Mapping Household Cost Burdens

A study of energy, transportation, water, and housing affordability in Connecticut

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OPERATION FUEL

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Executive Summary

Record inflation, and continued recovery from the economic disruption and health impacts of COVID-19 pandemic, are the backdrop of our 2023 affordability study focusing on energy, housing, transportation, and water costs in Connecticut. Vulnerable populations, including low- and moderate-income families, those relying on fixed incomes, and medically compromised continue bearing the worst impacts. Three years into the pandemic, approaching the end of the federal declaration of emergency, utility bill assistance providers like Operation Fuel continue experiencing overwhelming demand – including from households that never needed support for basic needs before. Rising costs are undue pressure that is both unjust and untenable. Understanding the specific challenges to basic needs affordability in Connecticut is key to developing successful, meaningful strategies to help families catch up and get ahead. Operation Fuel commissioned researchers from VEIC to explore and analyze geographic patterns in the affordability of energy, housing, transportation, and water.

Our analyses use three key metrics:

Burden: spending expressed as a percentage of household income.

Affordability threshold: maximum reasonable level of spending, expressed as a percent (burden) or in dollars (burden multiplied by median income). Each spending category included in the analysis has an affordability threshold.

Affordability gap: any spending in excess of the affordability threshold. Areas with cost burdens above the affordability threshold have affordability gaps. For example, if the affordability gap is $400, the average household in that census tract needs $400 more income, or $400 reduction in costs, to meet basic needs.

Both burden and affordability gap help us to understand where people are facing unaffordable costs and the level of relief required to meet the needs of those who are struggling.

We used publicly available datasets for each category to estimate spending and burden, as well as combined spending on housing (total shelter costs, inclusive of energy and water) and transportation. For the most part, our data reflected the years 2017-2021. Relative to the previous version of this report, which captured years 2015-2019, and was released in 2020,[1] affordability has worsened in some spending categories and stabilized in others.

> **Energy:** The estimated aggregate (total) energy affordability gap across households has increased 37% since the previous report, to $608 million statewide. Approximately 424,000

[1] **https://www.veic.org/Media/Default/documents/resources/reports/Mapping-Household-Energy-and-Transportation-Affordability-Report-Oct-2020.pdf**

households in Connecticut face unaffordable home energy costs. This increase does not account for electricity supply rates that doubled in early 2023 for most CT residents.

Housing: In 2020, approximately a third of homeowners and half of renters faced unaffordable housing costs (housing costs greater than 30% of household income), a marked increase over 2019 when 43% of renters were facing unaffordable housing burdens.

Transportation: Transportation costs dipped in 2020, due to the pandemic which restricted travel, increased rates of telecommuting, and ushered in fare free transit buses. Even so, transportation remains unaffordable in most areas of the state: three quarters of the state's census tracts face excessive transportation burdens. Overall transportation burden has declined since the previous report was released, from 20% to 18%.

Drinking Water: Data on water spending was only available for 73% of the state's census tracts. In most areas with data, water spending is affordable for households earning median income, with notable exceptions in areas of Hartford and New Haven. Nationally, water costs have outpaced inflation for the past 20 years and are one component of rising housing costs.

Combined spending: combined spending on housing (total shelter costs) and transportation was unaffordable in 32% of Connecticut's census tracts, an increase over the 2020 report when less than a quarter of tracts were deemed unaffordable. Combined burden exceeded 60% of median income in towns and cities across the state, including areas of Hartford, New Britain, Waterbury, Danbury, Stamford, Bridgeport, and Meriden.

Each component of our study represents an essential need for each household in Connecticut: everyone needs a stable home, access to energy to heat and cool their homes, access to reliable transportation to get where they need to go, and water to drink. By exploring patterns in affordability, we can understand the magnitude and form of relief needed. We invite you to further explore household affordability across these spending categories through our online interactive maps: **https://arcg.is/1u0n4r3**.

Acknowledgements

Thank you to staff at the Connecticut Department of Health, CT Department of Transportation, Metropolitan District Commission, Connecticut Water, Superpedestrian, and the Public Utilities Regulatory Authority for providing data and review of our analysis. Funding for this study was provided by Operation Fuel, OCC, and Avangrid.

Glossary

Affordability Gap: any spending in excess of an affordable level

Affordability Threshold: maximum reasonable level of spending, expressed as a percent (burden) or in dollars (burden multiplied by median income).

Building Energy Spending: spending on heating, cooling, and electricity, including fuel oil, natural gas, propane, and other fuels.

Census Tract: geographic designation used by the U.S. Census; each tract contains an average of 4,000 people.

Combined Burden: housing costs (total shelter costs) + transportation spending expressed as a percentage of household income.

Cost Burden: spending expressed as a percentage of income

Drinking Water Spending: spending on water used primarily inside the house; drinking water does not include waste water costs.

Housing Cost (Total shelter costs): rent/mortgage, utilities (energy and water), heating fuel, insurance, and association fees.

Transportation Spending: Level of spending required to achieve a minimum level of adequate mobility (access to schools, employment, healthcare, recreation, groceries). Transportation costs include vehicle ownership and maintenance costs, fuel costs, and public transit costs.

Introduction

Cost of living is a pressing issue for low- and moderate-income households in Connecticut, as many of the costs associated with energy, housing, transportation, and water, continue to outpace inflation by many measures. The consumer price index, a key indicator of inflation increased by 7.9% between February 2021 and February 2022,[2] creating acute financial pressure on household budgets. Nationally, electric rates rose 4.3%, the largest increase since 2008.[3] In CT, electric rates rose 12% during this same time frame of 2021-2022.[4] Figure 1 is an analysis done for the American Water Works Association, demonstrating that in recent years, even pre-pandemic, overall household expenditures are increasing more quickly for households in the lowest income quintile than other households.[5] This trend has been exacerbated during the pandemic as the cost of essentials has skyrocketed.[6]

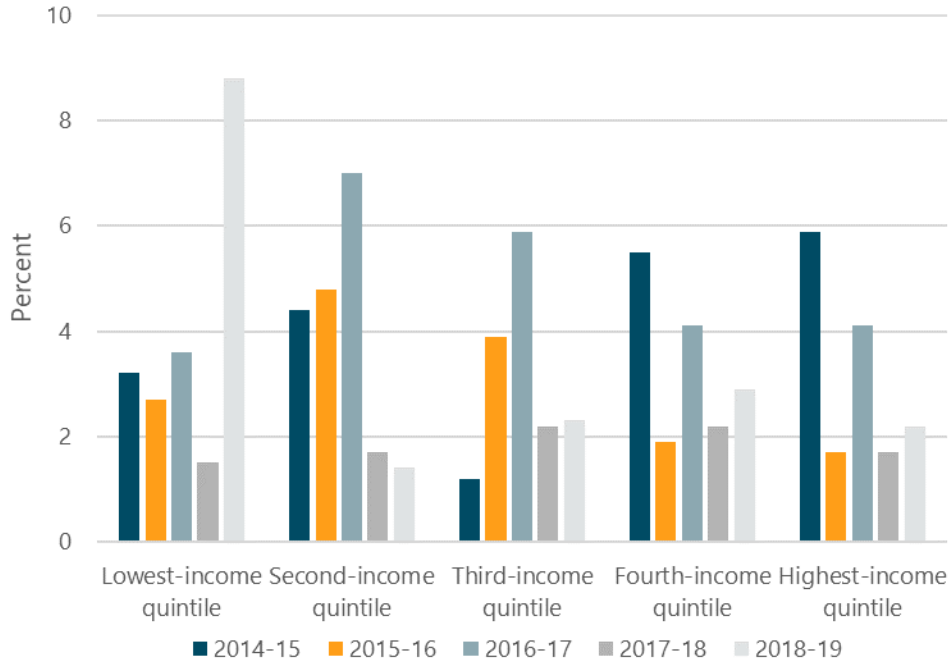

Figure 1. Percentage change in average annual expenditures by income quintiles, 2014-2019. [7]

[2]U.S. Bureau of Labor Statistics: **https://www.bls.gov/cpi/**

[3] Energy Information Administration: **https://www.eia.gov/todayinenergy/detail.php?id=51438#:~:text=In%202021%2C%20the%20average%20nominal,our%20latest%20Electric%20Power%20Monthly**.

[4] Energy Information Administration: **https://www.eia.gov/state/data.php?sid=CT#Prices**

[5] This has become exacerbated during the pandemic- inflation has been highest for essentials, such as food and energy, which comprise a greater proportion of household budgets in lower income quintiles.

[6] Maryland Center on Economic Policy: **http://www.mdeconomy.org/rising-cost-of-essential-goods-disproportionately-affects-low-income-marylanders/**

[7] U.S. Bureau of Labor Statistics, Consumer Expenditure Surveys *in* American Water Works Association. 2021. Improving the Evaluation of Household-Level Affordability in SDWA Rulemaking: New Approaches.

In this report, we use three metrics of affordability:

Burden: spending expressed as a percentage of household income.

Affordability threshold: maximum recommended level of spending, expressed as a percent (burden) or in dollars (burden multiplied by median income). Each spending category included in the analysis has an affordability threshold.

Affordability gap: the difference between actual spending and the affordability threshold. Areas with cost burdens above the affordability threshold have affordability gaps. For example, if the affordability gap is $400, the average household in that census block needs $400 more income, or $400 reduction in costs, to meet basic needs.

This report expands on previous studies of energy and transportation affordability conducted in partnership with CT Green Bank and Operation Fuel (Mapping Energy and Transportation Affordability in Connecticut, Connecticut Energy Affordability Gap),[8] adding an analysis of water affordability. Drinking water and wastewater affordability is a growing concern nationally- rates have increased an estimated 43% over the past decade.[9] Starting in 2018 Operation Fuel added water assistance to its suite of programs, in partnership with Aquarion, Metropolitan District Commission (MDC), and Jewett City. Water and wastewater rates have outpaced inflation for a number of reasons. In the mid 2000's, utilities increased repairs to pipes and water infrastructure. Meanwhile, federal funds available to water utilities have steadily declined since the 1970's and 80's, leaving utilities more dependent on revenue from customers.[10]

In contrast, some aspects of transportation spending declined in 2020, although they rebounded in 2021. According to the Consumer Expenditure Survey, a national survey conducted annually by the US Bureau of Labor Statistics, transportation expenditures declined by nearly 9% in 2020, to an average of $9,800, but then increased by over 11% in 2021.[11] The decline in transportation spending in 2020 is likely almost entirely due to Covid: increased rates of remote working and schooling, and near elimination of recreational travel. Other factors have also impacted transportation spending on the state: buses have been fare-free in Connecticut from April 2022 – 2023 and state lawmakers temporarily repealed the gas tax in 2022, to cushion consumers from increased transportation costs due to global volatility in energy prices. Consumer spending on public transportation rebounded considerably in 2021, from the decline in 2020, but remain

[8] See: **https://www.ctgreenbank.com/wp-content/uploads/2020/11/Mapping-Household-Energy-and-Transportation-Affordability-Report-Oct-2020.pdf** and **https://operationfuel.org/wp-content/uploads/2016/12/2016-ConnecticutHEAG-Final.pdf**

[9] Bluefield Research: US Municipal Water and Wastewater Utility Rate Index, 2021: **https://www.bluefieldresearch.com/research/u-s-municipal-water-wastewater-utility-rate-index-2021/**

[10] Federal funds were intended to be temporary subsidies to help utilities cover initial infrastructure and financing needs to comply with the Clean Water Act, Safe Drinking Water Act and other regulations implemented in the 1970's. See: Patterson and Doyle. 2021. Measuring Water Affordability and the Financial Capabilities of Utilities. American Water Works Association Water Science: **https://awwa.onlinelibrary.wiley.com/doi/epdf/10.1002/aws2.1260**

[11] US. Department of Labor Statistics: **https://www.bls.gov/news.release/cesan.nr0.htm**

below 2019 spending levels.[12] Total spending on transportation tends to increase with household income because wealthier households own more vehicles. Spending burden however, is highest for households in the lowest income quintile: 28%, more than double the national average of 13%.[13]

For the most part, our data reflected the years 2017-2021, across the four spending categories. Relative to the previous version of this report, which captured years 2015-2019, and was released in 2020,[14] affordability has worsened in some spending categories and stabilized in others. Average energy burden statewide has increased from 4% to 5% since the previous report and the number of census tracts with energy burdens that exceed the 6% affordability threshold has increased from 20% to 24%. In addition, the statewide aggregate energy gap has increased by 37%. Transportation burden has decreased, relative to the previous report, as might be expected due to reduced travel in 2020, although many areas of the state continue to face unaffordable costs.

Methods

For each census tract in Connecticut, we calculated the burden for each of the four spending categories: building energy, transportation, housing, and drinking water.

Burden = spending expressed as a percentage of census tract median household income

We also calculated a combined burden that includes total shelter costs (energy, water, housing) and transportation. In addition, we calculated the affordability gap by spending category, for each tract, using the affordability thresholds in Table 1 below. Affordability threshold is expressed as a percentage of household income and refers to the maximum spending burden considered affordable. Affordability varies by tract, depending on each tract's median income.

[12] **https://www.bls.gov/opub/ted/2022/consumer-spending-on-public-transportation-rebounded-in-2021-after-large-decline-in-2020.htm**

[13] U.S. Department of Labor, Bureau of Labor Statistics, Table 1101: **https://www.bls.gov/cex/**

[14] **https://www.veic.org/Media/Default/documents/resources/reports/Mapping-Household-Energy-and-Transportation-Affordability-Report-Oct-2020.pdf**

Table 1. Affordability threshold by spending category.

Spending Category	Affordability Threshold	Source
Drinking Water	2%	EPA[15]
Building Energy	6%	American Council for an Energy Efficient Economy (ACEEE),[16] Connecticut Public Utilities Regulatory Authority[17]
Housing	30%	HUD[18]
Transportation	15%	Housing and Transportation Affordability Index[19]
Combined Housing and Transportation Spending	45%	Housing and Transportation Affordability Index[19]

It is important to note that the affordability thresholds are merely suggestions. They are not exhaustive of monthly costs faced by households, which may also include healthcare and childcare. For instance, the MIT Living Wage Calculator estimates that childcare costs for one child in Connecticut is approximately $10,000, nearly as much as transportation costs for a family with two working adults.[20] It is also important to note that our estimates of burden are based on median income in each tract: **we are approximating the average burden in a tract. Households earning less than median income most likely face higher burdens and affordability gaps across all spending categories.**

[15] American Water Works Association. 2013. Affordability Assessment for Federal Water Mandates: **https://www.awwa.org/Portals/0/AWWA/ETS/Resources/AffordabilityAssessmentTool.pdf**

[16] A 6% affordability threshold is widely used within housing and energy sectors. In 2016, New York State established an Energy Affordability Policy that set the goal of limiting energy costs for low-income utility customers to an average of no more than 6 percent of income. The 6% affordability threshold is based on the assumption that energy costs should not exceed 20% of total shelter costs and total shelter costs should not exceed 30% of income (20% of 30% is 6%); See: **http://www.homeenergyaffordabilitygap.com/** and **https://www.aceee.org/sites/default/files/energy-affordability.pdf**. And **https://www.nyserda.ny.gov//media/Files/Publications/PPSER/Program-Evaluation/2017ContractorReports/LMI-Special-Topic-Rpt---Energy-Burden.pdf**

[17] The goal of Connecticut's new low-income discount residential electric rate is to limit household energy costs of 6% of household income: **https://portal.ct.gov/-/media/PURA/electric/FAQs-Docket-No-17-12-03RE11.pdf**

[18] See: **https://cdn2.hubspot.net/hubfs/4408380/PDF/General-Housing-Homelessness/who-can-afford.pdf** and **https://www.huduser.gov/portal/pdredge/pdr-edge-featd-article-081417.html#:~:text=Keeping%20housing%20costs%20below%2030,to%20be%20housing%20cost%20burdened**. Housing costs are inclusive of rent/mortgage, insurance, HOA fees, utilities (electricity, water, sewer), and fuel.

[19] Inclusive of vehicle maintenance, fuel, insurance, and public transit costs. See: **https://htaindex.cnt.org/about/#methodology**

[20] **https://livingwage.mit.edu/states/09** ; note that the Living Wage Calculator uses the Consumer Price Index to estimate transportation costs.

We gathered demographic data and data on spending from the sources listed below. Unless otherwise noted, all data is presented by census tract.[21] Connecticut contains 833 census tracts.

Housing costs and household income: We used the 2017-2021 American Community Survey (ACS) for tract-level housing costs and median household income. Estimates of housing cost from the ACS are total shelter costs: gross rent and selected monthly owner costs. Total shelter costs include utilities (electricity, gas, water, and sewer), fuels (oil, propane, coal, kerosene, wood), taxes, insurance, and monthly association fees.

