

APPENDIX A. Methodology

The number of future households in the region, given increases or decreases in age-group populations, can be estimated by applying the likelihood of individuals, at given age ranges, to be the head of a household, as defined by the United States Census Bureau. “Headship rate” is derived by dividing the number of households *headed* by individuals of a specific age, by the total number of individuals of that age.

This method of projecting future households has been widely used to project housing demand, and has recently been employed by organizations such as Harvard’s Joint Center for Housing Studies, the Metropolitan Area Planning Council in the Boston area, and Rhode Island’s Department of Housing.

Income and tenure characteristics for future households are predicted based on the age of heads of households and the current distribution of income and tenure.

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Households by Age of Head of Household

Example year: 2030.

1) Calculate 2010 headship rates, by age of head of household, for each town, by dividing households by population in households, for each age cohort. Calculate regional headship rate, by age, by summing the regional number of households and regional population in households.

$$\boxed{2010 \text{ HH}} \div \boxed{2010 \text{ Pop in HH}} = \boxed{2010 \text{ HR by Town}}$$

$$\boxed{2010 \text{ Regional HH}} \div \boxed{2010 \text{ Regional Pop in HH}} = \boxed{2010 \text{ Regional HR}}$$

2) Calculate future population expected 'simple households', by age of head of household, for each town. 'Simple households' represents future households assuming stable population in group quarters (nursing homes, correctional institutions, college dormitories, and military barracks).

Sum group quarters population for 2015 (base year).

$$\boxed{2015 \text{ NH Pop}} + \boxed{2015 \text{ CI Pop}} + \boxed{2015 \text{ CD Pop}} + \boxed{2015 \text{ MB Pop}} = \boxed{2015 \text{ GC Pop}}$$

Remove group quarters population from 2030 population estimates to determine 'simple household population'.

$$\boxed{2030 \text{ Pop}} - \boxed{2015 \text{ CG Pop}} = \boxed{2030 \text{ Simple HH Pop}}$$

Multiply 'simple household population' by 2010 headship rates, by age, by town to get 'simple households'. Sum 'simple households' to get regional 'simple households'.

$$\boxed{2030 \text{ Simple HH Pop}} \times \boxed{2010 \text{ HR by Town}} = \boxed{2030 \text{ Simple HH}}$$

[cont.]

DATA NEEDS

United States Census Bureau, 2010 Decennial Census

- 2010 Population in Households, by age, by town
- 2010 Households, by age of head of household, by town

Connecticut State Data Center, 2015-2040 Population Estimates

- 2015-2030 Population Estimates, by age, by town
- 2015 Group Quarters Population Estimates, by age, by town

INTERIM PRODUCTS

- 2010 Headship Rate, by age, by town
- 2010 Regional Headship Rate, by age
- 2015 Group Quarters Population, by age, by town
- 2030 Simple Household Population, by age, by town
- 2030 Simple Households, by age
- 2015 Regional Nursing-Home Rate, by age
- 2030 Regional Nursing-Home Population Loss (additional or reduced nursing home population)
- 2030 Regional Nursing-Home Household Loss

FINAL PRODUCTS

- 2030 Households, by age

3) Calculate additional household loss from nursing-home population, by age for the region.

Calculate rate of nursing-home share of total population, by age, for the region in 2015 (base year).

$$\boxed{2015 \text{ NH Pop}} \div \boxed{2015 \text{ Pop}} = \boxed{2015 \text{ NH Rate}}$$

Calculate additional nursing-home population loss, by age, in 2030.

$$\boxed{2030 \text{ NH Pop}} - \boxed{2015 \text{ NH Pop}} = \boxed{2030 \text{ NH Pop Loss}}$$

Multiply additional nursing-home population loss, by age, in 2030, by regional headship rate, by age.

$$\boxed{2030 \text{ NH Pop Loss}} \times \boxed{2010 \text{ Regional HR}} = \boxed{2030 \text{ NH HH Loss}}$$

4) Calculate 2030 households by subtracting households lost from additional nursing-home population from 'simple households'.

$$\boxed{2030 \text{ Simple HH}} - \boxed{2030 \text{ NH HH Loss}} = \boxed{2030 \text{ HH}}$$

* Note: *If current Group Quarters counts (must include Nursing Home counts) are unavailable, a simplified calculation would use only steps one and two, omitting any calculations that require Group Quarters counts. Steps for this calculation may be found on page 14 of the [Southeastern Connecticut Housing Needs Assessment \(2018\)](#).*

10-year Net Household Formations and Losses

Example year: 2015 to 2025.

