



Characterization of Single-Family Housing Stock in the State of Connecticut

FINAL

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Submitted to:

Energy Efficiency Board Evaluation Technical Consultant

Submitted by:

NMR Group, Inc.

1 Introduction

This memorandum provides an overview of the energy-related characteristics of single-family residential buildings in the state of Connecticut. The NMR team was asked to conduct this assessment in order to provide the Energy Efficiency Board (EEB) and the Department of Energy and Environmental Protection (DEEP) with an understanding of the housing stock in Connecticut to add it the state's efforts to achieve 80% weatherization by 2030. In order to attain as complete an understanding as possible of the features of these buildings, NMR acquired an extensive Database of properties in the state from The Warren Group, hereafter referred to as "the Database."

This memorandum first describes the Database and its contents, highlighting its usefulness for characterizing the energy-related features of single-family homes in Connecticut, but also noting some of the shortcomings of the Database.¹ Next, the team presents a summary of the characteristics of single-family residences as described by the data, and discusses the detailed analysis and findings from this short research effort. The memorandum does not offer any recommendations, as the purpose was to describe current housing conditions in the state.

2 Description of the Database

The Database is a compilation of property data assembled by The Warren Group from Connecticut county, town, and municipal property assessment, sales, and tax records. The Database, which does not explicitly focus on energy use, nevertheless includes a variety of variables that are useful in characterizing the energy-related features of single-family residential buildings in Connecticut. These variables include the following:

- Home ownership status
- When home built/age of home
- When the home was last renovated
- Gross and interior square footage (s.f.)
- Number of rooms and bathrooms
- Type of home heating fuel
- Type of heating equipment
- Presence of fireplaces

The team also estimated conditioned floor area (CFA) using information from the Database and additional analysis as described in more detail in Section 3 below.

Despite this wealth of information, the Database suffers from two types of missing data. First, it does not include information for all homes. According to the 2010 decennial census, there are

¹ The Database also includes information on multifamily homes, but the number of units is presented inconsistently. For example, some towns group records for one- to four-unit structures into a single category.

Housing Characterization Study

973,080 single-family housing units in Connecticut,² but the Database lists only 822,900 single-family homes, or 85% of the Census count. Second, while it offers a rich and extensive data set, the information contained in the Database was recorded in an inconsistent manner by personnel scattered throughout the various counties and municipalities of Connecticut. For this reason, the team is careful to note the number of records used in each analysis.

Another shortcoming of the Database stems from data entry errors. These errors could have occurred when the data were entered into original county, town, and municipal records or when the Warren Group compiled these records into one large dataset. To offer an example of an error, the Dataset lists a single-family home in Connecticut as having an area of 770,700 s.f. For perspective, this is far larger than world's largest single-family home. NMR has addressed this situation by excluding values that were clearly mistakes or extreme outliers from the analyses.

3 Key Findings

The key findings from the Database include the following:

- The Database lists a total of 822,900 single-family houses, 90% of which are owner-occupied houses.
- The Database shows fuel oil as the most common heating fuel in the majority of homes—71% of owner-occupied and 69% of renter-occupied.
- Although most county level variations in heating fuel can be explained by the availability of natural-gas lines, the choice of heating system type *within* fuel types differs across the state. For example, boilers are a more common choice for oil- and natural-gas heated homes in Tolland County (81% of oil homes and 55% of natural gas homes) than in New Haven County (56% of oil homes, 41% of natural-gas homes).
- A majority of the houses (63%) in Connecticut were built prior to 1970, and only about 10% of all homes are listed in the Database as having been renovated. Of the renovations that have occurred, 83% took place after 1970, which coincides with the time period in which building codes required R-11 wall insulation. However, renovations do not guarantee that the entire home has R-11 or better wall insulation.³
- Nearly three quarters (74%) of the homes included in the Database are between 1,000 and 2,500 s.f. in size. They tend to have six or seven rooms (47%), three bedrooms (53%), and one or two bathrooms (87%).