Building Energy (fossil fuels and electricity): The Low-Income Energy Affordability Data (LEAD) Tool was created by the U.S. Department of Energy and provides estimates of spending and burden for residential building energy by census tract.[22] The most recent LEAD tool estimates were released in 2020 and are based in large part on 2016 and 2018 ACS data. We updated the 2020 LEAD tool release with fuel prices from 2017-2021 to mirror our housing and income data. The 2020 Energy Information Agency (EIA) Residential Energy Consumption Survey (RECS) was used to inform current fuel use in buildings by end use, and prevalence of energy insecurity. 2020 RECS consumption and expenditure data will be released in 2023.

Transportation: The Housing and Transportation Affordability Index (H&T Index) provides estimates of transportation spending for each census tract. The Index reports the amount of spending on transportation that would be required in a given tract to achieve an adequate level of mobility, including spending on public transit and vehicle purchase, operation and maintenance. An adequate level of mobility is one that allows people to reliably reach employment, shopping, medical appointments, recreation opportunities and school, accounting for travel time and costs.[23] Our analysis uses the most recent release of the H&T that captures 2020 (released December 2022).

We also used 'journey to work' data available through the ACS. The ACS provides information on rates of telecommuting and commute travel mode by census tract. We were able to use this data to explore how Covid impacted telecommuting and transit use in Connecticut.

Drinking Water: There is no comprehensive source of water spending or rates in Connecticut. For our analysis of water spending we used the Water Affordability Dashboard, a tool created by Duke University that provides estimates of water spending and affordability for 58 utilities across 81 municipalities in Connecticut.[24] We converted estimates of water spending by town to census tract. We also met with staff from the Department of Health and local water companies to

[21] Census tracts are a geographic unit developed by the U.S. Census Bureau. Each tract contains between 1,200 and 8,000 people and an average of 4,000 people

[22] **https://www.energy.gov/eere/slsc/maps/lead-tool**

[23] **https://htaindex.cnt.org/**

[24] **https://nicholasinstitute.duke.edu/water-affordability/water-affordability-dashboard/**

access and review all available affordability data. Approximately 23% of Connecticut households are served by private wells.

Social Vulnerability Index

The Social Vulnerability Index (SVI) was developed by the Center for Disease Control (CDC) and is used by the Connecticut Department of Public Health. SVI combines 16 demographic variables including variables related to income, poverty, race, age, employment status, disability, education level, vehicle access, and housing characteristics (see Appendix for more detail).[3] The CDC uses SVI primarily to guide disaster preparedness and response, assuming that some communities are more vulnerable and may need more help in a disaster (or a pandemic). However, the index is based on demographic variables that link directly to social determinants of health and includes consideration of housing and transportation. In addition to planning for resilience, SVI can guide programming and provide additional demographic context beyond income, helping us understand patterns in burden and affordability across the spending categories covered in this report: energy, transportation, housing and water.

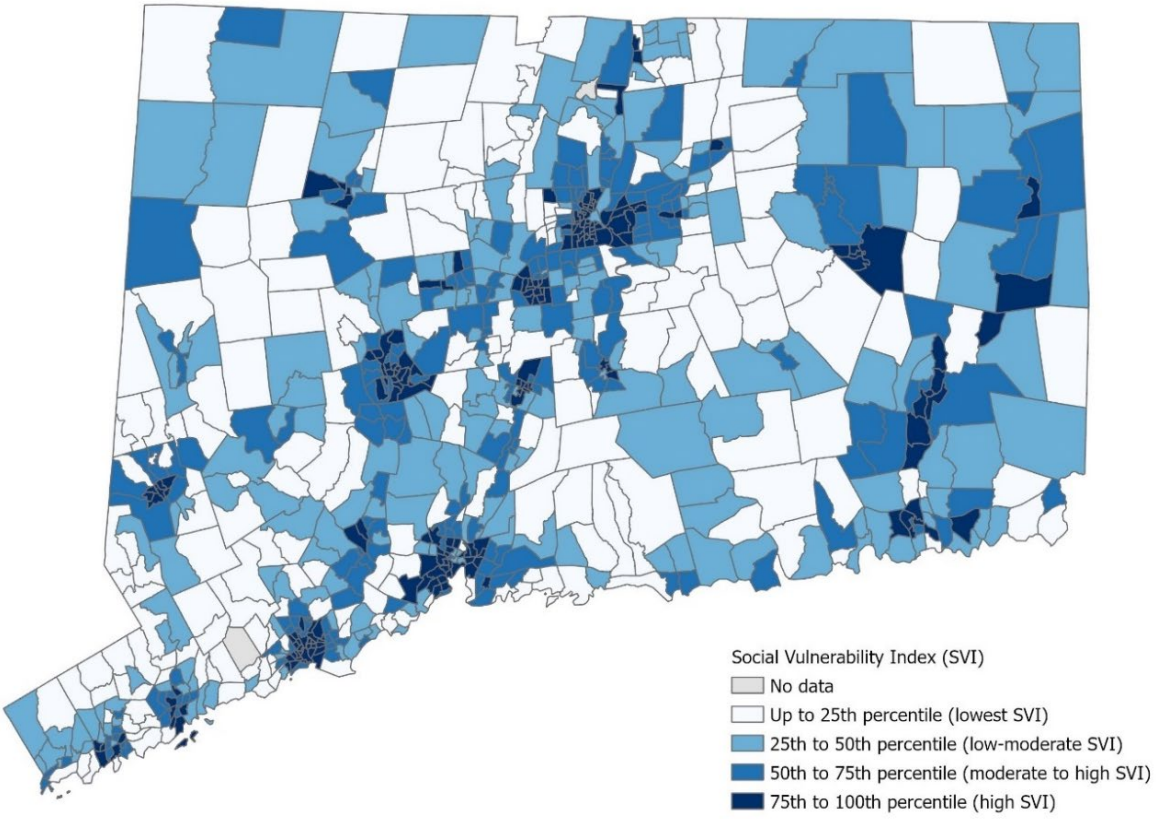

Figure 2. Social Vulnerability Index by census tract.

A lower SVI indicates lower social vulnerability. Each census tract in the US is assigned an SVI and then tracts are ranked against each other within a state and assigned a percentile. We created a map of CT Census tracts by SVI (Figure 2). On the map above, areas in gray are census

tracts that have an SVI less than the 50th percentile, meaning residents are less vulnerable than the statewide average. Areas in blue are census tracts in the 50th-75th percentile (high to moderate SVI) and areas in dark blue are tracts above the 75th percentile (high SVI- these are the most vulnerable tracts in the state).

Energy Affordability

ENERGY AFFORDABILITY BY THE NUMBERS

$608 million: the annual, aggregate statewide energy affordability gap among low-income households.

19%: energy burden among very low-income households.

400,000+: households across Connecticut facing unaffordable home energy costs.

Preliminary data available through the 2020 Residential Energy Consumption Survey (RECS) revealed that rates of propane and oil usage remain high in Connecticut - over 40% of Connecticut homes rely on these unregulated fuels for primary heating, similar to the levels seen in other New England states. Including natural gas, nearly 80% of Connecticut homes rely on fossil fuels for primary heating.[25] RECS data for Connecticut also showed relatively high rates of energy insecurity and power outages in New England, second only to Maine.

An estimated 11% of homes in the state are all-electric, including homes that use electric resistance heat. These households experience limited eligibility for arrearage and assistance programs. Paid for by natural gas customers through a bill charge, these funds can only be used to assist gas customers. There is currently legislation under consideration by Connecticut General Assembly (HB 6724) that would extend Winter Protection Program eligibility and the shutoff moratorium, protecting consumers from losing access to heat and electricity when they are struggling to pay their bills.

Statewide, average household spending on building energy (including electricity, natural gas, propane, and other fuels) is $3,800 annually. Of this nearly $3,800, approximately half is spending on electricity, and half is spending on heat. Energy prices are increasing across fuel types in Connecticut:

- Electricity and natural gas prices increased 9% between 2016 and 2021 and an additional 12% in 2022.[26]
- Fuel prices increased 14% between 2016 and 2021.[27]

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[25] RECS is a national survey conducted by the U.S. Energy Information Administration: **https://www.eia.gov/consumption/residential/index.php**

[26] In early 2023, electricity rates nearly doubled for many Connecticut residents: this latest price increase is not captured in our analysis.

[27] Energy Information Administration State Energy Portal: **https://www.eia.gov/state/seds/seds-data-complete.php?sid=CT**

- Natural gas prices, which increased 42% between January of 2021 and December of 2022, have been notably volatile in the past decade (Figure 3). Connecticut's electric grid relies heavily on natural gas: rising natural gas prices translate to higher electricity prices for consumers.

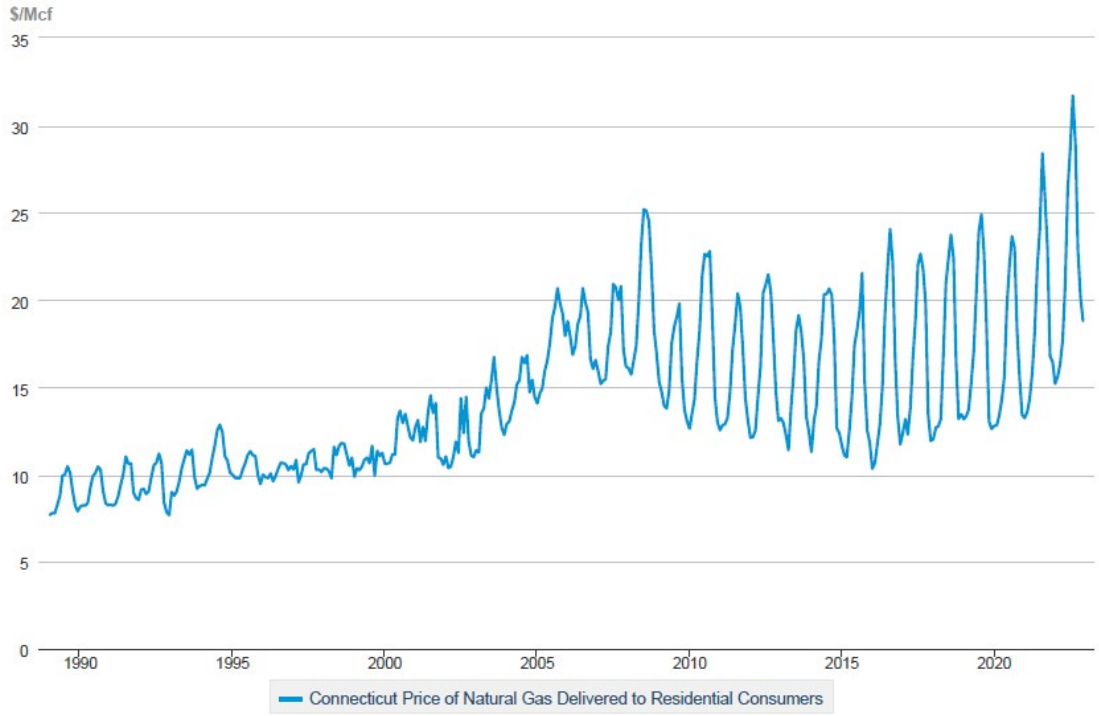

Figure 3. Residential natural gas prices ($/Mcf), 1988-2022.[28]

The LEAD tool provides estimates of energy spending and burden by income bracket and federal poverty level. Energy spending increases with income bracket while burden declines dramatically (Figure 4). We estimate that Connecticut households earning less than 60% of statewide median income have an energy burden of 13% and an annual affordability gap of over $1,400.

[28] EIA: **https://www.eia.gov/dnav/ng/ng_pri_sum_a_EPG0_PRS_DMcf_m.htm**

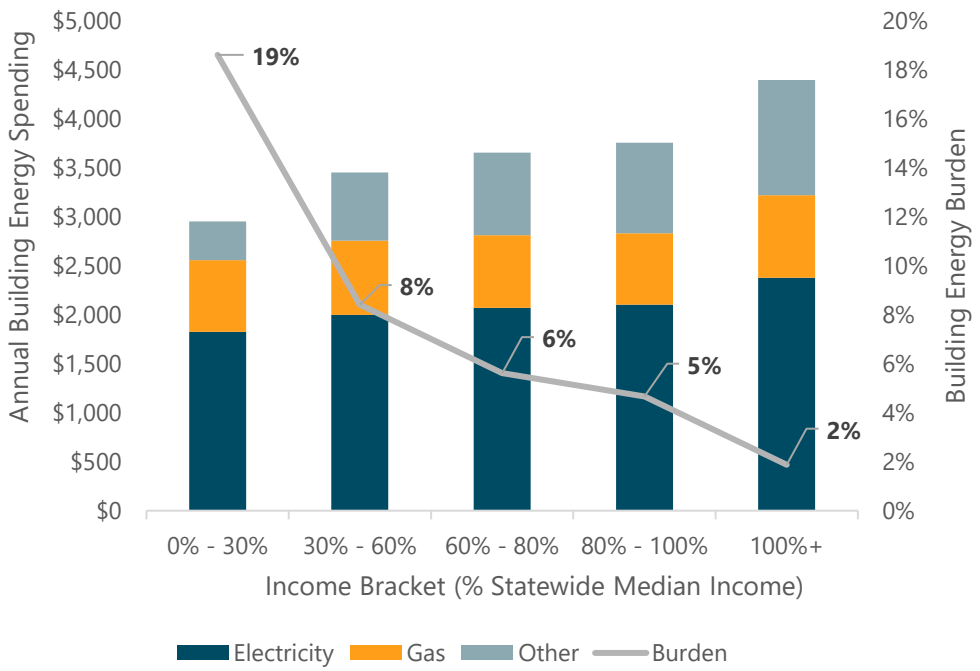

Figure 4. Building energy spending and burden by income bracket.

Based on inflation-adjusted estimates of energy spending by income bracket, **the aggregate affordability gap statewide, is $608,949,000, an increase of 37% over the 2020 aggregate gap,** estimated to be $440 million. Given the recent increase in electricity prices, in 2023, this gap presumably will be even greater. This affordability gap is carried by households earning less than 60% of the statewide median income, where average cost burden is 8% to 19% (Table 2).

Table 2. Aggregate statewide building energy affordability gap by statewide median income bracket.

Income Bracket (SMI)	Household Energy Burden	Annual Household Affordability Gap	# Households	Annual Statewide Affordability Gap
0% - 30%	19%	$2,002	184,394	$369,261,285
30% - 60%	8%	$992	241,616	$239,688,575
60% - 80%	6%	$0	145,881	
80% - 100%	5%	$0	136,771	
100%+	2%	$0	658,711	
			Total	**$608,949,000**

Using federal poverty guidelines, the aggregate energy affordability gap statewide is $524 million (an increase of 31% from the 2020 report when we estimated an aggregate gap of $398 million using FPG). It's important to note that in the 200% to 400% FPG income bracket, energy burden is almost exactly 6%, meaning a many of these households may in fact be exceeding the 6% affordability threshold and facing unaffordable energy costs, especially given the recent increases in electric rates.

Table 3. Statewide aggregate building energy affordability gap by Federal Poverty Guidelines.

Income Bracket (FPG)	Household Energy Burden	Annual Household Affordability Gap	# Households	Annual Statewide Affordability Gap
0% - 100%	26%	$2,267	121,952	$276,485,395
100% - 150%	12%	$1,576	85,218	$134,317,255
150% - 200%	9%	$1,220	93,140	$276,485,395
200% - 400%	6%	$0	330,002	
400%+	2%	$0	737,062	
			Total	**$524,421,047**

We identified 205 tracts with excessive building energy burdens, over a quarter of all tracts for which we had energy burden data. These tracts, which appear red on the maps below, span both rural and urban areas of the state (Figures 5 and 6). An energy affordability gap is present in census tracts where the energy burden exceeds the 6% affordability threshold. Some of the highest energy burdens and affordability gaps are present in Hartford (Northeast, Upper Albany) Bridgeport (East Bridgeport, Cedar Creek Harbor), Waterbury (downtown), and New Haven (Fairhaven/Quinnipiac Meadows), where energy burdens were consistently more than double the 6% affordability threshold and annual affordability gaps exceeded $2,000.

