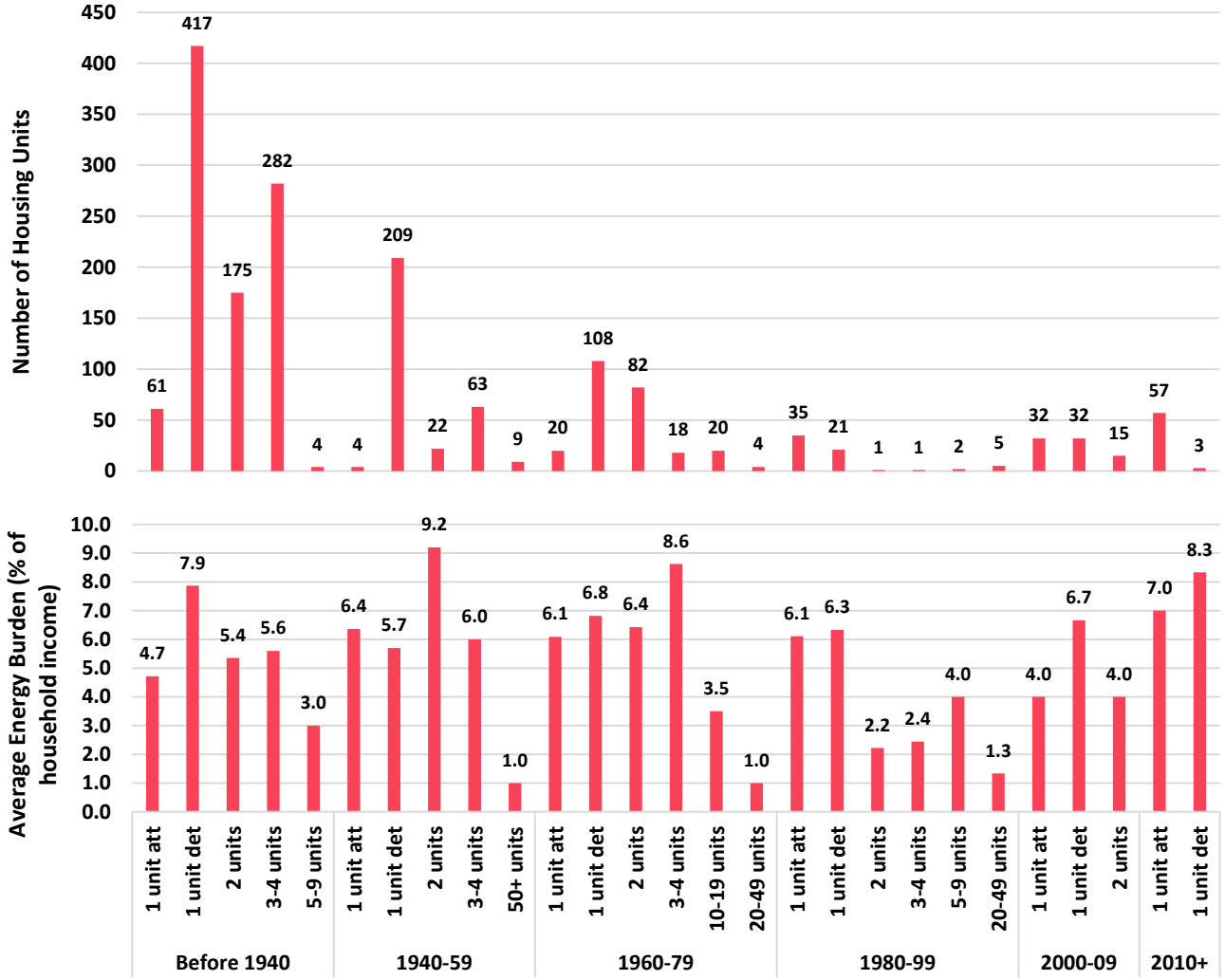


This graph shows cross data for building type and age and energy burden for renter-occupied units in the 30%–60% AMI group.

- The most common renter-occupied building type are 3–4-unit, pre-1940 buildings (1,067) with an average energy burden of 5.6%.
- Other common and highly energy-burdened building types are single-unit detached pre-1940 (155) at 7.2%; 3–4-unit buildings built between 1940 and 1959 (307) at 8.5%; and 3–4-unit buildings built between 1980 and 1999 (351) at 6.9%.