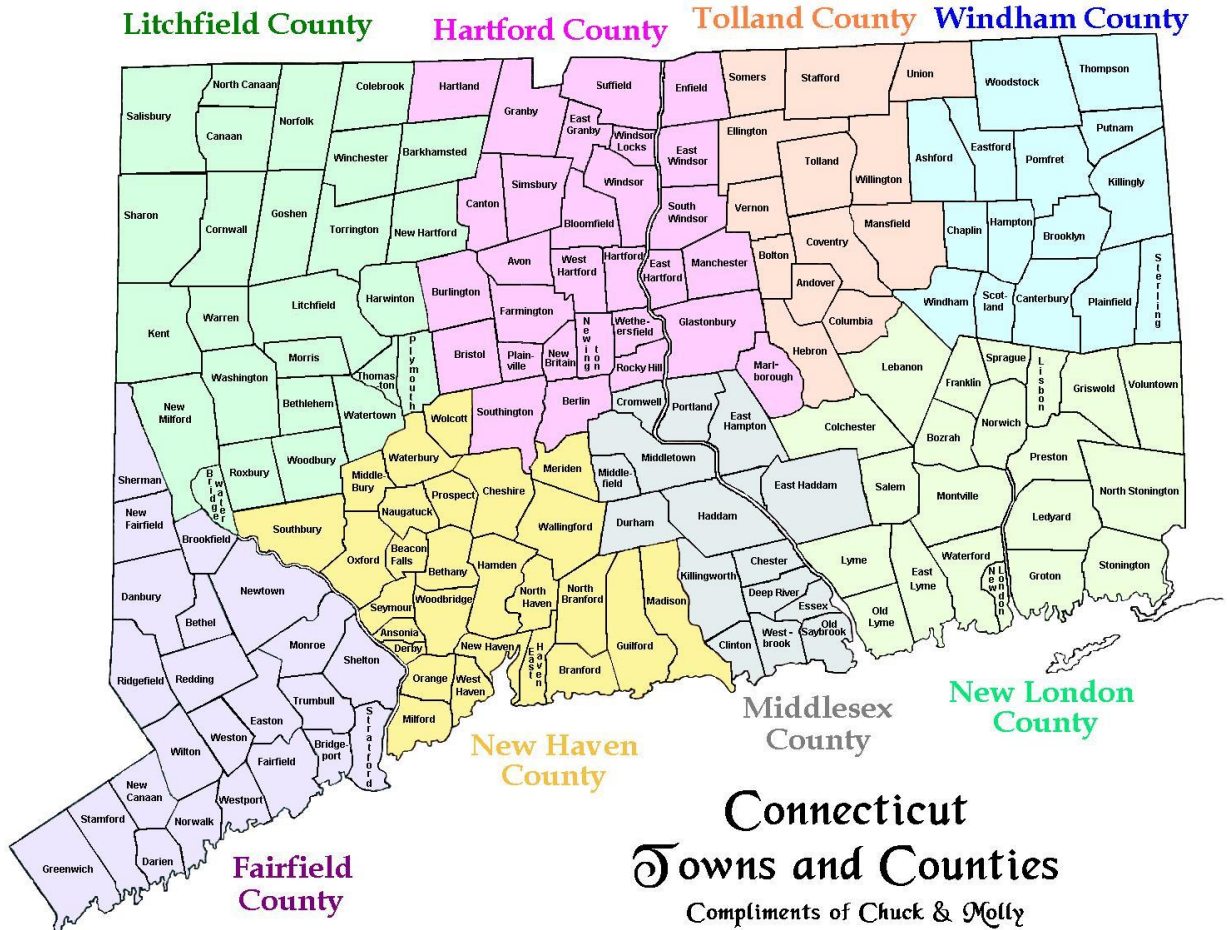
² “U.S. Census – State & County QuickFacts, Connecticut.” U.S. Census Bureau, accessed September 11, 2012. <http://quickfacts.census.gov/qfd/states/09000.html>.

³ The Database did not provide specific information regarding what renovations entailed. We have noted the evolution in building codes that could have affected whether insulation was installed during renovations.

4 Database Analysis

Figure 4-1 presents a map of Connecticut towns and counties, which the team believes will help readers in their interpretation of the subset of findings presented by county that follow.

Figure 4-1: Map of Connecticut Towns and Counties



Source: <http://www.chuckstraub.com/Letterboxing/ctmap.htm>

4.1 Single-Family Homes

Single-family homes represent 75% (822,000) of the 1.1 million residential buildings in the state included in the Database (Table 4-1). An additional 12,557 properties (1.1%) are listed as being one-to-four family residential buildings, which comprise a distinct category in the Database. The percentage of single-family homes varies across counties in the state, ranging from 72% in Fairfield and New Haven to 85% in Windham.

Table 4-1: Percentage of All Residential Buildings that is Single-Family

County	Total # of Residential Buildings (N)	% of Residential Buildings in County that are Single family	% of Statewide Single-family Homes Located in County
Statewide	1,097,495	75%	100%
Fairfield	274,495	72%	24%
Hartford	263,756	74%	24%
Litchfield	74,401	77%	7%
Middlesex	61,208	81%	6%
New Haven	257,262	72%	22%
New London	86,310	84%	9%
Tolland	46,010	84%	5%
Windham	34,053	85%	3%

About 90% of single-family homes are owner-occupied; the remaining 10% are rented, with rented properties being identified as those in which the homeowner’s property tax bill is sent to an address other than that of the property (Table 4-2).

Table 4-2: Owner-or Renter-Occupied by County—All Homes*

County	Owner-Occupied		Rentals	
	N	% of County	N	% of County
Statewide	740,019	90%	82,881	10%
Fairfield	179,314	91%	18,014	9%
Hartford	183,867	95%	10,727	6%
Litchfield	45,477	80%	11,502	20%
Middlesex	41,709	84%	7,854	16%
New Haven	170,110	92%	14,291	8%
New London	60,894	84%	11,633	16%
Tolland	35,109	91%	3,610	9%
Windham	23,539	82%	5,250	18%

* Results subject to rounding error.

4.2 Heating Equipment and Fuel⁴

Statewide, the Database contains information on heating fuel for 93% of single-family cases. The majority of single family housing units in Connecticut use oil heat. Seventy-one percent of owner-occupied and 69% of renter-occupied single-family housing units have oil heat (Table 4-3).⁵ Over one-fifth of owner-occupied single-family housing units (22%) and nearly one-fifth of renter-occupied units (19%) have natural gas heat. Five percent of owner-occupied units use electric heat, compared to 9% for renter-occupied units.

Table 4-3: Owner-or Renter-Occupied by Heating Fuel

Fuel	Owner-occupied	Renter-occupied	Overall
<i>Statewide</i>	689,742	73,333	763,075
Oil	71%	69%	71%
Natural Gas	22%	19%	22%
Electric	5%	9%	6%
Other ⁱ	1%	3%	2%

ⁱ Includes entries for coal and wood, which together comprise 0.08% of all cases, and solar, which makes up less than 0.03% of cases. Data are missing for a total of 59,825 cases.