Head of Household Ages in 2025 (projection years must be spaced 10-years, same as age cohorts).

1) Determine net household formation and loss of 15-24 age cohort in 2025, which is the total number of 15-24 households in 2025.

$$\boxed{2025 \text{ HH } 15-24} = \boxed{15-24 \text{ Net Form/Loss}}$$

2) Determine net household formation and loss of 25-34, 35-44, 45-54, 55-64, 65-74, and 75-84 age cohorts in 2025 by subtracting the total households from the net-youngest age cohort in 2015.

$$\boxed{2025 \text{ HH } 25-34} - \boxed{2015 \text{ HH } 15-24} = \boxed{25-34 \text{ Net Form/Loss}}$$

$$\boxed{2025 \text{ HH } 35-44} - \boxed{2015 \text{ HH } 25-34} = \boxed{35-44 \text{ Net Form/Loss}}$$

$$\boxed{2025 \text{ HH } 45-54} - \boxed{2015 \text{ HH } 35-44} = \boxed{45-54 \text{ Net Form/Loss}}$$

$$\boxed{2025 \text{ HH } 55-64} - \boxed{2015 \text{ HH } 45-54} = \boxed{55-64 \text{ Net Form/Loss}}$$

$$\boxed{2025 \text{ HH } 65-74} - \boxed{2015 \text{ HH } 55-64} = \boxed{65-74 \text{ Net Form/Loss}}$$

$$\boxed{2025 \text{ HH } 75-84} - \boxed{2015 \text{ HH } 65-74} = \boxed{75-84 \text{ Net Form/Loss}}$$

3) Determine net household formation and loss of 85+ age cohort by subtracting 75-84 and 85+ households from 2025 85+ households

$$\boxed{2025 \text{ HH } 85+} - \boxed{2015 \text{ HH } 85+} - \boxed{2015 \text{ HH } 74-85} = \boxed{85+ \text{ Net Form/Loss}}$$

DATA NEEDS

Study Calculations

- 2015 Households, by age
- 2025 Households, by age

FINAL PRODUCTS

- Net Formation or Loss of Households by 10-year Age Cohort in 2025
 - 15-24 Net Formed
 - 25-34 Net Formed/Lost
 - 35-44 Net Formed/Lost
 - 45-54 Net Formed/Lost
 - 55-64 Net Formed/Lost
 - 65-74 Net Formed/Lost
 - 75-84 Net Formed/Lost
 - 85+ Net Formed/Lost

Household Tenure

Example year: 2030.

1) Calculate 2010 household tenure rates (renter- and owner-occupied households), by age of head of household, for each town. Calculate regional tenure rates, by age, by summing renter- and owner-occupied, and total, households.

$$\boxed{\text{2010 Renter HH}} \div \boxed{\text{2010 HH}} = \boxed{\text{2010 Renter Rate}}$$

$$\boxed{\text{2010 Owner HH}} \div \boxed{\text{2010 HH}} = \boxed{\text{2010 Regional Renter Rate}}$$

$$\boxed{\text{2010 Regional Renter HH}} \div \boxed{\text{2010 Regional HH}} = \boxed{\text{2010 Owner Rate}}$$

$$\boxed{\text{2010 Regional Owner HH}} \div \boxed{\text{2010 Regional HH}} = \boxed{\text{2010 Regional Owner Rate}}$$

2) Calculate 'simple renter- and owner-occupied households', by age, by town. Sum households to get regional households, by tenure, by age.

$$\boxed{\text{2030 Simple HH}} \times \boxed{\text{2010 Renter Rate}} = \boxed{\text{2030 Simple Renter HH}}$$

$$\boxed{\text{2030 Simple HH}} \times \boxed{\text{2010 Owner Rate}} = \boxed{\text{2030 Simple Owner HH}}$$

3) Calculate regional household tenure by subtracting would-be renter- and owner-occupied households lost to nursing homes, by age, in the region.