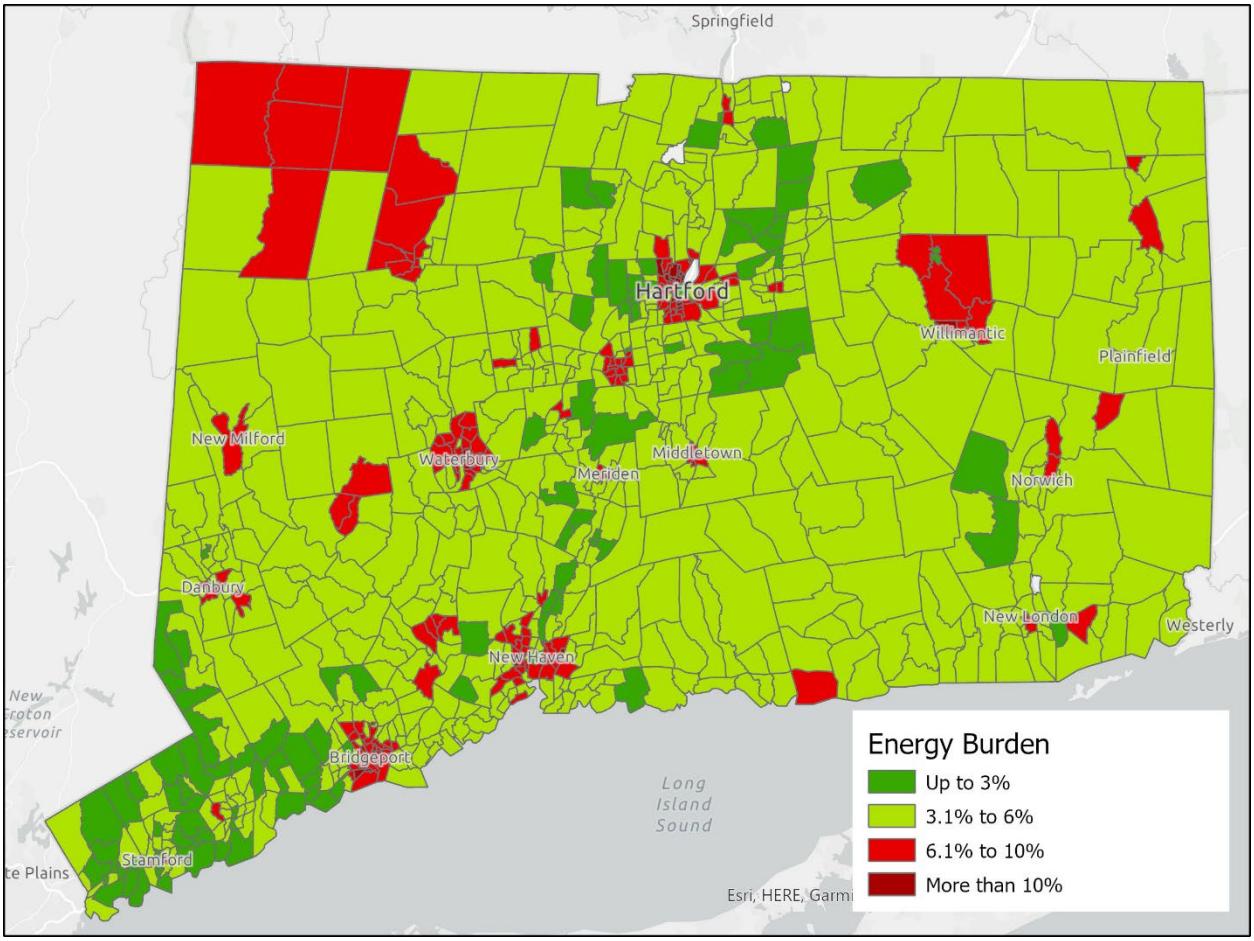

Figure 5. Building energy burden by census tract.

The state's most highly burdened tracts are also some of the most socially vulnerable. Where energy burden exceeded 10% social vulnerability tended to exceed the 90th percentile statewide in at least one of the four SVI categories, often more than one. Social vulnerabilities varied among tracts, from socioeconomic status (e.g., income, unemployment rate, education level), to household characteristics (disability status, age, English language proficiency) to racial and ethnic minority status, to housing type and transportation.[29] While energy burden can help us understand the magnitude of relief that is needed to improve affordability, SVI can help to inform effective and empowering program delivery.

[29] There are four categories of social vulnerability used in the SVI: socioeconomic status, household characteristics, racial and ethnic minority status, housing type and transportation.

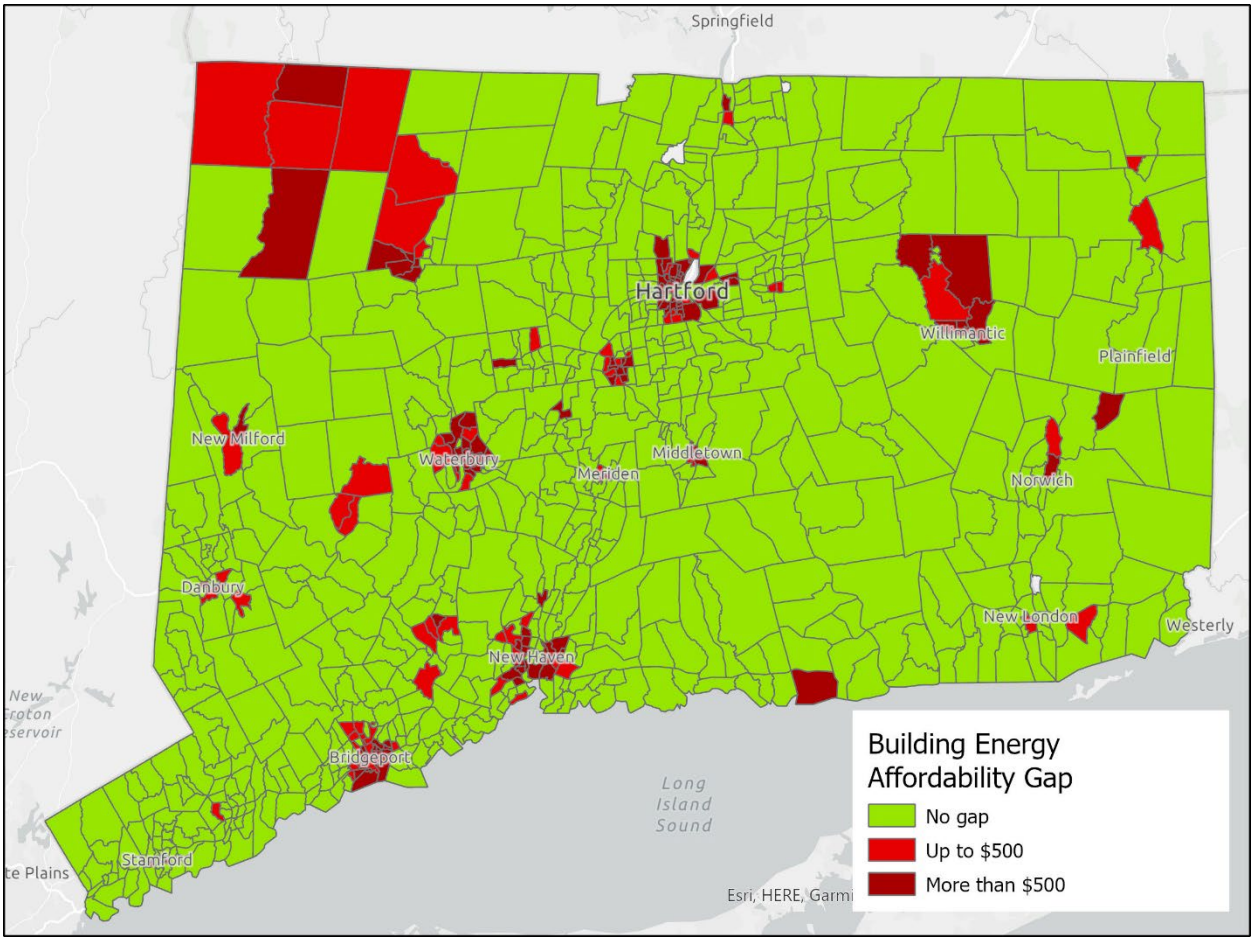

Figure 6. Building energy affordability gap by census tract.

Energy Assistance Programs

Tiered utility rates are among the most equitable and transformative means of energy assistance, in large part because households do not need to be behind on their bills to qualify. In the fall of 2022, the Connecticut Public Utilities Regulatory Authority approved tiered and deeply discounted income-eligible residential electric rates, using 60% Statewide Median Income and 160% Federal Poverty Guidelines as eligibility guidelines.[30] In our previous report we noted that the combination of energy efficiency upgrades and solar generated enough savings to effectively fill the energy affordability gaps for low-income households. However, this relief is only available to those who can access the technologies: thus far, deployment has greatly lagged behind need, and in the case of solar, is available primarily to homeowners.[31] In addition,

[30] **https://www.dpuc.state.ct.us/2nddockcurr.nsf/8e6fc37a54110e3e852576190052b64d/cd198950921e4b93852588e000512853/$FILE/171203RE11-101922.pdf**

[31] Approximately 4,400 households have participated in Solar for All, solar program for low and moderate income homeowners: **https://www.ctgreenbank.com/strategy-impact/societal-impact/successful-legacy-programs/solar-for-all/**

direct bill assistance is available to qualifying households. In 2022, LIHEAP served 78,146 households, a 17% increase over 2021.

Weatherization is a key tool to reduce energy burden for low-income households. In 2011, Connecticut enacted a law establishing a goal of weatherizing 80 percent of homes by 2030.[32] The state does not have a standard definition for "weatherization," nor a uniform platform to track progress toward this goal. The Connecticut Weatherization Assistance Program (WAP) reports weatherizing 515 homes between 2017 and 2021, with lifetime savings of over $7.2 million dollars.[33] The WAP aims to weatherize 260 homes in 2023. However, over 400,000 households statewide meet the WAP income eligibility requirements and 80% of homes in Connecticut equates to over a million - meaning a huge gap exists between the 80% goal and implementation to date. For those households that can access weatherization services, the Connecticut Green Bank's Smart-E Loans program provides low-interest loans.

Homes with structural barriers or mold issues are deferred from weatherization services, which excludes much of the older, renter-occupied housing in the state. Residential Loan Program tries to address these challenges by allowing up to 25% of loans to be for health and safety measures. In 2021, the legislature passed a bill to establish the Residential Energy Preparation Services (REPS) program, managed by the Department of Energy & Environmental Protection (DEEP), which began serving owner-occupied, single-family housing in 2022.

In the 2020 report we noted that for many low-income households, the affordability gap can effectively be closed by efficiency upgrades and solar PV. Solar programs previously run by the Connecticut Green Bank (including Residential Solar Investment Program and Solar for All) ended in 2021. Solar incentives and net metering are no longer offered. Instead, Eversource offers a feed-in tariff (started in January 2022), which has a similar value to consumers as the incentives that were previously available.

In 2022, the CT General Assembly expanded the state's Shared Clean Energy Facility (SCEF) program, providing bill credits through community solar and fuel cell projects to LMI consumers. A new battery storage program is available through the Green Bank, with two components: one with upfront assistance for consumers, including low-cost financing, and a performance-based program.[34] Operation Fuel is partnering with the Green Bank to investigate low- and moderate-income customer attitudes toward battery storage and ensure deployment rates are robust in vulnerable communities. Although the focus of the program is resilience, rather than cost-savings, access to new technologies is a key component of energy equity.

[32] **https://www.cga.ct.gov/2011/act/pa/pdf/2011PA-00080-R00SB-01243-PA.pdf**
[33] **https://portal.ct.gov/-/media/DEEP/energy/weatherization/PY22-WAP-State-Plan.pdf**
[34] **https://www.ctgreenbank.com/home-solutions/energy-storage-solutions/**

Housing Affordability

More than a third of homeowners are housing burdened (spending more than 30% of household income on housing costs).

Nearly half of renters are housing burdened; this is an increase from 2019 when 43% of renters were housing burdened.

Energy affordability is one component of housing affordability. Building energy costs generally comprise about 3.5% of household income, nationally, although they are often included in monthly rent. Although housing affordability is not the focus of this study, we include it because it is inextricably linked with energy, transportation, and water affordability. We used two datasets to understand housing affordability in Connecticut:

- the 2020 American Community Survey (ACS), which provides statewide estimates of gross rent and mortgage costs, and
- the 2017-2021 Five Year ACS, which provides tract-level estimates of housing costs; the Five Year ACS provides a finer geographic resolution but less insight into impacts of Covid on housing costs.

According to the 2020 ACS, median gross rent in the state was $1,217, and 31% of households rent.[35] More than a third of homeowners statewide are housing burdened (spending more than 30% of household income on housing), and nearly half of renters are burdened, an increase from 2019 when 31% homeowners and 43% renters were burdened. More than a quarter of renters were severely cost-burdened in 2020, spending more than 50% of household income on housing. [36] In areas of Fairfield, Middlesex and Hartford Counties, rent increased an estimated 5-10% in 2020, while rents in areas of New Haven County increased by 10-20%.[37]

[35] 2020 ACS estimates are only available statewide, not by census tract.
[36] Joint Center for Housing Studies at Harvard University: **https://www.jchs.harvard.edu/son-2022-cost-burdens**
[37] JCHS: **https://www.jchs.harvard.edu/state-nations-housing-2022**

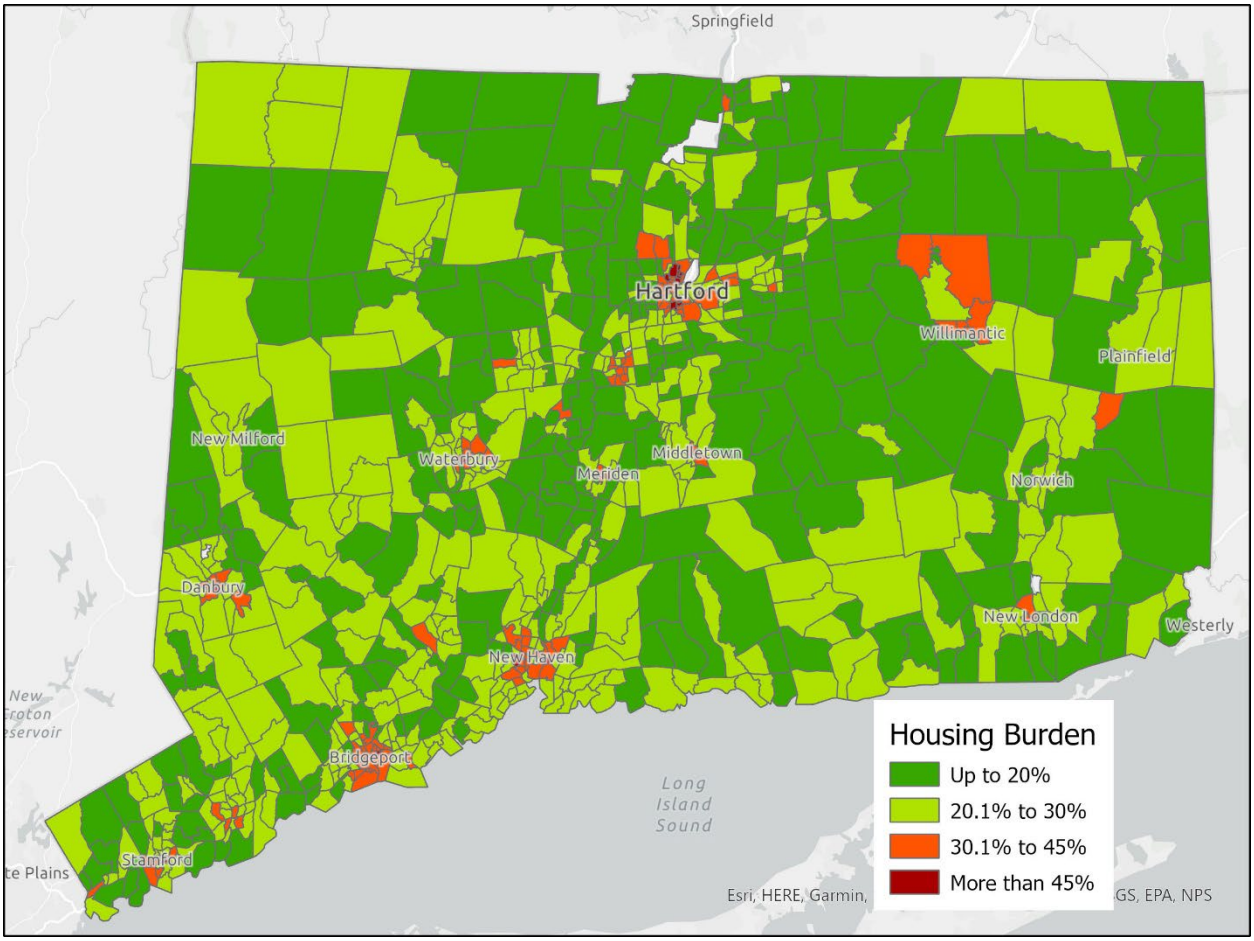

Figure 7. Annual housing burden by census tract.

Tract-level housing data for years 2017-2021 reveal an average housing burden of 24% across the state's census tracts. Housing burden exceeds the 30% threshold in over 150 census tracts (Figure 7). **We observed the highest burden in the Clay Arsenal neighborhood in Hartford: 70% of median household income.** High housing burdens are also present in the Waterside and Cove Side areas of Stamford, the Eastside of Bridgeport and the West River and Fairhaven areas of New Haven. We also noted high segregation of renters and homeowners: the majority of census tracts in Connecticut are dominated almost exclusively by either renters or homeowners.