Less-populous Windham and Tolland counties in the northeastern part of the state are the most heavily reliant on oil for heat, with 82% and 84% of homes respectively using oil, but even in Hartford County, which has the lowest incidence of fuel oil use among single-family homes, 59% of homeowners heat with oil (Table 4-4).

Table 4-4: Heating Fuel By Countyⁱ

County/Tenure	N	Oil	Nat. Gas	Electric	Misc. Combustion ⁱⁱ	Solar
Statewide	763,075	71%	22%	6%	2%	<1%
Fairfield	189,350	69%	27%	4%	<1%	<1%
Hartford	181,757	59%	33%	3%	5%	<1%
Litchfield	52,786	77%	12%	10%	1%	<1%
Middlesex	48,155	79%	9%	11%	1%	<1%
New Haven	153,962	73%	23%	4%	<1%	<1%
New London	70,807	78%	10%	12%	1%	<1%
Tolland	38,102	84%	8%	7%	1%	<1%
Windham	28,156	82%	6%	11%	1%	<1%
Owner-occupied	689,742	71%	22%	5%	1%	<1%
Rentals	73,333	69%	19%	9%	3%	<1%

ⁱ There were no propane homes listed in the database; it is possible that some entries listed simply as “gas” were propane or that some homes listed as oil converted to propane.

ⁱⁱ Includes coal and wood.

⁴ Table 3-11 summarizes renovation history by heating-fuel and equipment type, showing that more recently built and renovated homes are more likely to have forced hot air systems and natural-gas fired systems.

⁵ Note that the Census Bureau estimates that about 61% of single-family homes rely on fuel-oil for heating. The discrepancy between the two estimates likely reflects that 1) the Database may not be updated for fuel switching, and 2) the Census relies on self-reported fuel type, which may suffer from self-reporting error.

Housing Characterization Study

Statewide, oil-fired heating systems tend to be rely on boilers, also known as hydronic systems, (66%), while gas-fired systems are fairly evenly split between forced air furnaces (51%) and boiler equipment (49%) (Table 4-5). While the Database indicates that there are some boilers and furnaces that run on electricity, homes with this kind of equipment only comprise about 0.8% of the total. Electric heating systems are largely baseboard electric resistance, but a few of them are likely heat pump systems, although the database did not specify the type.

Table 4-5: Heating Fuel & Equipment Statewide

Fuel	<i>N</i>	Boiler	Furnace	Electric	Otherⁱ
Oil	<i>539,478</i>	66%	34%	<1%	<1%
Natural Gas	<i>168,530</i>	49%	51%	<1%	<1%
Electric	<i>43,289</i>	5%	9%	86%	<1%
Other ⁱⁱ	<i>11,778</i>	34%	58%	6%	3%

ⁱ Includes entries for solar or solar-assisted heating systems and unit heaters, which make up less than 0.03% of cases.

ⁱⁱ Includes entries for coal and wood, which together make up 0.08% of all cases, and solar as fuel, which makes up less than 0.03% of cases and coincides with the solar-assisted systems.

Table 4-6 lists heating fuel by heating equipment for the various counties in Connecticut. While the variation across counties in fuel type large reflects availability of natural gas, the variation in the type of equipment in use within a particular fuel varies considerably. For example, 58% of oil-heated homes in Fairfield County use a boiler system while 75% of those in Hartford County do.

Table 4-6: Heating Fuel & Equipment by County

County/Fuel	% Within Fuel Type	N	Boiler	Furnace	Electric ⁱ	Other ⁱⁱ
Fairfield						
Oil	68%	121,844	58%	42%	<1%	<1%
Natural Gas	28%	50,180	47%	53%	<1%	<1%
Electric	4%	6,790	4%	26%	70%	<1%
Other ⁱⁱⁱ	<1%	65	42%	54%	5%	-
Hartford						
Oil	62%	107,672	75%	25%	<1%	<1%
Natural Gas	34%	58,948	55%	45%	<1%	<1%
Electric	4%	6,010	5%	9%	87%	<1%
Other ⁱⁱⁱ	<1%	79	32%	58%	8%	<1%
Litchfield						
Oil	77%	40,532	64%	36%	<1%	<1%
Natural Gas	12%	6,340	51%	49%	<1%	<1%
Electric	10%	5,312	11%	3%	85%	<1%
Other ⁱⁱⁱ	<1%	207	24%	70%	1%	4%
Middlesex						
Oil	80%	37,767	66%	34%	<1%	<1%
Natural Gas	9%	4,484	35%	64%	<1%	1%
Electric	11%	5,169	5%	7%	88%	<1%
Other ⁱⁱⁱ	<1%	55	40%	49%	6%	6%
New Haven						
Oil	73%	108,049	56%	44%	<1%	<1%
Natural Gas	24%	34,853	41%	59%	<1%	<1%
Electric	4%	5,608	5%	6%	90%	<1%
Other ⁱⁱⁱ	<1%	72	39%	57%	3%	1%
New London						
Oil	78%	54,922	74%	26%	<1%	<1%
Natural Gas	10%	6,973	48%	52%	<1%	<1%
Electric	12%	8,152	3%	5%	92%	<1%
Other ⁱⁱⁱ	<1%	92	44%	48%	5%	3%
Tolland						
Oil	85%	31,967	81%	19%	<1%	-
Natural Gas	8%	3,085	55%	45%	<1%	<1%
Electric	7%	2,709	7%	4%	89%	<1%
Other ⁱⁱⁱ	<1%	83	31%	61%	6%	1%
Windham						
Oil	82%	22,853	80%	20%	<1%	<1%
Natural Gas	6%	1,726	49%	51%	<1%	-
Electric	11%	3,082	3%	3%	94%	-
Other ⁱⁱⁱ	1%	133	34%	50%	16%	1%

ⁱ Includes entries for heat pumps as well as resistance.