Determine renter- and owner-occupied households lost to nursing homes, by age.

$$\boxed{\text{2030 NH Pop Loss}} \times \boxed{\text{2010 Regional Renter Rate}} = \boxed{\text{2030 NH Renter Loss}}$$

[cont.]

DATA NEEDS

United States Census Bureau, 2010 Decennial Census

- 2010 Households, by age, by town
- 2010 Renter-occupied Households, by age, by town
- 2010 Owner-occupied Households, by age, by town

Study Calculations

- 2030 Simple Households, by age, by town
- 2030 Nursing Home Household Loss, by age, by town

INTERIM PRODUCTS

- 2010 Renter Rate, by age, by town
- 2010 Owner Rate, by age, by town
- 2010 Regional Renter Rate, by age
- 2010 Regional Owner Rate, by age
- 2030 Simple Renter Households, by age
- 2030 Simple Owner Households, by age
- 2030 Nursing Home Renter Loss, by age
- 2030 Nursing Home Owner Loss, by age

FINAL PRODUCTS

- 2030 Renter Households, by age
- 2030 Owner Households, by age

2030 NH Pop Loss	x	2010 Regional Owner Rate	=	2030 NH Owner Loss
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Subtract would-be renter- and owner-occupied households lost to nursing homes, by age, from 'simple renter- and owner-occupied households', by age.

2030 Simple Renter HH	-	2030 NH Renter Loss	=	2030 Renter HH
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2030 Simple Owner HH	-	2030 NH Owner Loss	=	2030 Owner HH
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Household Income

Example year: 2030.

1) Calculate share of heads of household by 16 income ranges and five age cohorts, in the region. Calculate regional totals by summing town-level households in each income range, by age.

<u>Age</u>	<u>Income</u>
$\left(\begin{array}{l} \bullet <25 \\ \bullet 25 - 44 \\ \bullet 45 - 64 \\ \bullet 65+ \end{array} \right)$	<ul style="list-style-type: none"> <li style="width: 50%;">• <\$10,000 <li style="width: 50%;">• \$45 - 50,000 <li style="width: 50%;">• \$10 - 15,000 <li style="width: 50%;">• \$50 - 60,000 <li style="width: 50%;">• \$15 - 20,000 <li style="width: 50%;">• \$60 - 75,000 <li style="width: 50%;">• \$20 - 25,000 <li style="width: 50%;">• \$75 - 100,000 <li style="width: 50%;">• \$25 - 30,000 <li style="width: 50%;">• \$100 - 125,000 <li style="width: 50%;">• \$30 - 35,000 <li style="width: 50%;">• \$125 - 150,000 <li style="width: 50%;">• \$35 - 40,000 <li style="width: 50%;">• \$150 - 200,000 <li style="width: 50%;">• \$40 - 45,000 <li style="width: 50%;">• >\$200,000

$$\boxed{\text{[Income Range by Age]}} \div \boxed{\text{[Total Households by Age]}} = \boxed{\text{[Income Pct of Age Group]}}$$

2) Calculate expected distribution of future household incomes by age of head of household using percent share of households in each income range, by age, and regional household projections by age.

$$\boxed{\text{2030 Simple HH}} - \boxed{\text{2030 NH HH Loss}} = \boxed{\text{2030 HH}}$$

3) Assign income ranges to low income, moderate income and upper income categories

Obtain HUD Income Limits for Low-Income Households (reports income limits for Extremely Low, Very Low (<50%) and Low (<80%), adjusted by household size)

Determine most representative household size for reporting income ranges

Determine 130% AMI Income (derive from stated 80% AMI)

DATA NEEDS

United States Census Bureau, 2011-2015 American Community Survey

- Household Type by Household Size
- Age of Householder by Household Income

HUD 2015 Adjusted Home Income Limits, New London- Norwich HMFA

FINAL PRODUCTS

- 2030 Households by Age and Income

Total Housing Units Needed

Example year: 2030.

Average counts from 2014 and 2015 (American Community Survey) were used because those years closely resembled desired vacancy rates of rental and for-sale properties.