Housing affordability gap refers to the difference between affordable housing costs and those that exceed the 30% affordability threshold. The highest housing affordability gap (over $9,000 annually) was present in a census tract on the East Side of Stamford. In this tract, median household income is approximately $42,000 annually, and housing costs are estimated to be over $2,000 each month.

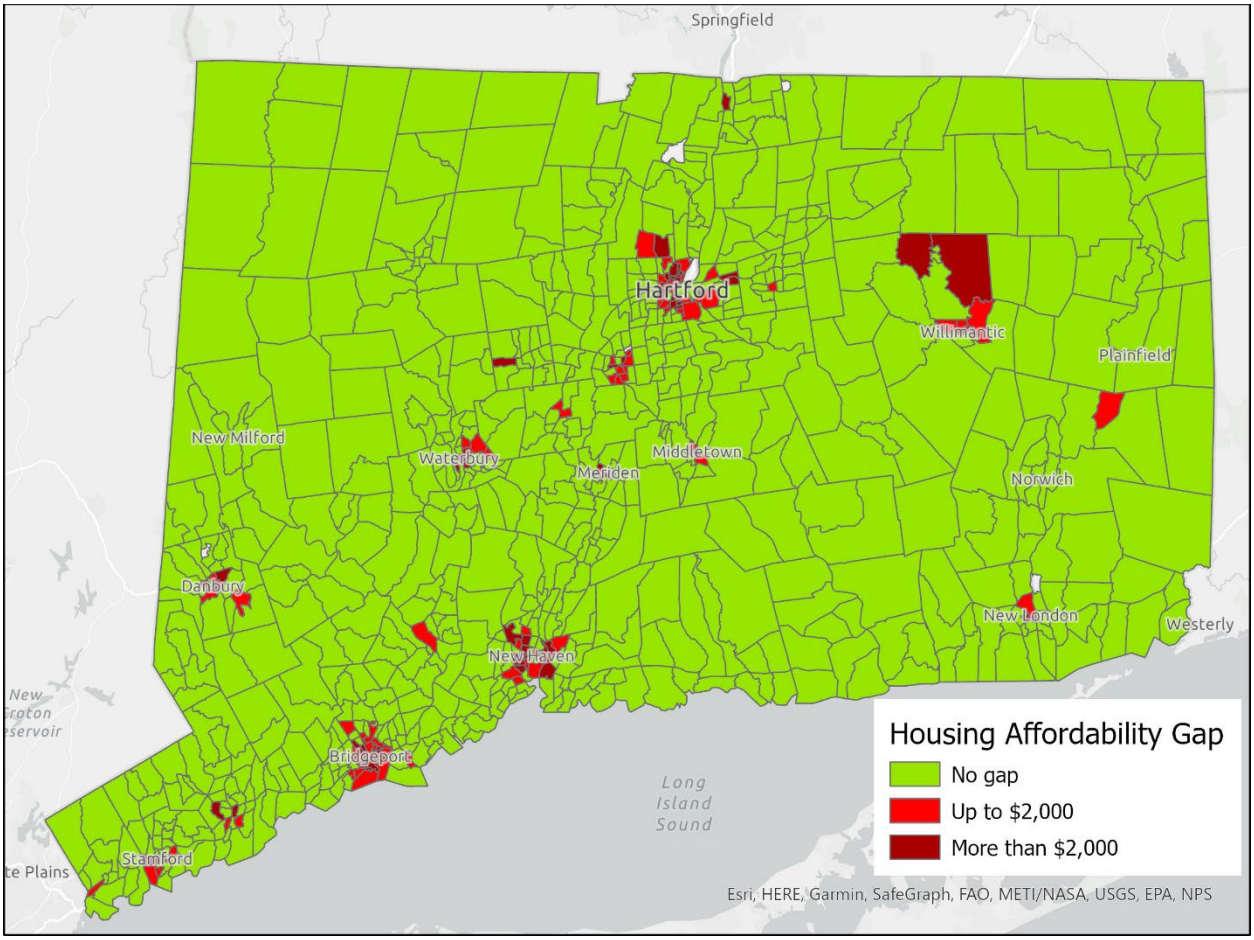

Figure 8. Annual housing affordability gap by census tract.

Housing Assistance Programs

Connecticut has a variety of housing assistance programs, including UNITE CT, which provides rental assistance, the Department of Housing's Rental Assistance Program, and the Connecticut Housing Finance Agency, which provides emergency housing assistance to homeowners. In addition, the US Department of Housing and Urban Development provides Section 8 rental vouchers. Most programs have lengthy waiting lists. The Rental Assistance Program has closed its waitlist because demand exceeds available assistance so dramatically.[38] Like many places in the US, Connecticut's housing supply is severely constrained and many towns have no

[38] **https://portal.ct.gov/DOH/DOH/Programs/Rental-Assistance-Program**

affordable housing. The state is predicted to lose approximately 5,000 existing affordable housing units over the next five years, due primarily to expiration of the Low-income Housing Tax Credit,[39] exacerbating the existing crisis. The state lacks a central agency to regulate housing and assistance can be challenging to access, even for those who qualify.

[39] See: **https://ctmirror.org/2023/04/17/ct-affordable-housing-unit-preservation/**

Transportation Affordability

BY THE NUMBERS

$14,408: annual transportation costs for the average household in Connecticut

80%: transportation costs that are related to private vehicle ownership.

100%: census tracts in the state that require a vehicle to achieve adequate mobility.

75%: census tracts that exceed the transportation affordability threshold.

For decades, transportation has been the second highest expenditure for households in the US, surpassed only by housing costs. In 2020, transportation spending declined due to reduced travel and commuting in the midst of the COVID-19 pandemic. According to the Consumer Expenditure Survey, nationally, households spent an average of $9,800 in 2020 on transportation, 16% of total household expenditures in 2020. Households in the bottom income quintile spend nearly double this percentage: 29% of expenditures are transportation-related.[40] Some transportation costs are increasing, however: in 2021 new vehicle prices increased 12% and used vehicle prices 35%.[41]

In our previous analysis of transportation affordability in Connecticut we noted that in nearly all areas of the state, a personal vehicle is needed in order to maintain a minimum level of mobility. Even in the state's densely populated areas, transit access is not robust enough to effectively replace a vehicle, especially considering the extra time burden of transit trips compared to private vehicle trips.

The pandemic significantly disrupted travel patterns in the state. Especially during the early days of the pandemic, vehicle miles traveled (VMT) declined, and transit use plummeted,[42,43] although not uniformly across modes. In Connecticut, train ridership dropped about 90%, while bus

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[40] See: **https://data.bts.gov/stories/s/ida7-k95k**

[41] Bureau of Labor Statistics: **https://www.bls.gov/news.release/cpi.nr0.htm**

[42] Federal Highway Administration Monthly Estimates: **https://www.fhwa.dot.gov/policyinformation/travel_monitoring/20jultvt/page6.cfm**

[43] See: **https://ctmirror.org/2021/09/08/bus-ridership-crawls-back/** , **https://portal.ct.gov/-/media/DOT/documents/dptransportation/CTfastrak-ridership-graph-0421.jpg?sc_lang=en&hash=02AA72B062C2FF041F7ED0E4DCD8D3AE**; https://www.journalinquirer.com/connecticut_and_region/public-buses-continue-routes-despite-lack-of-passengers-during-pandemic/article_b9bbe2c0-72cd-11eb-99f4-af403b9fffac.html

ridership only dropped 50%. Bus riders tend to be lower-income, essential workers who did not have the option of remote work.[44]

The H&T Index provides estimates of transportation costs for households earning area median income (AMI) and those earning 80% of area median income.[45] Average annual transportation costs statewide are $14,408 for a household earning AMI and nearly identical for a family earning 20% less: $13,785 for a family earning 80% of AMI. For instance, in the Elm Hill section of Newington, the median income is close to the statewide median income of $83,000. Table 4 shows varying estimates of transportation burden and affordability gap for households earning AMI in Elm Hill and those earning 80% AMI.

Table 4. Transportation costs and burden in the Elm Hill section of Newington.[46]

	Household earning AMI	Household earning 80% AMI
Household Income	$83,272	$66,618
Transportation Costs	$14,561	$13,620
Burden	17.5%	20.4%
Affordability Gap	$2,070	$3,627

For both of these household types, the bulk of transportation costs (nearly 80%) is made up of costs associated with vehicle ownership and operation. Across both household types (those earning AMI and those earning 80% of AMI), average vehicle ownership is 1.8 per household statewide. There were no census tracts in the state where an adequate level of mobility could be achieved without at least one vehicle (an adequate level of mobility is achieved when employment, shopping, medical care, and school can be reliably reached). Average transportation burden statewide is 18.6% for households earning AMI and 22.2% for households earning 80% AMI. Estimates of vehicle miles traveled were highest in rural areas (over 25,000 miles annually in Canterbury) and lowest in urbans areas (only 6,938 in Hartford).

[44] **https://ctmirror.org/2022/09/26/ct-bus-free-fare-program-riders-transit-transportation-gas-prices-inflation/**

[45] Transportation spending is available for 830 of Connecticut's census tracts.

[46] Census Tract 4942.01

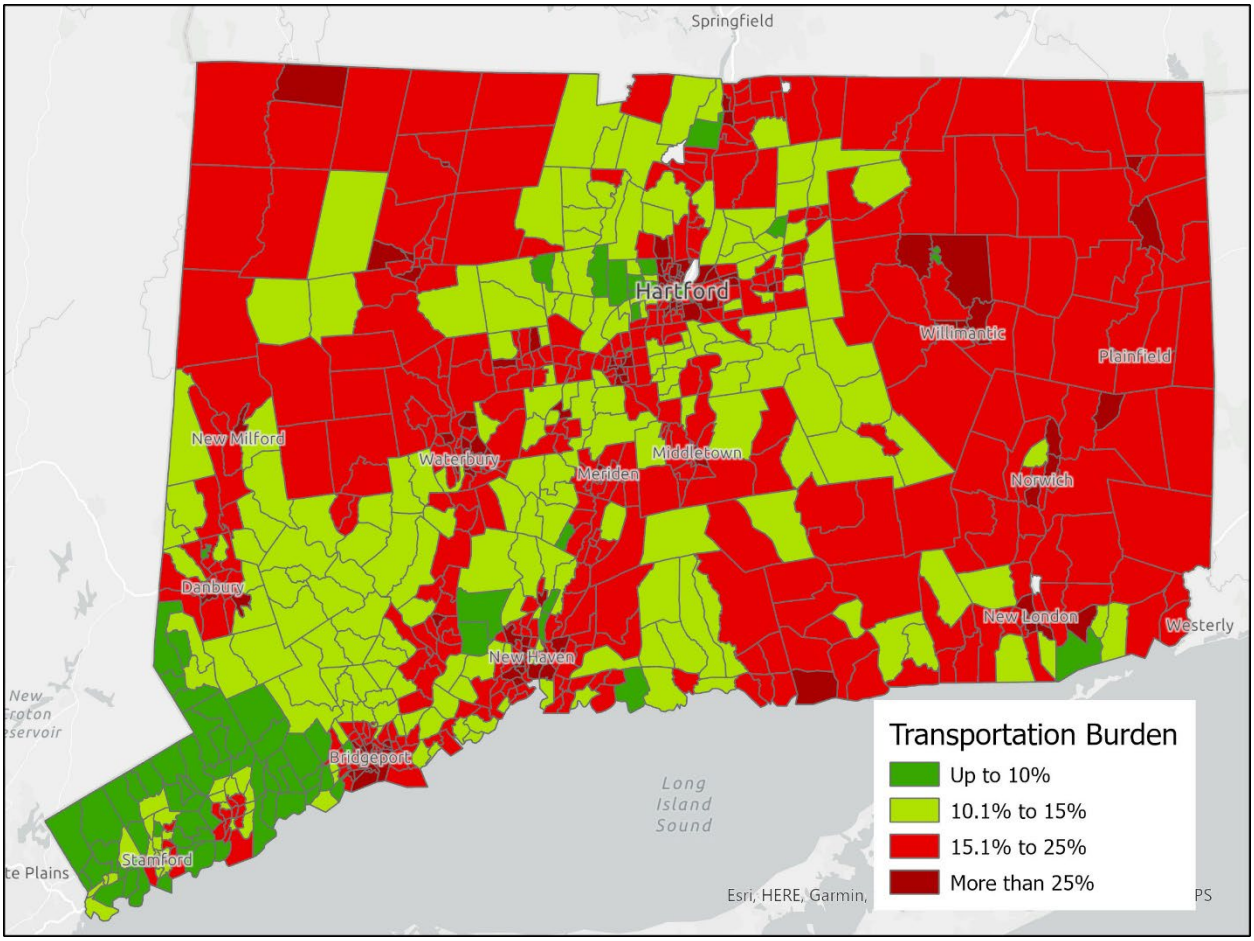

Figure 9. Transportation cost burden by census tract.

Of the 830 census tracts for which transportation costs estimates are available, over three quarters (650 tracts) have transportation cost burdens that exceed a 15% affordability threshold (Figure 9). Eighty-four census tracts have transportation cost burdens that are double the affordability threshold, comprising an estimated 30% of household income. The highest transportation burden is in downtown Waterbury (67%), driven by low median income of approximately $12,000 and transportation costs of over $8,000 to maintain a basic level of mobility. Census tracts with affordable transportation costs are characterized by high median incomes and moderate/average estimates of vehicle miles traveled.

It's important to remember, that the Housing and Transportation Affordability Index estimates what households would *need* to spend to achieve adequate mobility, not necessarily what they *are* spending. Households that lack the funds for reliable transportation are likely to miss medical appointments, and experience limited access to employment, recreation, and educational opportunities. By essentially privatizing our transportation system through use of personal vehicles, we limit people's ability to fully participate in society and create a crippling financial burden for households across income levels.

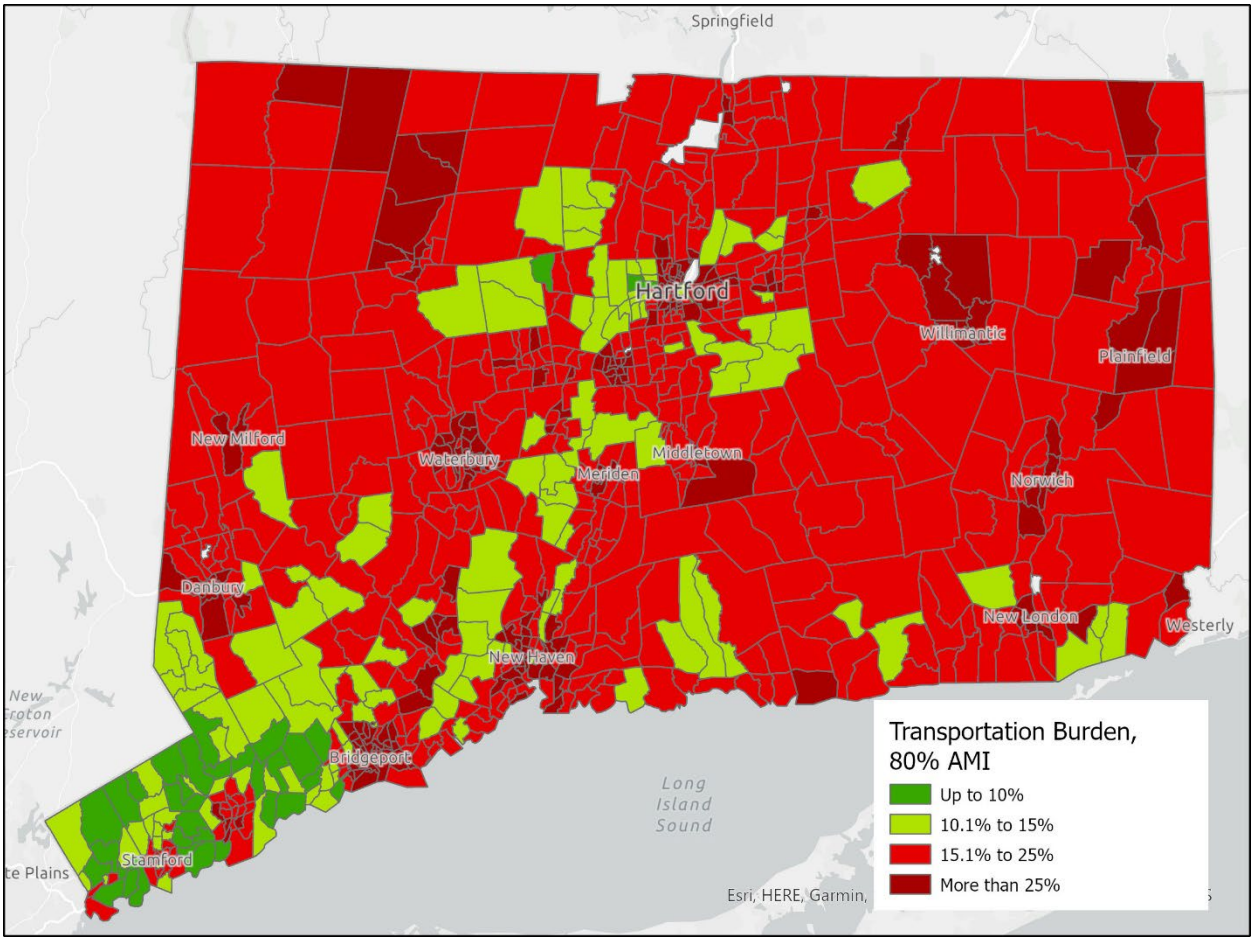

Figure 10. Transportation Burden, households earning 80% Area Median Income.