ⁱⁱ Includes entries for solar or solar-assisted heating systems and unit heaters, which together make up less than 0.03% of cases.

ⁱⁱⁱ Includes entries for coal and wood, which together make up 0.08% of all cases, and solar as fuel, which makes up less than 0.03% of cases and coincides with the solar-assisted systems.

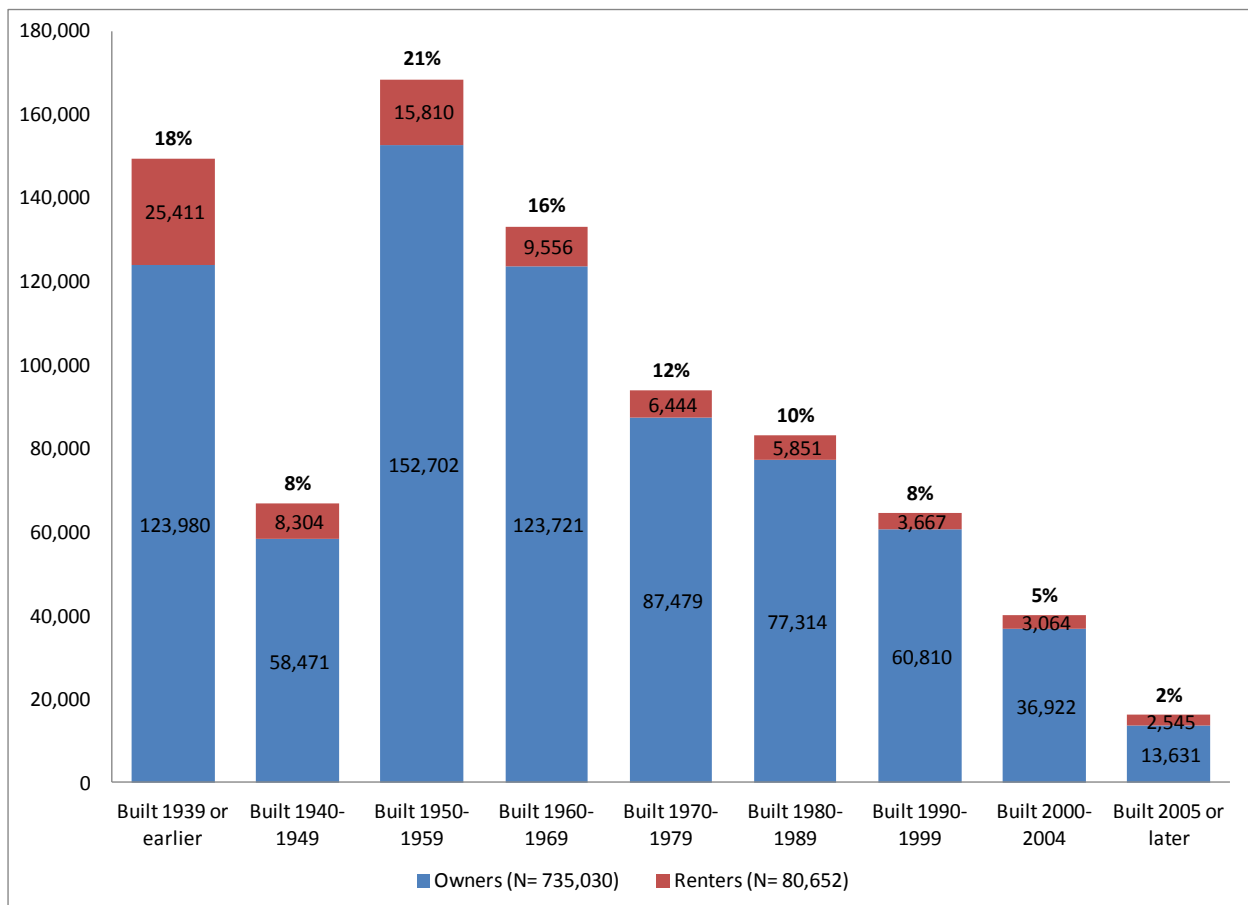
4.3 Age and Size of Homes

This section describes the age of size of homes, including addressing the renovation history as listed in the Database.

4.3.1 Construction and Renovation History

A majority of the houses (63%) in Connecticut were built prior to 1970. Single-family rental properties statewide are older than owner-occupied properties, on average; Sixty-one percent of the 80,652 rentals were built before 1959 compared to 46% of the 735,030 owner-occupied homes. The age of single-family rentals makes them likely candidates for energy-efficiency retrofits, but the split incentive concern⁶ and the relatively small number of renter-occupied compared to owner-occupied houses will mean that residential retrofit programs will continue to serve more owner-occupied than renter-occupied households (Figure 4-2).

Figure 4-2: Average Age of Single-Family Homes^{i,ii}



ⁱ Indicates original construction date, irrespective of renovation history.

ⁱⁱ Age data are unavailable for 4,989 (<1%) owner-occupied and 2,229 (<3%) renter-occupied homes.