1) Calculate region-level, 2014/2015-average housing units by occupancy characteristics (owner-occupied, renter-occupied, vacant-for-rent, vacant-rented, vacant-for-sale, and vacant-sold).

$$\left[\begin{array}{c} \text{'15 Owner} \\ \text{HH} \end{array} + \begin{array}{c} \text{'14 Owner} \\ \text{HH} \end{array} \right] / 2 = \text{14-15 Owner HH}$$

$$\left[\begin{array}{c} \text{'15 Renter} \\ \text{HH} \end{array} + \begin{array}{c} \text{'14 Renter} \\ \text{HH} \end{array} \right] / 2 = \text{14-15 Renter HH}$$

$$\left[\begin{array}{c} \text{'15 Vac For} \\ \text{Rent HU} \end{array} + \begin{array}{c} \text{'14 Vac For} \\ \text{Rent HU} \end{array} \right] / 2 = \text{14-15 Vac For Rent HU}$$

$$\left[\begin{array}{c} \text{'15 Vac} \\ \text{Rented HU} \end{array} + \begin{array}{c} \text{'14 Vac} \\ \text{Rented HU} \end{array} \right] / 2 = \text{14-15 Vac Rented HU}$$

$$\left[\begin{array}{c} \text{'15 Vac For} \\ \text{Sale HU} \end{array} + \begin{array}{c} \text{'14 Vac For} \\ \text{Sale HU} \end{array} \right] / 2 = \text{14-15 Vac For Sale HU}$$

$$\left[\begin{array}{c} \text{'15 Vac} \\ \text{Sold HU} \end{array} + \begin{array}{c} \text{'14 Vac} \\ \text{Sold HU} \end{array} \right] / 2 = \text{14-15 Vac Sold HU}$$

[cont.]

DATA NEEDS

United States Census Bureau, 2011-2015 American Community Survey

- 2011-2015 Occupancy Characteristic of Housing Units, by town

United States Census Bureau, 2010-2014 American Community Survey

- 2010-2014 Occupancy Characteristic of Housing Units, by town

Study Calculations

- 2030 Renter Households, by age
- 2030 Owner Households, by age

INTERIM PRODUCTS

- 2014/2015 Owner Households
- 2014/2015 Renter Households
- 2014/2015 Vacant for Rent Housing Units
- 2014/2015 Vacant Rented Housing Units
- 2014/2015 Vacant for Sale Housing Units
- 2014/2015 Vacant Sold Housing Units
- Owner Multiplier
- Renter Multiplier

FINAL PRODUCTS

- 2030 Owner (For-Sale) Housing Units
- 2030 Renter (For-Rent) Housing Units

2) Calculate owner- and renter-housing unit multipliers. The owner-housing unit multiplier is the sum of vacant-sold, vacant for-sale, and owner-occupied units, divided by owner-occupied units. The renter-housing unit multiplier is the sum of vacant-for-rent, vacant-rented, and renter-occupied units, divided by renter-occupied units.

$$\left[\begin{array}{c} 14-15 \text{ Vac Sold HU} \\ 14-15 \text{ Vac For Sale HU} \\ 14-15 \text{ Owner HH} \end{array} \right] \div \begin{array}{c} 14-15 \\ \text{Owner HH} \end{array} = \text{Owner Multiplier}$$

$$\left[\begin{array}{c} 14-15 \text{ Vac Rented HU} \\ 14-15 \text{ Vac For Rent HU} \\ 14-15 \text{ Renter HH} \end{array} \right] \div \begin{array}{c} 14-15 \\ \text{Renter HH} \end{array} = \text{Renter Multiplier}$$

3) Multiply future owner- and renter-occupied households by owner and renter multipliers to determine needed number of additional housing units, by tenure.

$$\begin{array}{c} 2030 \text{ Owner HH} \end{array} \times \begin{array}{c} \text{Owner Multiplier} \end{array} = \begin{array}{c} 2030 \text{ Owner HU} \end{array}$$

$$\begin{array}{c} 2030 \text{ Renter HH} \end{array} \times \begin{array}{c} \text{Renter Multiplier} \end{array} = \begin{array}{c} 2030 \text{ Renter HU} \end{array}$$