Among households earning 80% of AMI and below, transportation burden is even more pronounced and exceeds the 15% affordability threshold in 760 census tracts (Figure 10).

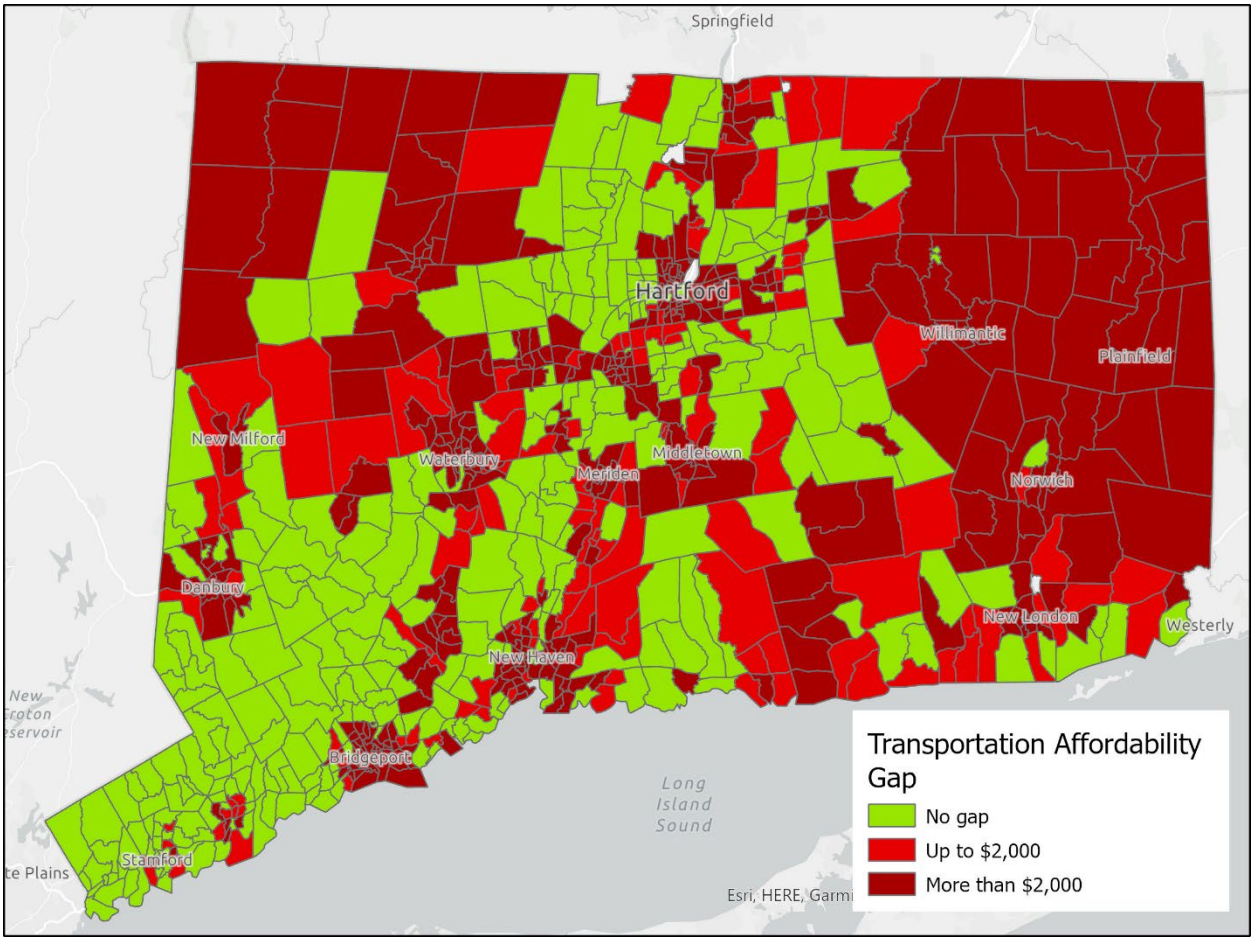

Figure 11. Annual transportation affordability gap by census tract.

Transportation affordability gap provides another lens of affordability. Among households earning AMI, we observed the largest transportation affordability gaps in the Quinnipiac Meadows section of New Haven, central Southington, and central Danbury. In these tracts, transportation affordability gaps exceeded $9,000 annually (Figure 11).

Telecommuting and Transit Use

Two key means of reducing transportation cost burden are through telecommuting and robust public transit. According to the 2020 ACS, 16% of workers in Connecticut telecommuted, up from 6% in 2019. The bulk of telecommuting occurs in the southeastern portion of the state (Fairfield County), in census tracts with median incomes well-above the statewide median. This portion of the state also has high rates of transit ridership and telecommuting, further driving down transportation cost burden. Rates of commuting via transit were also high in Hartford and parts of New Haven. Fairfield County is served by one of Connecticut's six rail lines and train is

the predominant mode of commuting, while in Hartford, bus is the predominant form of transit.[47]

We performed a hotspot analysis in ArcGIS to explore how rates of commuting via transit and telecommuting cluster by census tract. Hotspot analyses identify clusters of tracts that are significantly above or below the statewide average. In Figure 12, we see that the southeastern portion of the state (Fairfield County), the Hartford metro region, and New Haven are transit hotspots: clusters of tracts where transit use is consistently higher than the statewide average. In contrast, areas surrounding Hartford (likely home to many of Hartford's commuters) are prominent cold spots- areas where transit use for commuting is significantly lower than the statewide average. Gray/neutral census tracts are those with average rates of commuting via transit.

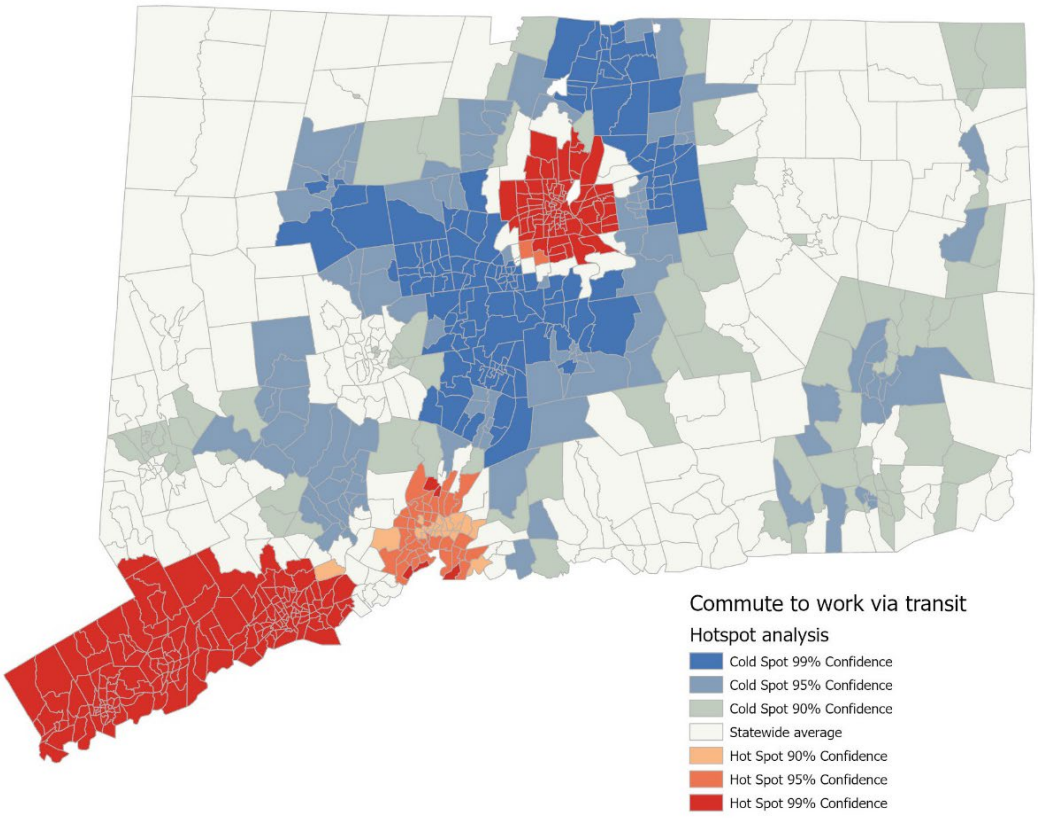

Figure 12. Hotspot analysis of commute to work via transit by census tract.

[47] 2022 CTDOT Service and Fare Equity Analysis: **https://portal.ct.gov/-/media/DOT/documents/dptransportation/Draft_CTDOT-Rail-and-Bus-SAFE-4-27-2022.pdf**

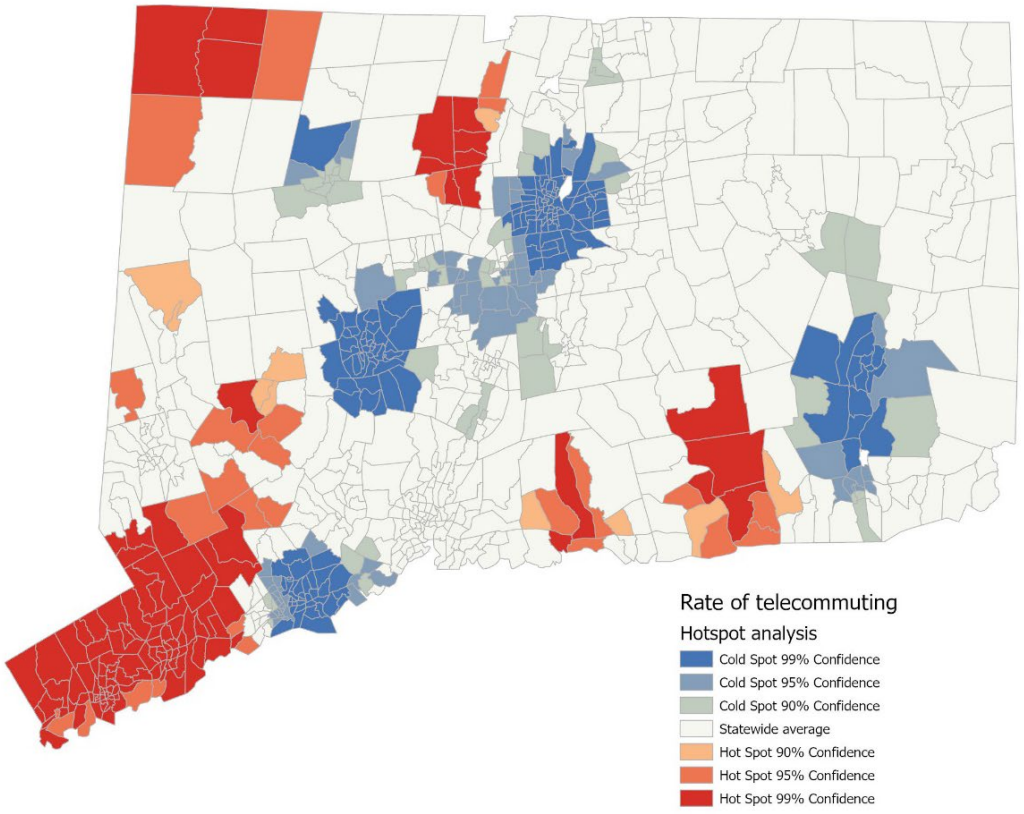

Figure 13. Telecommuting by census tract hotspot analysis.

Fairfield County also emerges as a hotspot for telecommuting (Figure 13). In contrast to transit use, Hartford and New Haven are cold spots for telecommuting: these are clusters of census tracts where the rate of telecommuting is significantly less than the statewide average and where car ownership rates are lower. Telecommuting hotspots are present in Litchfield County (Salisbury, Canaan, North Cannan), Hartford County (Canton, Simsbury, Avon area) and in the Lyme, Old Saybrook and parts of East Haddam in New London and Middlesex Counties. Southeastern Connecticut has particularly limited bus and train access making private vehicles necessary for an adequate level of mobility.

Transportation Programs

Connecticut offers a range of electric vehicle (EV) and micromobility programs, both of which have the potential to reduce household transportation burden through reduced fuel costs and reliance on personal vehicles. The Connecticut Hydrogen and Electric Automobile Purchase Rebate (CHEAPR) program provides incentives for new and used EV and fuel cell vehicles (almost no hydrogen rebates have been granted). CHEAPR has issued over 8,000 incentives since the program was established in 2015. An enhanced incentive for low-income households became available in 2021. As of April 2023, 42 low-income rebates have been issued. [48] As a rebate, the CHEAPR incentive may be more useful to low and moderate income households than tax credits (e.g., the federal EV tax credit), although rebates require that program participants have funds to finance or purchase the full vehicle price.

The Connecticut Department of Energy and Environmental Protection (DEEP) also provides a ratepayer funded residential EV charger incentive.[49] The Connecticut Public Utilities Regulatory Authority requires utilities to offer incentives for EV charging infrastructure.[50] In addition, utilities such as Norwich Public Utilities, Groton Utilities offer EV incentives. These incentives are funded by ratepayers through a charge on electric bills and managed by utilities.

DEEP plans to offer a $500 tax rebate for purchase of qualified e-bike through the existing CHEAPR program and up to $1,000 for low-income residents. [51] A statewide E-bike incentive program was approved in May 2022; the agency plans to begin offering the incentives some time in 2023. E-bikes, and other forms of electrified transportation, like e-scooters, can be a transformative way to increase mobility without substantially increasing households' transportation cost burden.

Transit and Micromobility Programs

Like many transit providers nationwide, much of transit in Connecticut went fare-free with the pandemic. State run transit and paratransit buses in Connecticut were fare-free through April 1, 2023.

A number of non-profits offer subsidized bicycles to qualified individuals, including New Haven Bradley Street Bicycle Co-op, Hartford BiCi Co., Bike New London, Northeast Community Cycles. In addition, cities across the state have launched a range of microtransit pilots and programs, including:

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[48] **https://portal.ct.gov/DEEP/Air/Mobile-Sources/CHEAPR/CHEAPR---Program-Statistics**

[49] **https://portal.ct.gov/PURA/Electric/Office-of-Utility-Programs-and-Initiatives/Clean-Energy-Programs/Electric-Vehicle-Charging-Program**

[50] See PURA Docket No. 17-12-03RE04.

[51] **https://portal.ct.gov/DEEP/Air/Mobile-Sources/CHEAPR/Electric-Bicycles** ; see [will be up to $1000 for lower-income residents – DEEP CHEAPR board meeting 3/16/23, slides should be up on website]

- **SEAT Stonington HOP Microtransit** – Southeastern Transit District is piloting a microtransit in the area formerly served by a lightly used bus route.
- **SEAT New London Smartride Microtransit** - Service within the city of New London.
- **CT Rides Rewards App -** Users receive gift cards and coupons for recording their qualifying trips using public or active transportation.
- **E-Scooter rental (dockless) Bridgeport –** Shared Mobility Program is working with Lynx and Bird scooter networks within the city.
- **Lynx E-Scooter** – Lynx is a Connecticut based e-scooter network and operates in the following communities: New Milford, Bethel, Stratford, Fairfield, and Bridgeport.
- **Link (Superpedestrian) E-Scooters in Hartford** – Scooters are available in throughout the city. Subsidized fare for qualified individuals: people receiving state or Operation Fuel assistance or who show proof of income can receive discounted rides 70% off. Superpedestrian reports that usage has been steady throughout the city. Hartford is one of company's busiest markets nationwide.
- **Bird E-scooters** brought 100 scooters to Ansonia in 2022 and launched a program in Fairfield in May 2022.