⁶ Landlords are sometimes reluctant to invest in energy-efficiency upgrades because their tenants pay the utility bills, that is, unless landlords believe the upgrades will allow them to charge more rent or more easily secure tenants for a unit.

Housing Characterization Study

Statewide, the Database shows that about one out of every ten single-family homes has been renovated at some point since their construction (Table 4-7). The Database lists the most recent renovation known for the each renovated home, but NMR warns that the database may not include all actual renovations that have taken place. The large majority (84%) of renovations listed in the Database occurred after 1970, which is roughly when building code began to stipulate that contractors install R-11 wall insulation.⁷ However, even if the entire house was renovated there is no guarantee that the entire home has this level of insulation. Note that the known renovation history varies by county, with Fairfield County being the most likely to have renovated homes (15%) and New London (3%) the least.

Table 4-7: Renovation History

County	N	Number and percent renovated at some point	Date of Most Recent Renovation (% of renovated homes) ⁱ				
			Pre-1970	1970-79	1980-89	1990-99	Since 2000
Statewide	822,900	79,151 (10%)	17%	19%	31%	18%	16%
Fairfield	197,328	29,573 (15%)	30%	28%	17%	11%	14%
Hartford	194,594	14,179 (7%)	7%	20%	27%	23%	23%
Litchfield	56,979	4,851 (9%)	10%	8%	58%	15%	10%
Middlesex	49,563	4,085 (8%)	5%	8%	53%	21%	13%
New Haven	184,401	20,283 (11%)	4%	11%	46%	25%	14%
New London	72,527	1,971 (3%)	10%	9%	23%	23%	35%
Tolland	38,719	3,110 (8%)	41%	8%	8%	20%	23%
Windham	28,789	1,099 (4%)	6%	7%	24%	32%	31%

ⁱ Percentages may not sum to 100% due to rounding error.

⁷ Connecticut was the first state to have adopted a uniform, statewide building code—the 1970 Building Officials and Code Administrators (BOCA) Building Code. The state officially adopted the code on September 1, 1971, but lobbying for the code’s adoption by building officials began several years prior to that. Because changes in prevailing insulating practices occurred gradually rather than as the result of a single act of government, the year 1970 is used as an approximation of when builders began using R-11 wall insulation as part of their standard practice. An account of this regulatory change is available on the website of the Connecticut Building Officials Association: <http://www.ctbuildingofficial.org/About%20CBOA>

Housing Characterization Study

Sixteen percent of the homes built prior to 1900 have been renovated at some point, while only two percent of homes built in 2000 or later have been renovated at some point (Table 4-8). Among homes built prior to the 1980s, renovations were most likely to occur before the 1970s or during the 1980s.

Table 4-8: Renovation History by Year of Construction

	Year of Construction					
	Prior to 1900	1900 to 1939	1940 to 1959	1960 to 1979	1980 to 1999	2000 or later
<i>N</i>	33,896	115,495	235,287	227,200	147,642	56,162
Percent renovated at some point	16%	17%	12%	8%	4%	2%
Date of Most Recent Renovation						
<i>N (Renovated)</i>	5,393	19,121	28,942	18,563	5,997	1,135
Pre-1970	34%	37%	13%	2%	--	--
1970-79	13%	15%	25%	21%	--	--
1980-89	27%	26%	35%	36%	16%	--
1990-99	14%	12%	15%	26%	35%	--
Since 2000	12%	9%	13%	15%	49%	100%

Some of the parity between forced air and forced hot water gas-fired heating systems as noted earlier in Section 4.2 can be explained by the increasing popularity of both forced air equipment and availability of natural gas. On average, 37% of single-family homes in Connecticut for which the Database describes heating type have forced air heating equipment, yet 66% of houses built or renovated since 2000 use furnaces for heat (Table 4-9). A corresponding, but smaller, increase in the availability of natural gas as a heating fuel accompanies the rise of furnaces: while 22% of single-family homes for which there are data heat with natural gas, this is true for 31% of houses built or renovated since 2000.⁸

Table 4-9: Heating Equipment & Fuel by Date of Most Recent Renovation or Constructionⁱ

Time Period	Heating Equipment					Heating Fuel				
	<i>N</i>	Boiler	Furnace	Electric	Other ⁱⁱ	<i>N</i>	Oil	Natural Gas	Electric	Other
Statewide	735,708	58%	37%	5%	<1%	762,967	71%	22%	6%	2%
Prior to 1900	25,486	64%	34%	2%	<1%	26,116	77%	19%	2%	2%
1900 to 1939	83,870	63%	35%	2%	<1%	87,332	66%	29%	2%	3%
1940 to 1959	188,688	61%	37%	2%	<1%	197,666	78%	17%	2%	3%
1960 to 1979	210,252	65%	26%	9%	<1%	218,124	67%	22%	10%	1%
1980 to 1999	165,164	54%	39%	8%	<1%	169,758	70%	21%	9%	1%
2000 or later	62,248	33%	66%	1%	<1%	63,971	67%	31%	2%	1%

¹ Table uses date of construction if the home has not been renovated.

⁸ Table 4-11 below also examines renovation history by the size of home.