Appendix 8: Building Type, Age, and Energy Burden for Owner-Occupied Units at 30% to 60% Area Median Income

Average Energy Burden and Housing Count for Owner-Occupied Building Ages and Types at 30%–60% AMI

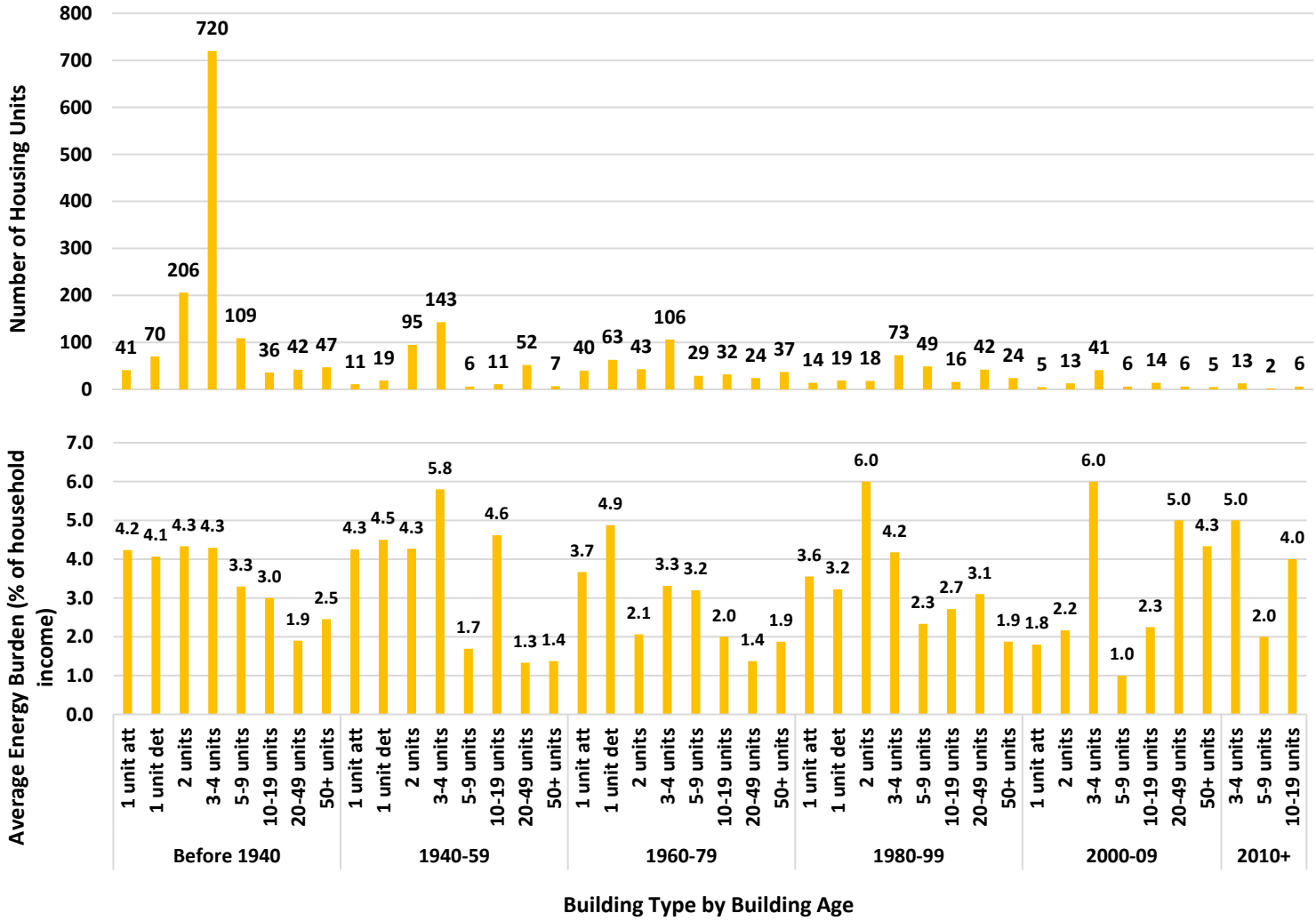


This graph shows cross data for building type and age and energy burden for owner-occupied units in the 30%–60% AMI group.

- The most common building type is single-unit building, pre-1940 (417) with an energy burden of 7.9%.
- Other common building types with high energy burdens are 2–4-unit buildings built between 1940 and 1959 (63) at 6%; 2-unit buildings built between 1960 and 1979 (82) at 6.4%; and single-unit detached buildings built between 1960 and 1979 (108) at 6.8%.
- 22 buildings with 2-units that were built between 1940 and 1959 have the highest average energy burden of 9.2%.