Discussion

We know that building walkable, bikeable communities is critical to reducing vehicle dependence, greenhouse gas emissions, and household transportation costs. Walkability and bikeability are also critical to improving transportation equity, accessibility, and quality of life. However, pedestrian deaths spiked, both in Connecticut and nationwide in 2020, despite double digit declines in vehicle miles traveled. Nationwide, overall pedestrian deaths increased 5% in 2020. The fatality rate in relation to vehicle miles traveled increase 21%, meaning that for every mile driven in 2021, five times more pedestrians died compared to 2020.[52] In their annual report, Dangerous by Design, Smart Growth America reports that Black Americans are twice as likely to die while walking and rates of pedestrian fatalities are 3.5 times higher in low income census tracts relative to higher income tracts nationally.[53] **In Connecticut, 65 pedestrians were killed in 2021 and 74 in 2023, more than double the number killed in 2011.**

Electrification of the transportation sector presents some opportunity to reduce household transportation fuel costs. However, purchase price of EVs remains high and **simply electrifying the existing transportation system will do little to address underlying inequities**. The current system caters almost exclusively to private vehicles, leaving behind those who do not own a vehicle (due to financial hardship, physical disability, preference, age, etc.). Despite our current vehicle-centric system, which comes at the expense of a system inclusive of public transit

[52] Governor's Highway Safety Association: **https://www.ghsa.org/resources/Pedestrians21**
[53] **https://smartgrowthamerica.org/dangerous-by-design/**

with robust bicycle and pedestrian infrastructure, research has consistently shown that health outcomes improve in communities where residents can walk and bike safely to destinations.

Water Affordability

Water costs have outpaced inflation for the past two decades.

37 census tracts have drinking water burdens that exceed the 2% affordability threshold.

Tracts in New Haven and Hartford have burdens exceeding 4%.

The EPA uses a drinking water affordability threshold of 2% of household income and combined water and wastewater threshold of 4.5%.[54, 55] As noted in the introduction, federal funding available to water utilities for infrastructure maintenance and improvements has declined since the 1970's and 80's, leaving utilities more dependent on revenue from customers.[56]

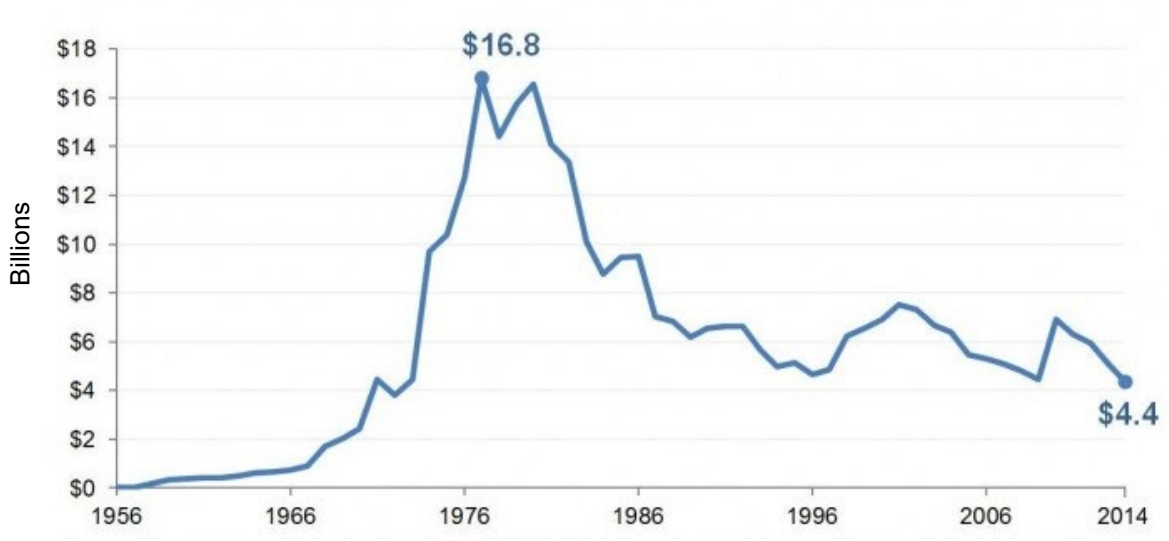

Figure 14. Federal spending on water and wastewater infrastructure, 1956-2014 (reported in billions of $).[57]

Water bills are increasing at a rate faster than other utility bills, such as natural gas and electricity, and phone service.[58] Researchers at Duke University note that since the early 2000s,

[54] U.S. Environmental Protection Agency. Affordability Criteria for Small Drinking Water Systems: An EPA Science Advisory Board Report By the Environmental Economics Advisory Committee of the EPA Science Advisory. 2002.
[55] Affordability Assessment Tool for Federal Water Mandates: **https://www.awwa.org/Portals/0/AWWA/ETS/Resources/AffordabilityAssessmentTool.pdf**.
[56] Patterson and Doyle. 2021. Measuring Water Affordability and the Financial Capabilities of Utilities. American Water Works Association Water Science: **https://awwa.onlinelibrary.wiley.com/doi/epdf/10.1002/aws2.1260**
[57] Congressional Budget Office: Public Spending on Transportation, 1956-2014: **https://www.cbo.gov/publication/49910**
[58] Utilities Worry Water's Becoming Unaffordable: **https://www.governing.com/archive/gov-water-utilities-worry-about-high-costs-for-low-income-customers.html**

water rates have increased faster than the rate of inflation, approximately 5% annually, while the median household income increased by less than 3% over the same period. In a 2017 study, researchers from Michigan State University concluded that "*If water rates rise at projected amounts over the next five years, conservative projections estimate that the percentage of U.S. households who will find water bills unaffordable could triple from 11.9% to 35.6%.*" [59] This same study noted that 96 census tracts in Connecticut are at risk for unaffordable water burdens in the future.

There are approximately 2,500 public water systems in Connecticut, including investor-owned utilities (IOUs), large, non-profit water providers, and small community providers. These public systems serve about three-quarters of the state's population and are regulated by the Department of Public Health.[60] The ten IOU water utilities operating in the state are also regulated by the Public Utilities Regulatory Authority (PURA). PURA must approve any requests for rate increases. Rates include the costs associated with meeting federal clean water standards and maintaining infrastructure. These IOUs serve about a quarter of the state's population. An estimated 23% of the state's population relies on private wells (Figure 15). Households that rely on private wells do not receive a monthly water bill, and are not included in our analysis, although those households do have water costs associated with maintenance of wells and water quality.

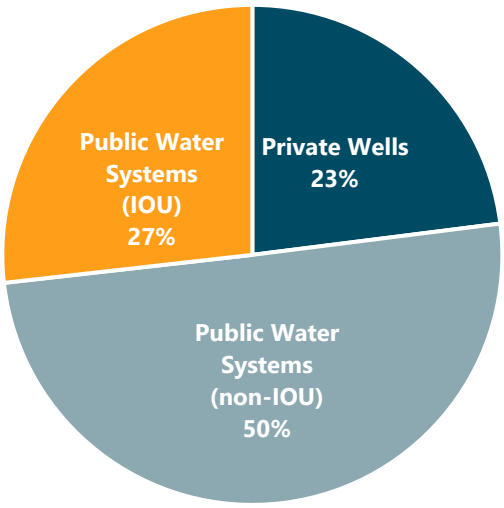

Figure 15. Types of water providers in Connecticut by percentage of population served.[61]

[59] Mack & Wrase. 2017. A Burgeoning Crisis? A Nationwide Assessment of the Geography of Water Affordability in the United States. PLoS ONE 12(1): e0169488. doi:10.1371/ journal.pone.0169488.
[60] See: **https://portal.ct.gov/DPH/Drinking-Water/DWS/Information-for-Public-Water-Systems**
[61] CT Department of Health: **https://portal.ct.gov/-/media/Departments-and-Agencies/DPH/dph/environmental_health/private_wells/2018-Downloads/26-Private-Wells-Types-Construction-2018.pdf**

The Metropolitan District Commission (MDC) is one of Connecticut's largest non-profit providers of both drinking water and sewer services, providing drinking water to 400,000 people across eight member towns (Berlin, Cromwell, East Granby, Farmington, Glastonbury, Manchester, Portland, and South Windsor) and parts of neighboring non-member towns. In areas served by MDC, the water rate is set in accordance to the EPA water affordability threshold of 2%, i.e., a household's water bill (exclusive of wastewater) should not exceed 2% of household income. Water burden is averaged across all towns served by MDC to ensure it is below the 2% threshold. Affordability analysis by MDC revealed that although this average remains below 2% regionally, some towns are approaching or already exceeding this threshold. Further, because this is an average, it means that many households in MDC territory are already facing unaffordable water burdens. Although, towns in the region have widely different median incomes (e.g., in Hartford median income is $33,000, while in West Hartford it is $120,000), MDC's affordability metric uses a regional average, in accordance with EPA guidelines.

MDC is implementing the multibillion dollar Clean Water Project and anticipates needing to make significant infrastructure improvements in the next 40 years. If these costs are passed on to customers, it will significantly increase rates and exacerbate affordability problems for low- and moderate-income customers.[62] However, maintaining rates at the current levels would require deferring maintenance over a longer period, risking the supply, quality, and potential pollution for residents.

Estimating Water Burden

We obtained detailed cost estimates for 58 water providers in Connecticut, collectively serving 81 towns and cities, 650 census tracts, and over 1 million people across the state from the Duke University Water Affordability Dashboard.[63] The dashboard categorizes water providers by both size and ownership (public/private; Table 2).[64] In our analysis, we assume that households using approximately 5,000 gallons monthly (approximately 80-100 gallons per person per day for a two person household),[65] spend $592 on water annually. The 2019 Tighe and Bond Drinking Water Rate Survey assumes household usage of 6,000 gallons per month and reported a similar statewide average of $561 annually, noting a 10% increase in rates between 2016 and 2019.[66]

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[62] Metropolitan District Hartford, CT, 2018 Integrated Long-term CSO Control Plan Summary: **https://themdc.org/app/uploads/2021/01/Hartford-MDC-LTCP-Executive-Summary-Final-May-14-2020.pdf**

[63] See: **https://nicholasinstitute.duke.edu/water-affordability/water-affordability-dashboard/** Connecticut has 169 municipalities in total. Towns with no water cost data available are primarily towns with small providers not regulated by PURA or private wells.

[64] Due to high variation across and within water provider size categories and owner type, we did not extrapolate spending beyond the providers included in the Water Affordability Dashboard.

[65] The EPA estimates that the average American uses 88 gallons of water per day, equating to over 10,000 gallons per month for a family of four: **https://www.epa.gov/watersense/understanding-your-water-bill**.

[66] See T&B PDF from MDC folks.

We noted considerable variation among these water rates, even within utilities and towns. At usage of 5,000 gallons per month the estimated cost for water (exclusive of wastewater) ranged from $12 per month in Danbury to $99 in East Lyme. We also noted substantial variation in base costs, ranging from $0 to $65 each month (Figure 16). When smaller water companies are acquired, their rates are "grandfathered in" so the company's existing ratepayers are not charged for the acquired company's deferred maintenance costs. This phenomenon explains some variation in rate structures within companies and towns.

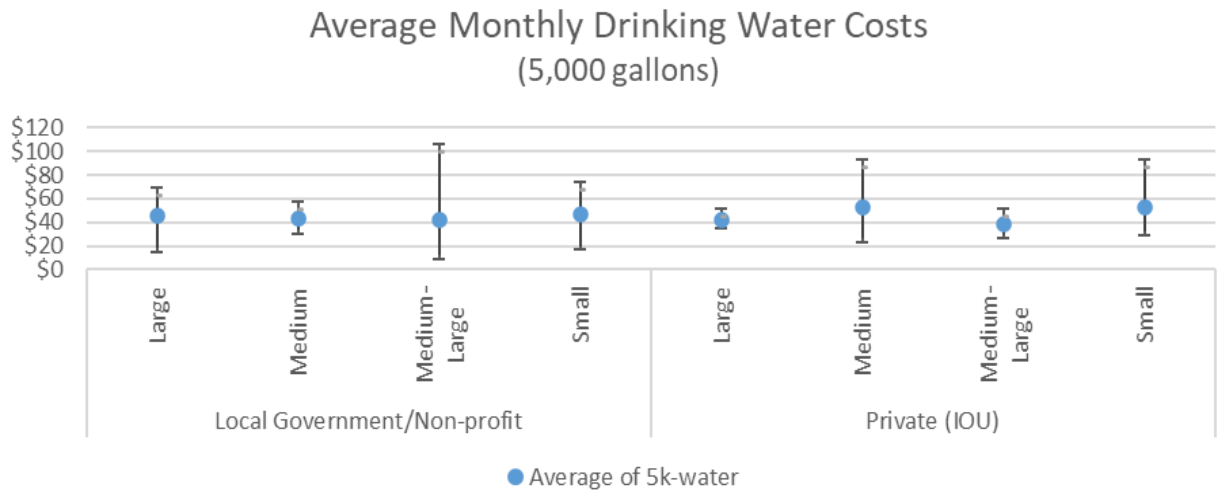

Figure 16. Average Monthly Drinking Water Costs by town and provider type at 5,000 gallons of monthly usage.

We also examined water burden by municipality and census tract. Among those municipalities for which we had data, the average water burden was 0.7%. Water burden ranged from 0.1% in Windsor to 1.8% in Hartford. No town exceeded the EPA's affordability threshold of 2%, although both Hartford and New Haven came close with water burdens of 1.5%.

When examining water burden by tract, a more granular metric, 37 tracts, home to over 47,000 households, had water burdens that exceed the 2% affordability threshold (Figure 18). Tracts in New Haven (City Point) and Hartford (South Green and Blue Hills neighborhoods) had burdens that approached and exceeded 4% of median household income, more than seven-fold higher than the statewide average burden of less than 1%.[67] As noted, earlier, water costs have outpaced inflation for the past two decades. If rates continue to increase at 5% annually, we estimate that the number of census tracts facing unaffordable average water burdens will increase to nearly 50 tracts by 2025.

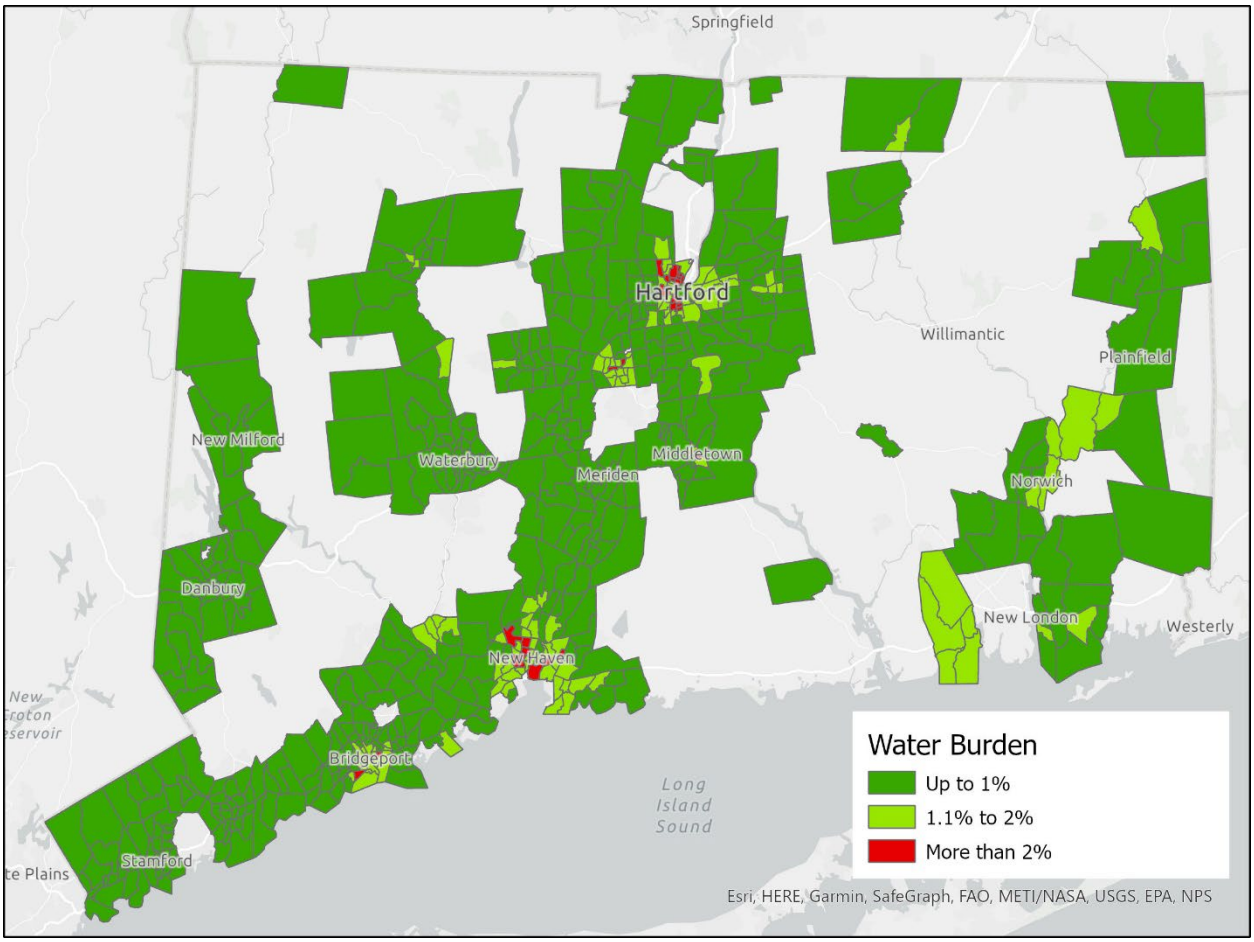

Figure 17. Water burden by census tract at 5,000 gallons of usage a month.