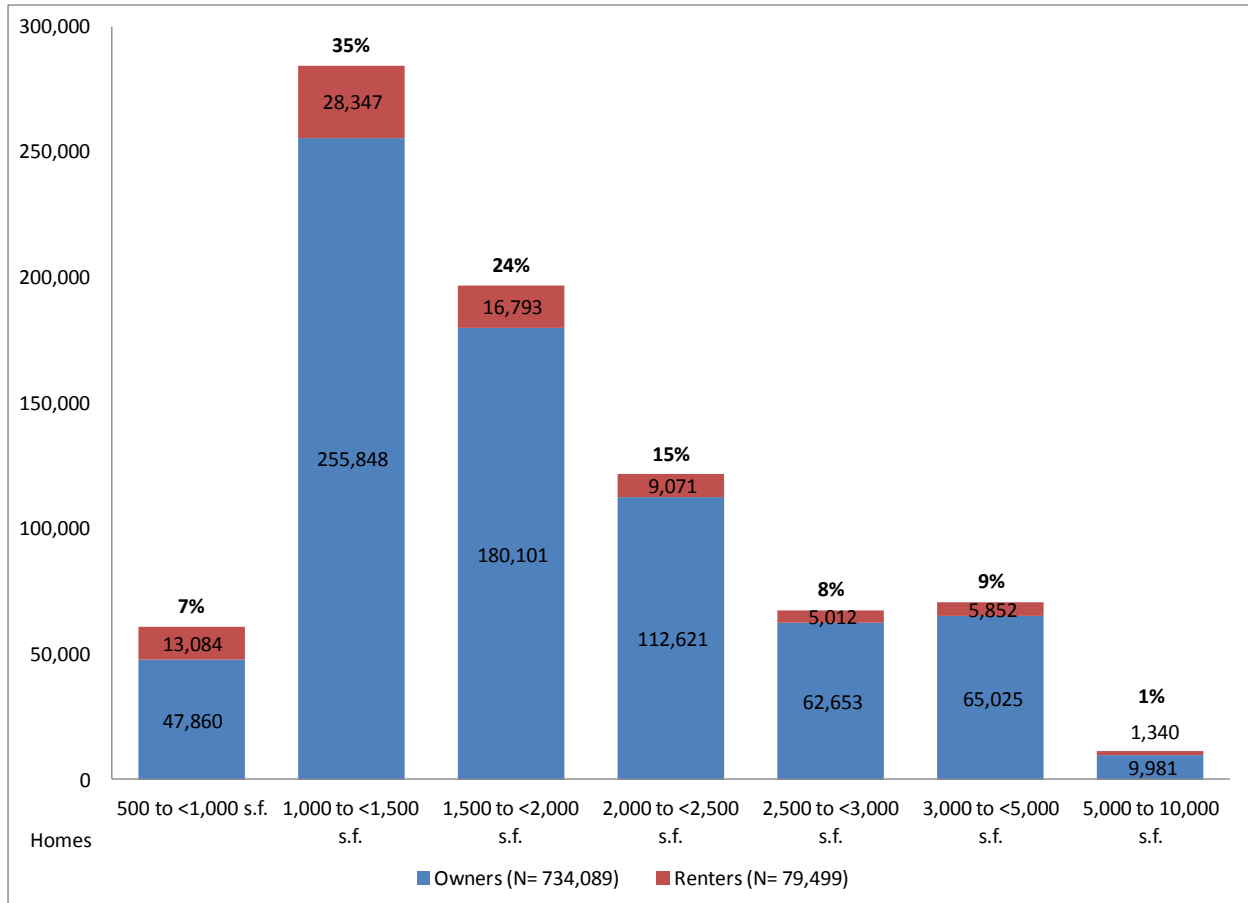
4.3.2 Estimated Conditioned Floor Area

The Database features a measure of a building's interior square footage, which provides an estimate of the conditioned floor area (CFA) (Figure 4-3). In developing this variable, it was necessary to exclude both very small and very large homes, particularly those NMR suspected represented data entry errors (e.g. 120 s.f. or 770,700 s.f.). Specifically, NMR excluded those homes that fell below 500 s.f. (about one standard deviation [1,371 s.f.] below the mean of 1,868 s.f.). This resulted in the exclusion of 0.8% of the single-family homes in the sample. Similarly, while there are some dubiously large values for interior square footage in the Database, in NMR's experience, there are some very large single-family homes in Connecticut. However, out of 822,900 single-family records, only 344 are greater than 10,000 s.f. (just 0.04% of all records); thus, 10,000 s.f. appears to be a plausible upper limit for most single-family homes in the state. Excluding all records with a value greater than 10,000 s.f. or less than 500 s.f. eliminates about one percent of all single-family cases for the purposes of this estimate. Among rental properties, four percent of cases are removed, suggesting the possibility that counties and towns have a more difficult time determining the size of rental properties than they do single-family homes.

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After excluding these outliers, the Database shows that nearly three-quarters of the homes (74%) are between 1,000 and 2,500 s.f. Not surprisingly, single-family rental homes tend to be smaller than owner-occupied homes. Fifty-two percent of the 79,499 rentals were between 500 and 1,500 s.f. compared to 41% of the 734,089 owner-occupied homes.

Figure 4-3: Estimated Conditioned Floor Area



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Across all home sizes, slightly more than two-thirds of homes had oil heat (Table 4-10). In fact, homes of most sizes showed little variation in heating fuel type, although smaller homes were more likely than larger homes to have electric heat and were also more likely to use other heating sources.