Appendix 9: Building Type, Age, and Energy Burden for Renter-Occupied Units at 60% to 80% Area Median Income

Average Energy Burden and Housing Count for Renter-Occupied Building Ages and Types at 60%–80% AMI

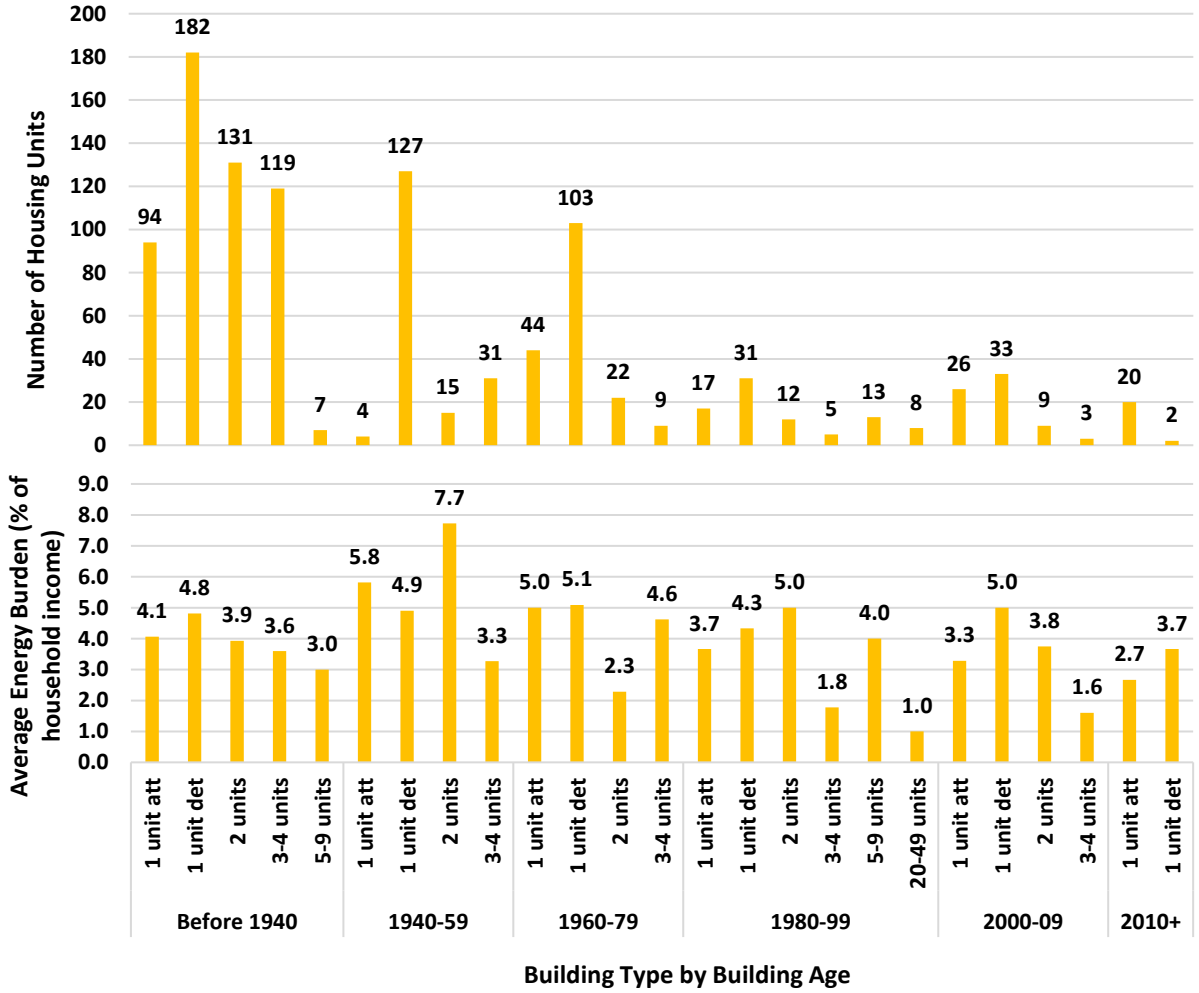


This graph shows cross data for building type and age and energy burden for renter-occupied units in the 60%–80% AMI group.

- The highest energy-burdened building types are 2-unit buildings built between 1980 and 1999 (18) and 3–4-unit buildings built between 2000 and 2009 (41), both at 6%.
- The second highest energy-burdened building type is 3–4-unit buildings built between 1940 and 1959 (143) at 5.8%.

Appendix 10: Building Type, Age, and Energy Burden for Owner-Occupied Units: 60% to 80% Area Median Income

Average Energy Burden and Housing Count for Owner-Occupied Building Ages and Types at 60%–80% AMI



This graph shows cross data for building type and age and energy burden for owner-occupied units in the 60%–80% AMI group.

- The highest energy-burdened building type is 2-unit buildings built between 1940 and 1959 (15) at 7.7%.
- The second highest energy-burdened building type is single-unit attached buildings (4) built between 1940 and 1959 at 5.8%.