[67] New Haven is served by the Regional Water Authority and Hartford by the Metropolitan Water District.

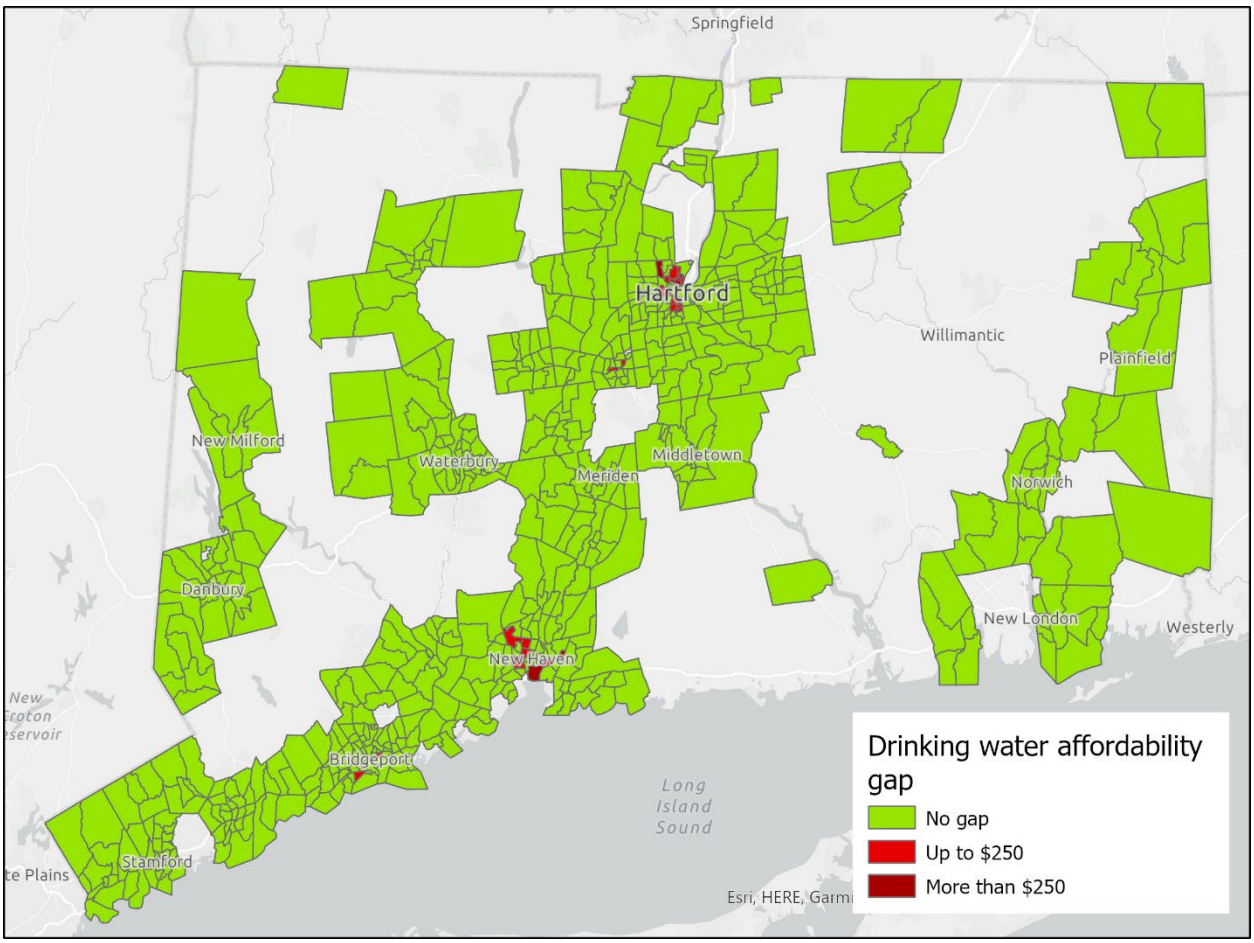

Figure 18. Water affordability gap by census tract at 5,000 gallons of usage a month.

Excessive water burdens translate to an affordability gap: this gap (the difference between an affordable level of spending and actual spending) is highest where burden is highest. A census tract with an affordability gap is one where the average household cannot pay their water bills. We estimated the highest gap to be $427 annually, in the Blue Hills census tract in near the University of Hartford, followed by a gap of $355 in the City Point area of New Haven. Ten census tracts, in Quinnipiac Meadows in New Haven and Clay Arsenal and Northeast Hartford, have annual gaps above $200.

In our analysis we noted a significant amount of variability associated with rates for households within a utility service area but outside the municipal boundary. Generally, 'outside' rates are considerably higher. For the utilities we studied, outside rates ranged from 23% to 68% higher than inside rates at the same utility (Figure 19). For instance, in New Britain, the 'inside' rate for drinking water is $51 per month, at 5,000 gallons vs. $83 for the 'outside' rate.

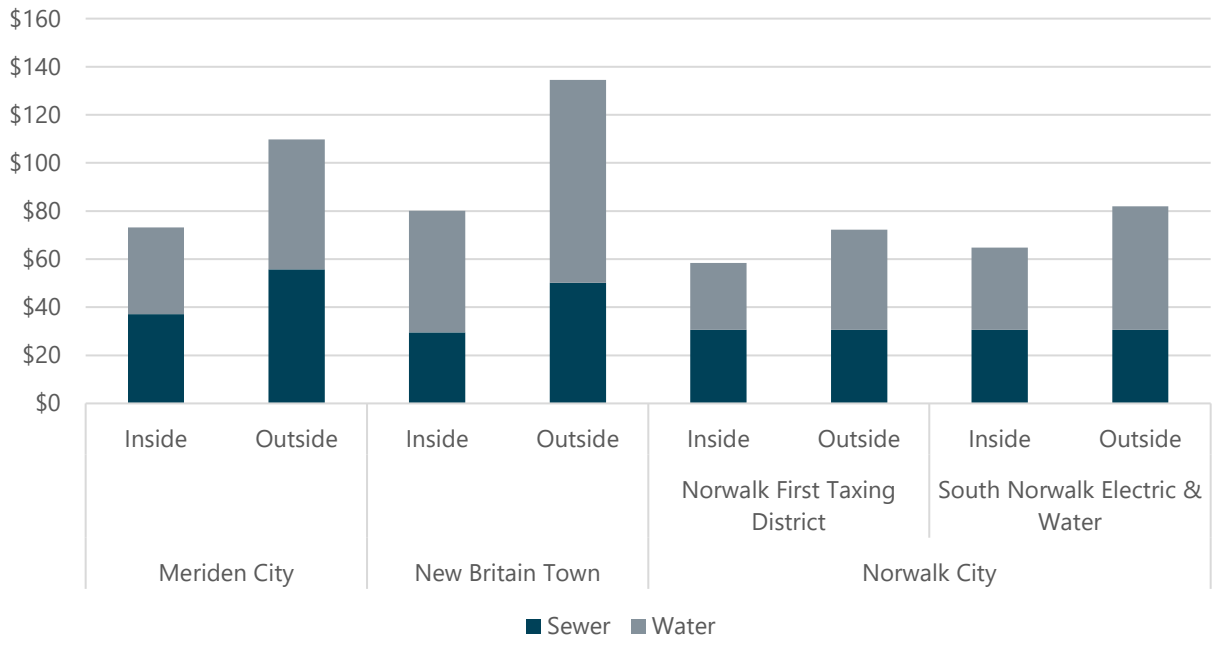

Figure 19. Rate variance for home inside vs. outside municipality at 5,000 gallons monthly usage.

Water Assistance Programs

We are aware of little assistance available to residents served by private or community wells, who make up about a quarter of the state. Those on public systems (served by an IOU or local government or non-profit system) have access to the Low-Income Household Water Assistance Program, which provides assistance up to $1,000 per household (Table 5).

Table 5. Average cost and available assistance for private wells and public water systems.

Water System	Ownership	Population Served	Cost types	Average Annual Cost (Range)	Assistance Available
Private Well	Homeowner/ HOA	830,000	Well drilling and Installation, well inspection, pump replacement, water testing, remediation, filters, softeners	From ~$50/yr to several $100-1000 for specialized tests	Limited financial assistance
Public	Private (IOU)	965,000	Monthly, usage fees (potential high usage fees due to leaks etc.)	$528 ($142-$1184)	Up to $1,000 (LIHWAP)
	Local Government/ Non-Profit	1,810,000		$577 ($313-$1028)	Up to $1,000 (LIHWAP)

Operation Fuel administers low-income water assistance programs for MDC, CT Water, and Aquarion customers. The program provides up to $500 in grant assistance and is available to both renters and homeowners (although water costs are usually included in monthly rent).

The Low Income Household Water Assistance Program (LIHWAP) program is federally funded and administered by the Connecticut Department of Social Services.[68] The program became available in 2021 and provides one-time assistance of up to $1,000 and can be used to prevent water shut-offs, restore water service for homes that have been disconnected, and reduce overdue bills. Eligible households are those that earn less than 60% of the statewide median income, in alignment with the Connecticut Energy Assistance Program (CEAP). LIHWAP can be used for both drinking water and wastewater assistance. The program was introduced in 2021. According to data presented on April 5, 2023 by the Department of Social Services to the Low-Income Energy Advisory Board, which oversees the water assistance program along with LIHEAP, the program has spent roughly $4 million of $10 million allocated. The program supports customers at Aquarion, CT Water, and MDC, who are also eligible for Operation Fuel assistance.

In addition to offering assistance through Operation Fuel, Connecticut Water offers the Water Rate Assistance Program (WRAP), which provides customers with HH incomes at or below 200% FPL a 15% bill reduction.[69] According to CT Water, uptake of their assistance programs has generally been very low although uptake has increased recently and there appears to be more

[68] **https://portal.ct.gov/DSS/Highlights/Low-Income-Household-Water-Assistance-Program-Coming-to-CT**
[69] See: **https://www.ctwater.com/customers/customer-assistance/water-rate-assistance-program-wrap**

need as households struggle with COVID. CT Water has increased outreach efforts to raise awareness of WRAP. Historical data on uptake of assistance programs is not available. CT Water also offers H_2O- Help to Our Customers, also available to households with income at or below 200% FPL. H_2O provides customers with one time hardship financial assistance and deferred payment arrangement plans.[70]

In 2022, Aquarion Water brought a rate case to PURA, arguing in favor of an increased Return on Equity, and to increase rates by double digits in the next 3 years. Instead, regulators approved a rate reduction; the company is appealing the decision in CT court. PURA did approve a new Aquarion program, the Low-Income Rate Assistance Program (LIRAP), as an interim program and will be implemented in 2023 in partnership with Operation Fuel. LIRAP would provide a 15% credit to residential customers who meet the 60% SMI & below eligibility requirements, and would be applied to the entirety of the customer's bill.[71]

Table 6. Summary of water assistance programs.

Program	Administrator	Assistance Level	Eligibility
MDC	Operation Fuel	$500 grant	
CT Water	Operation Fuel	$500 grant (grant level can vary)	
CT Water- Water Rate Assistance Program (WRAP)	Approval from Operation Fuel or Town Social Service Office	15% reduction on entire bill excluding service line protection program.	The company typically uses income at or below 200% of the Federal Poverty Level Guidelines as modified from time to time.
CT Water – H2O: Help 2 Our Customers	Internal + Operation Fuel or Town Social Service Office	Waive fees and discount the past due balance by 50% if customer follows mutually agreed upon payment plan. Leak detection services to prevent excessive billing. One time hardship discount for customers in good standing.	Income at or below 200% of the Federal Poverty Level Guidelines

[7070] **https://www.ctwater.com/customers/customer-assistance/h2o-help-2-our-customers-assistance-program**

[71] **https://www.dpuc.state.ct.us/dockcurr.nsf/8e6fc37a54110e3e852576190052b64d/1a9f8dffcd1ea5a085258973004c6c43/$FILE/220701-031523.pdf**

Program	Administrator	Assistance Level	Eligibility
SCC-RWA	Dollar Energy Fund	Up to a $175 grant every 12 months	The total gross household income must be at or below 250% of the 2020 Federal Poverty Income Guidelines
LIWAP – Department of Social Services	• Regional Community Action Agency • Joint statewide CEAP/LIWAP application portal	One-time assistance of up to $1,000 for select water and wastewater expenses from participating providers.	Households with annual income 60% or less of state median.
Aquarion Water Company Customer Assistance Program[72]	Operation Fuel	One-time $50 voucher or up to $250 grant if certain stipulations are met	Owners, renters who are current with their water bill. Additional bill and income requirements for the grant program.
Aquarion Water Company COVID-19 Assistance Program	Internal	Payment plan that allows for payment of past due bills (billed during the pandemic) for up to 24 months without fees or interest.	A business owner or homeowner in Aquarion's service territory, or a contractual renter (water bill must be in tenant's name) receiving bills on a monthly basis
Torrington Water Company	Internal	Payment plan that allows for payment of past due bills (billed during the pandemic) for up to 24 months without fees or interest.	None, all customers eligible.
Jewett City Water	Internal	Call to arrange payment plan	Call to find out
Hazardville Water company	Internal	Call to arrange payment plan	Call to find out

[72] **https://operationfuel.org/wp-content/uploads/2022/02/Aquarion-customer-assistance-program-2.22-fillable.pdf**

Discussion

Based on the data available, water affordability is an issue in areas of Hartford (Blue Hills, Northeast, Clay Arsenal, South Green) and New Haven (City Point, Quinnipiac Meadows). However, our estimate of burden uses median income- for household's below or close to median income, there may be a water affordability gap not captured in our analysis. Further, we only had data for 81 of Connecticut's 169 towns. Reducing water burden through tiered or reduced rates may reach more households than assistance programs, which may be difficult to access. Residents of towns not captured in our analysis may rely on private wells or small providers and be subject to highly variable costs with little access to assistance. Ground wells, whether for a household or a community well, can have contamination challenges and maintenance costs.

Recommendations

Increase Efficiency Standards: Reducing water demand and use for households is the clearest way to reduce their water burden. The EPA estimates that use of water efficient fixtures and appliances can reduce water use by 20% for the average household, saving households in Connecticut approximately $200 annually. Existing assistance programs could provide more permanent relief for households by increasing awareness of and access to water efficient technologies.[73, 74] Connecticut has not increased water efficiency standards since 1987.[75]

Tiered Assistance: In 2015, the Philadelphia Water Department became the first utility to offer a water rate based on household income. The Tiered Assistance Program (TAP) caps households' water bills based on income. Between 2012 and 2018, 40% of households in the city had unpaid water bills. In 2015 the city moved to a tiered approach to rates and assistance. The tiered approach aims to increase affordability for those households that most need it, create predictable water bills for households, reduce program overhead, and increase payment and revenue recovery for the city.[76] The program is open to both homeowners and renters earning up to 150% federal poverty level and **participants do not need to be behind on their bills to enroll**.[77]

[73] **https://www.epa.gov/watersense/statistics-and-facts#:~:text=We%20can%20all%20use%20at,and%20ENERGY%20STAR%20certified%20appliances**.
[74] **https://www.epa.gov/system/files/documents/2021-07/ws-assistance-that-saves-efficiency-and-affordability.pdf**
[75] American for Water Efficiency
[76] **https://graham.umich.edu/media/pubs/Water-CS-Philidelphia-Tiered-Assistant-Program_0.pdf**
[77] **https://www.circleofblue.org/2017/water-management/pricing/philadelphia-water-rate-links-payments-household-income/**

Ban water lien sales: Chronically unpaid water bills can result in a service shut-off or lien on a home that may ultimately lead to foreclosure and eviction.[78] Water lien sales contribute to declining rates of homeownership within the Black community nationally.[79, 80] Liens are often for relatively small amounts ($300-$350) but can result in households losing an asset worth $200,000+. In Connecticut, water liens are subject to an 18% interest rate.[81] Utilities may impose liens on homes that have delinquent bills. There is no minimum delinquency. Water liens take precedence over all other liens except tax liens and can be remain in effect for up to 15 years.[82] In 2017, the New Haven Independent noted that the area's wastewater provider, the Greater New Haven Water Pollution Control Authority (GNHWPCA), initiated foreclosure on 158 homes in 12 months for non-payment of wastewater bills. Foreclosures were clustered in New Haven's Hill, West River, Newhallville and Fair Haven neighborhoods.[83] We struggled to find comprehensive data on water lien sales in Connecticut. **In lieu of banning water lien sales, they should at least be tracked.**

Ban water disconnection below a given threshold amount, especially for vulnerable populations such as the elderly, disabled and those with young children.