Table 4-10: Heating Fuel Type by Estimated Conditioned Floor Area

Fuel	Total	500 to <1,000 s.f.	1,000 to <1,500 s.f.	1,500 to <2,000 s.f.	2,000 to <2,500 s.f.	2,500 to <3,000 s.f.	3,000 to <5,000 s.f.	5,000 to 10,000 s.f.
<i>N</i>	761,513	53,683	260,785	185,605	117,251	65,570	68,080	10,539
Oil	71%	65%	70%	71%	72%	73%	73%	72%
Natural Gas	22%	21%	22%	22%	22%	23%	24%	27%
Electric	6%	10%	7%	6%	5%	4%	2%	1%
Other ⁱ	2%	4%	2%	1%	1%	1%	<1%	<1%

ⁱ Includes entries for coal and wood, which together make up 0.08% of all cases, and solar, which makes up less than 0.03% of cases.

Because home size and renovation history both affect energy usage, NMR examined their relationship. About 10% of homes of most sizes have been renovated at some point (Table 4-11). Larger homes—particularly those 5,000 to 10,000 s.f. (19%), but also those 3,000 to 5,000 s.f. (15%)—were more likely than other home sizes to have been renovated at some point. Larger homes were also more likely to have been renovated more recently.

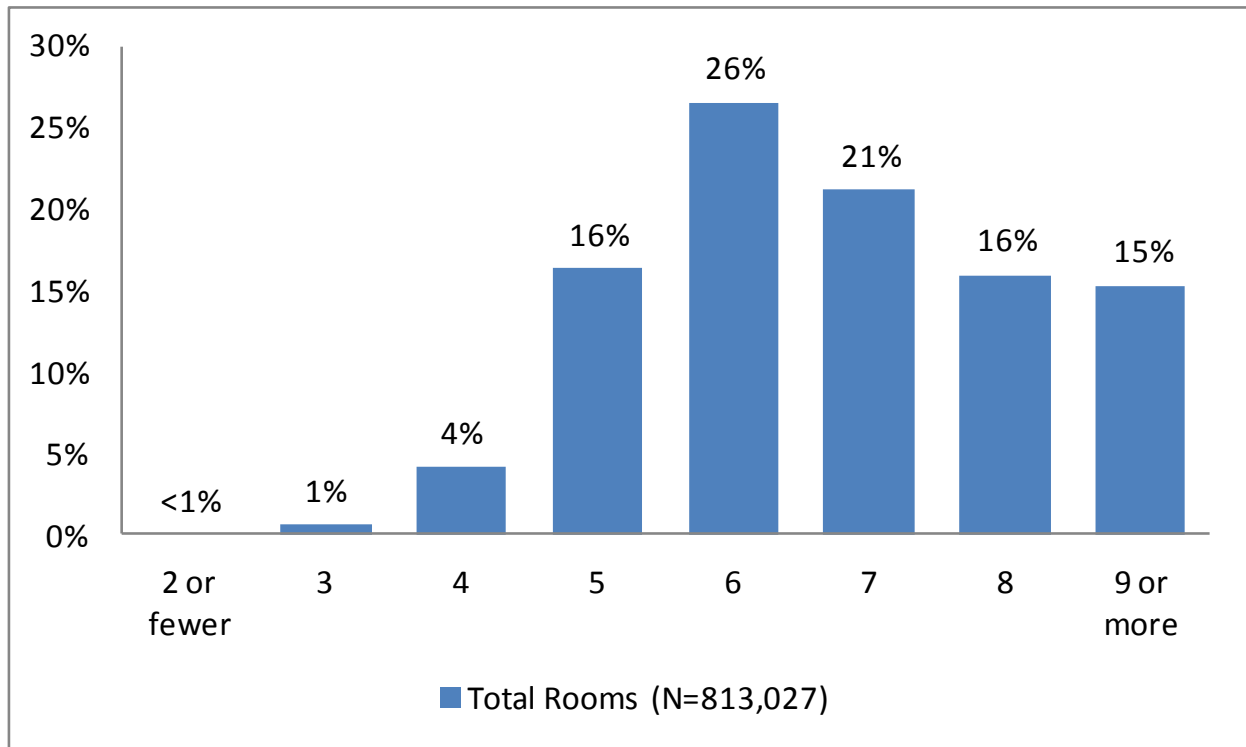
Table 4-11: Renovation History by Estimated Conditioned Floor Area

Fuel Date of Most Recent Renovation	500 to <1,000 s.f.	1,000 to <1,500 s.f.	1,500 to <2,000 s.f.	2,000 to <2,500 s.f.	2,500 to <3,000 s.f.	3,000 to <5,000 s.f.	5,000 to 10,000 s.f.
<i>N</i>	60,944	284,195	196,894	121,692	67,665	70,877	11,321
Number renovated at some point	5,668	24,157	18,648	11,507	6,947	9,693	2,155
Renovated at some point	9%	9%	10%	10%	10%	14%	19%
<i>N (Renovated)</i>	5,668	24,157	18,648	11,507	6,947	9,693	2,155
Renovated Pre-1970	18%	16%	19%	17%	15%	14%	16%
Renovated 1970-79	18%	18%	19%	18%	19%	20%	23%
Renovated 1980-89	40%	37%	31%	26%	23%	20%	19%
Renovated 1990-99	15%	18%	18%	20%	20%	16%	13%
Renovated Since 2000	10%	10%	13%	20%	23%	29%	29%

4.3.3 Number of Total Rooms, Bedrooms, & Bathrooms

Just under one-half (47%) of the homes in the Database had six or seven rooms in them (Figure 4-4). According to the database, more than one-half (53%) of the homes have three bedrooms, and another 32% have four or more bedrooms (Figure 4-5). Most homes in the database have either one (43%) or two (44%) bathrooms.⁹