Require utilities to offer a customer assistance program, including robust and targeted outreach programs. The New Haven Independent interviewed a number of customers who did not know what assistance was available nor how to access it. Such a requirement may only be possible through statutory change: PURA has less regulatory reach within the water industry, relative to energy.

[78] There was a temporary moratorium on service shut-offs in Connecticut with the onset of COVID. The moratorium was lifted on on-hardship shut-offs was ended in 2021. The moratorium on hardship shut-offs has been extended until 5/2/2023, with possibility for further extension.

[79] Colton, Roger. The Affordability of Water and Wastewater Services in Twelve US Cities: A Social, Business and Environmental Concern. Report prepared for The Guardian. May 2020: **https://www.theguardian.com/environment/2020/jun/23/full-report-read-in-depth-water-poverty-investigation**

[80] NAACP Legal Defense and Education Fund. 2019. Water / Color: A Study of Race & the Water Affordability Crisis in America's Cities: . **https://www.naacpldf.org/wp-content/uploads/Water_Report_Executive-Summary_5_21_19_FINAL-V2.pdf**

[81] Connecticut General Assembly: **https://www.cga.ct.gov/PS99/rpt%5Colr%5Chtm/99-R-1292.htm**

[82] See: **https://www.cga.ct.gov/PS99/rpt%5Colr%5Chtm/99-R-1292.htm**

[83] **https://www.newhavenindependent.org/index.php/article/WPCA_foreclosures/**

Combined Burden

Combined shelter costs (housing, energy, water) and transportation costs are unaffordable in nearly a third of Connecticut's census tracts.

In areas of high combined burden, combined affordability gap exceeds $4,000 annually.

High combined burdens are driven by a combination of high transportation costs and low median incomes.

Combined burden includes total shelter costs (rent or mortgage, utility, energy, water, taxes, insurance, association fees) and transportation costs (transit costs, vehicle fuel, maintenance, financing, and insurance). The Housing and Transportation Affordability Index uses an affordability threshold of 45% of household income. In some locations high housing costs can offset lower transportation costs and vice versa. Housing and transportation costs are related: where one lives directly affects how far one travels for basic needs. **Combined burdened exceeds the 45% affordability threshold in 32% of Connecticut's census tracts 267 in both urban and rural areas of the state** (Figure 20).

Towns and cities across the state, including Hartford (Northeast, Upper Albany, Clay Arsenal, South Green), New Britain (downtown), Waterbury (Central Business District, Washington Hill), Danbury (downtown), Stamford (downtown and Cove-East Side-Shippan), Bridgeport (downtown, the Hollow, East Bridgeport), Meriden (Southwest Meriden, North of Ceppa Field), have census tracts where the combined burden exceeds 60% of tract-level median income. The annual affordability gap in these towns exceeds $4,000 annually (Figure 20). In these census tracts, excessive combined burdens were driven by both high transportation costs and relatively low median incomes.

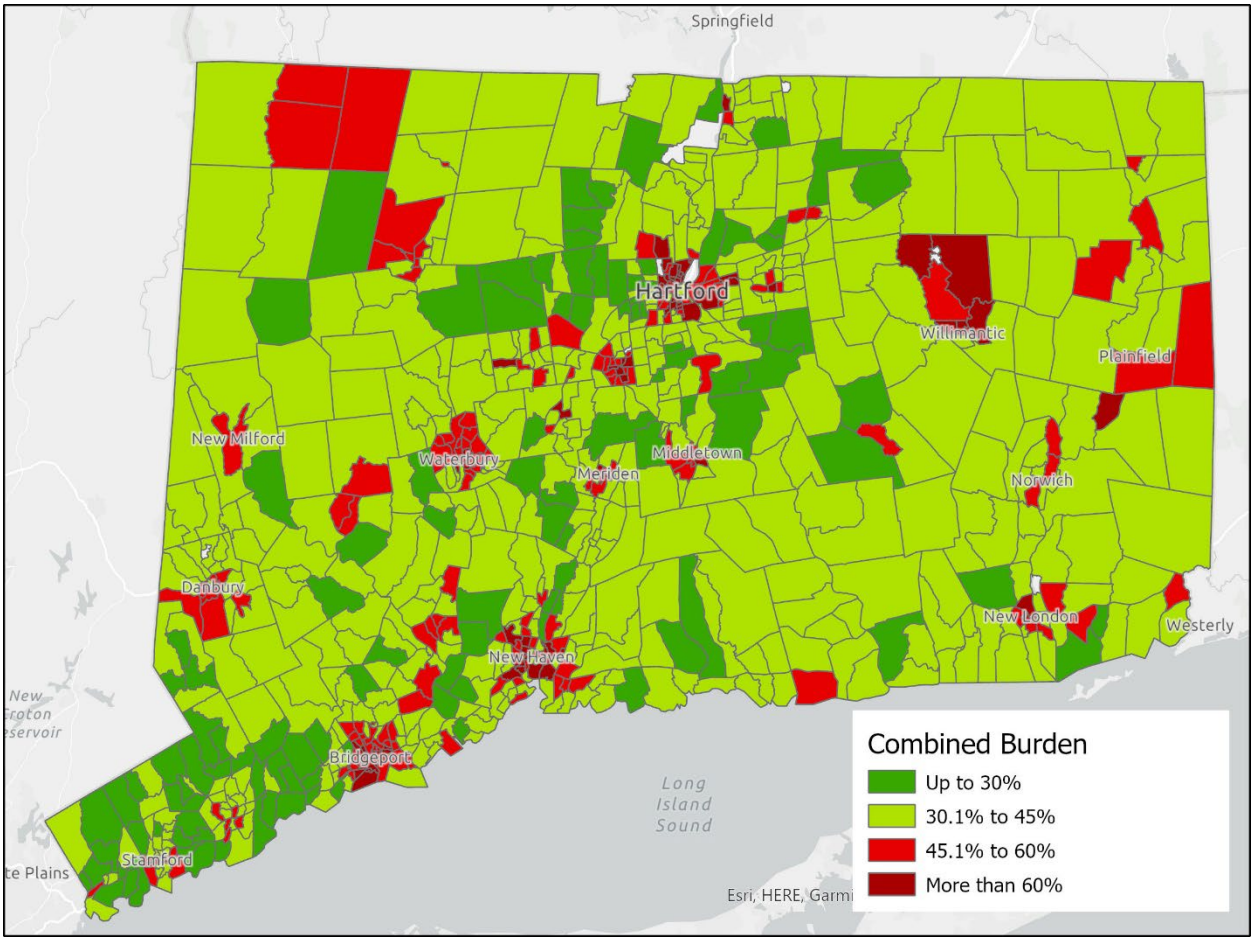

Figure 20. Combined housing and transportation burden by census tract.

For instance, in a census tract in Southington, just north of Central Southington (tract 4306.03), the median income is $37,868. The combined burden of total shelter costs and transportation is 71%, resulting in an affordability gap of nearly $10,000 each year. Of course, households may not actually be spending 71% of their income on housing and transportation: they may lack reliable transportation or may be forced to keep their homes uncomfortably cold in the winter to save on fuel costs. What the combined burden shows us what a household would need to spend in order to achieve adequate mobility and comfortable housing.

Areas with excessive combined burdens (Figure 20) and affordability gaps (Figure 21) also tend to be areas of high social vulnerability (see Figure 2 and note overlap: clustering of high SVI and combined burden in the state's urban centers, as well as Enfield, Torrington, and Mansfield). However, some areas may simply be expensive places to live: southern Westbrook in Middlesex County has no notable social vulnerability and a the combined affordability burden of 50% and the affordability gap of $3,300 each year, indicative of the high cost of living in Connecticut, even for households earning median income or close to it.

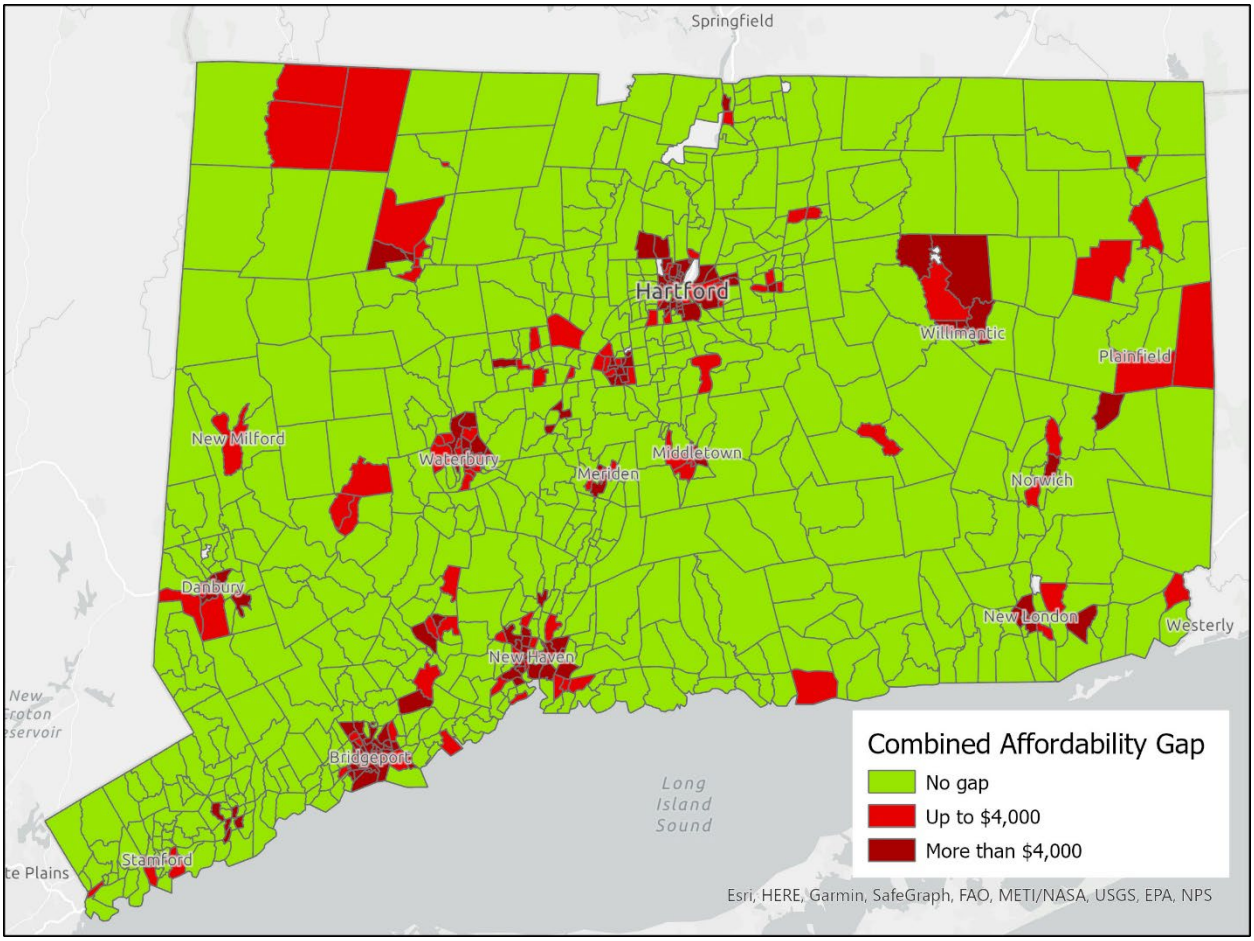

Figure 21. Combined housing and transportation annual affordability gap by census tract.

We explored changes in cost burdens between the 2020 and 2023 affordability studies in three census tracts across the state: western Greenwich (Pemberwick, Tract 105), the Parkville neighborhood of Hartford (Tract 5041), and western Brooklyn (Tract 9051.02; Figure 22).[84] Burdens were fairly stable, across categories and within tracts, although Brooklyn's combined burden now exceeds the 45% affordability threshold, due to increases in both housing and transportation burden. In this census tract in Brooklyn, the average household now faces a combined affordability gap of nearly $942, meaning they are spending nearly $1,000 more than they can afford each year. Combined affordability improved in Hartford but remains well above the affordability threshold in all spending categories, adding up to an annual affordability gap of $7,120. We expect both energy and housing costs to continue to rise, increasing pressure on households already overburdened, as well as those currently on the edge of affordability.

[84] In the 2020 study, Brooklyn was a single census tract- it has since been split into two.

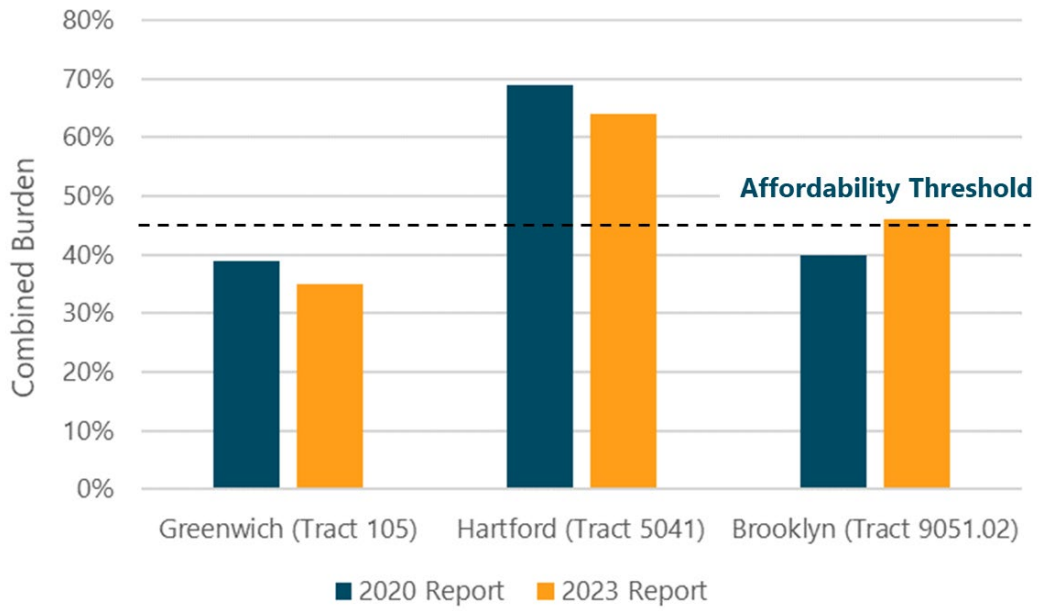

Figure 22. Comparison of combined burden in Greenwich, Hartford, and Brooklyn census tracts, 2020 vs. 2023 Affordability Studies.

Discussion

Affordability is an issue for households across Connecticut, in rural and urban parts of the state, and in the case of transportation, even for households earning median income. As noted above, transportation was a key driver of high combined burden and affordability gap- the state's reliance on personal vehicles is a hindrance for households' ability to build wealth, especially in rural areas where vehicle miles traveled is high. Transportation costs are unsustainable for low-income families, especially with rising vehicle costs. Electrification and the focus on private vehicles is leaving low-income residents behind. Most EVs remain out of reach for low-income households, even with available subsidies.

Housing and transportation costs are the largest monthly expenditures for most households, yet little relief is available to households, and in the case of housing, there are high barriers for accessing assistance. High housing costs also present a substantial barrier to investment in energy efficiency. When households struggle day-to-day to pay rent or mortgage, long-term investments in energy efficiency can seem impossible, although efficiency is a meaningful, permanent means of reducing energy burden. Energy efficiency programs focused on LMI households are critical to achieving and preserving energy affordability.

Despite record high rates of inflation since 2020, utility costs in Connecticut are rising even faster, and with recent increases in electric rates, we expect energy burdens and affordability gaps in low- and moderate-income households will continue to rise in 2023. It remains challenging for qualified households to access assistance of all types (fuel, housing, water).

LIHEAP recently removed the assets test form their application, substantially streamlining the application process and increasing the number of applicants: this success should be recognized and replicated.

All of the spending categories that we studied are essential: it is critical that all households can afford stable housing, energy to heat and cool their homes, reliable transportation to get where they need to go, and water to drink. By understanding patterns in affordability, we can tailor programmatic and policy solutions to create a Connecticut where all households can not only meet their basic needs but thrive. For a more detailed look at affordability in Connecticut visit our interactive, online maps: **https://arcg.is/1u0n4r3**.

Appendix

The Social Vulnerability Index combines 16 demographic variables to create four categories of social vulnerability for each census tract. These four categories can be combined for an overall estimate of social vulnerability in a given census tract. For more information on SVI see: **https://www.atsdr.cdc.gov/placeandhealth/svi/map/data/docs/SVI2020Documentation_08.05.22.pdf**