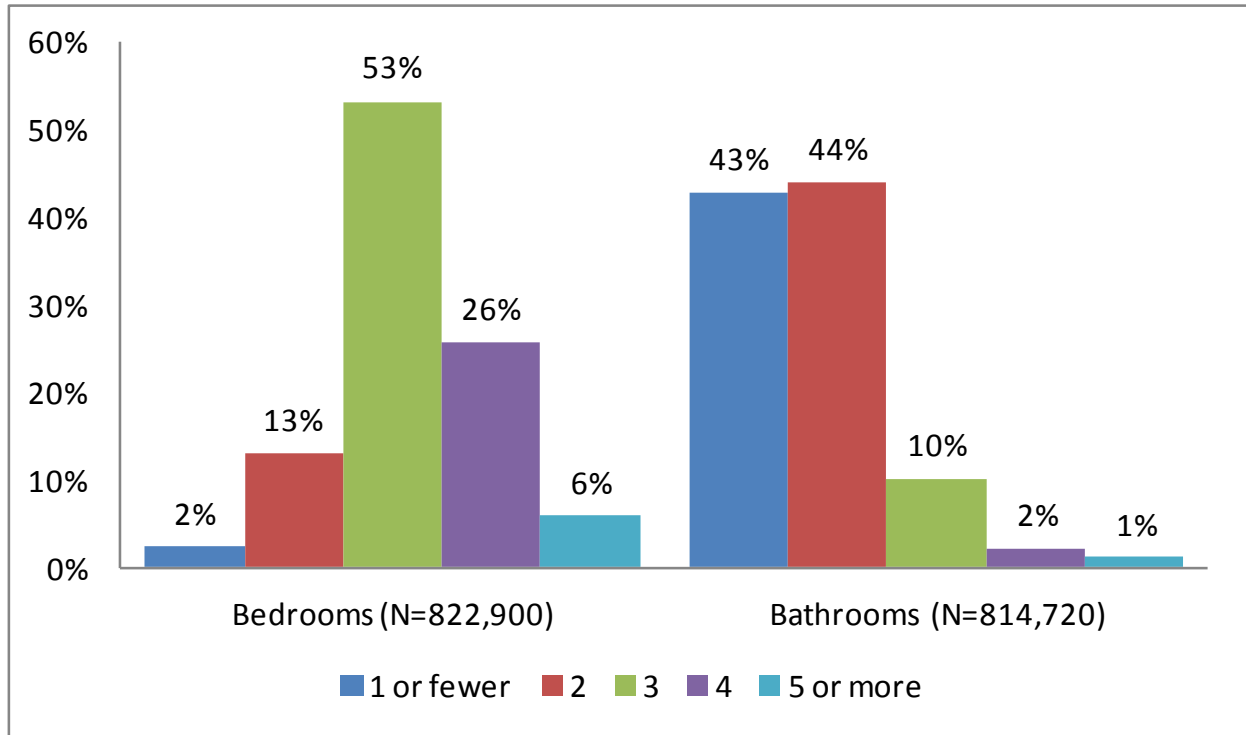
Figure 4-4: Number of Total Roomsⁱ



ⁱ Excludes cases with total rooms greater than 35.

⁹ Half bathrooms are not included in the analysis.

Figure 4-5: Number of Bedrooms and Bathroomsⁱ



ⁱ Does not include half bathrooms.

4.3.4 Fireplaces

A fireplace is a significant energy characteristic in a home. In some homes, a fireplace is used to heat a house in lieu of, or supplemental to the primary heating system; a fireplace may also operate using natural gas or propane, which can add to a home's fuel consumption. Additionally, fireplaces may represent a source of air leakage. In Connecticut, more single-family houses have fireplaces (52%) than do not (48%), although the degree to which they are still operational, the frequency of their use, and whether they burn wood or gas is not captured in the Database. Fireplaces are also relatively common in five of the eight counties in the state (Table 4-12), with New London (22%), Windham (38%), and New Haven (42%) being the least likely to have fireplaces.

Table 4-12: Presence of a Fireplace by County and Occupancy Status

County	N	Statewide	Owner-Occupied		Rentals	
			N	%	N	%
Statewide	822,900	52%	740,019	54%	82,881	42%
Fairfield	197,328	62%	179,314	63%	18,014	57%
Hartford	194,594	61%	183,867	62%	10,727	49%
Litchfield	56,979	54%	45,477	57%	11,502	42%
Middlesex	49,563	57%	41,709	60%	7,854	44%
New Haven	184,401	42%	170,110	43%	14,291	34%
New London	72,527	22%	60,894	23%	11,633	19%
Tolland	38,719	67%	35,109	68%	3,610	50%
Windham	28,789	38%	23,539	39%	5,250	35%

5 Next Steps

The analyses presented here present a broad overview of the single-family housing stock in Connecticut as it pertains to some characteristics critical to weatherization. Therefore, it provides important background information to aid in the state's efforts to weatherize 80% of homes by 2030. However, the database does not examine all variables pertinent to weatherization, and many of the existing variables suffer from missing data (i.e., the important data are available only for some homes in the database). It is very likely that the missing data are not randomly distributed: some towns and cities track these data and others do not. In short, the picture painted by the dataset is incomplete and likely somewhat biased in unknown ways. The forthcoming weatherization study adhered to a random selection process and gathered a more complete set of variables related to weatherization. The weatherization study and the data from the Warren Group will complement each other and provide critical information to help the state reach its ambitious weatherization goals.