Methodological Appendix:
The Growing Shortage of Affordable Housing for the Extremely Low Income in Massachusetts

Appendix A: Estimating Extremely Low-Income Households

This report uses American Community Survey (ACS) five-year estimate microdata to attain a sample size and geographic coverage that are sufficient in estimating local-level extremely low-income (ELI) renter households. Thus the estimates of ELI households and affordable and available (AA) units are five-year averages. For 2011, these estimates cover the period 2007 through 2011. For 2016, they cover 2012 through 2016. Unless otherwise noted, references to 2011 and 2016 estimates denote five-year annual averages.

ELI households are defined by the US Department of Housing and Urban Development (HUD) as households with incomes at or below 30 percent of the area mean income (AMI), dependent on household size and the corresponding HUD Fair Market Rent Area (HMRA), or households whose income does not exceed the federal poverty level, if it is greater than 30 percent of the AMI. In defining ELI households for this report, two adjustments are made to the HUD definition. These adjustments are intended to account for temporary decreases in household income resulting from job loss or personal choice. These adjustments are also applied to HUD's definitions of the very low-income (VLI) and low-income (LI) categories. A third category, higher income (HI), refers to households with incomes above the LI threshold (80 percent of the AMI) and to the households that are removed from the other three categories through the adjustments.

The first adjustment to the ELI household estimate is identical to the one used by HUD in its biennial *Worst Case Needs* series of reports.[i] Households that had a negative total income during the survey year are not included in the estimate of ELI households (or other HUD income categories) if their gross rent (contract rent plus utilities) exceeded their area's fair market rent (FMR) value. This adjustment addresses the ACS inclusion of income from wages and income from farm and non-farm businesses, which can be negative. Removing these households from the ELI, VLI, and LI estimates assumes that households that have negative income but are renting units above the FMR level are likely experiencing temporary decreases in income and are normally able to afford the higher level of rent. This adjustment resulted in about 300 households being removed from the base number of ELI households for both 2011 and 2016.

The second adjustment to the total number of ELI households removed households in which the head—denoted in the ACS as the reference person for the household survey—was a student. This adjustment assumes that households that meet the ELI income definition and are headed by a student have

temporarily low income resulting from the head's decreased or zero work hours while in school. While these households currently may meet the ELI definition, they likely do not fit in the longer-term ELI population. This adjustment had the greatest impact on the ELI household total, resulting in 20,000 to 30,000 being removed from the base count for both 2011 and 2016.

Table A: Estimates of Extremely Low-Income Renter Households, Before and After Adjustment Massachusetts, 2011 and 2016		
Year	**Before Adjustment**	**After Adjustment**
2011	309,456	271,833
2016	307,695	274,842

Note(s): Estimates represent five-year averages for the periods ending in 2011 and 2016.

Source(s): Source: ACS 5–year estimates for 2011 and 2016; HUD Income Limits for 2011 and 2016

Local Area Estimates

For the estimates of local ELI households, ACS Public Use Microdata Areas (PUMA) are "crosswalked" to Massachusetts city and town areas using methods similar to those applied in the Urban Institute report titled *The Housing Affordability Gap for Extremely Low-Income Renters in 2014*.[ii] The steps for this process were roughly as follows:

1) Aggregate tables were retrieved from the US Census Bureau's American FactFinder website that report the number of owner and renter households, as well as vacant units, by census tract area in Massachusetts.

2) Census tracts were matched to their corresponding PUMA and calculated the proportion of PUMA households in each census tract for each household group type (owner, renter, vacant unit), with the resulting census tract weight adjustment multiplied by the household weight found in the ACS microdata file. The weight adjustments were then matched to the ACS microdata records based on PUMA, dependent on whether the household record was for an owner or renter household or for a vacant for-rent unit. At this stage, each unique record in the ACS file corresponds to at least one adjustment weight matching record.

3) Household weights (HHWT) were multiplied by the weight adjustment to create a census-tract-level household weight.

4) The renter household and vacant unit records were matched to corresponding county subdivisions. The adjusted household weights were summed to achieve estimates of city and town renter households and vacant units.

Applying ELI Thresholds

After applying the adjusted weights, HUD income limit thresholds were matched to corresponding cities and towns by census tract to the expanded ACS dataset for both 2011 and 2016. HUD provides these income limits for ELI, VLI, and LI thresholds by household size, ranging from one person to eight people. Income limit thresholds were calculated for households with more than eight people by applying the methods outlined on HUD's Income Limits website.[iii] A household was identified as belonging to each of the HUD income groups if its household income was at or below the maximum threshold for its household size. At this point, apply the adjustments to the ELI estimate. Households in which the head was a student and households that had negative incomes but were renting apartments above the FMR for their area were removed from the total number of identified ELI households.

Limitations

Estimating at the local level is necessarily risky, even with the expanded sample size of the ACS five-year files. Many cities and towns in Massachusetts have relatively few renter households and correspondingly fewer ELI households once the adjusted weights are applied. For this reason, smaller communities may suffer from large margins of error and thus yield inaccurate estimates of ELI households.

Adjusting ELI estimates to remove student-led households represents a departure from similar studies that use a measure based solely on income. Assuming that student-led households are experiencing temporary declines in incomes may be appropriate for some but not all of these households. Once a student head is back in the labor force full time, the household income may still qualify the household as ELI, and thus estimates in this report may understate the long-term ELI population. ELI-affordable units in which student-led households reside are also not counted in the final measure of AA units. Instead they are classified as affordable units occupied by HI households, thus reducing the total number of AA units. If these households were included in the ELI estimate, it is likely the total number of AA units would also increase.

This report also does not include estimates of the homeless population, which likely intersects with the ELI household population in terms of income level. Including these estimates would increase the total ELI

renter household population. Also, the estimates treat households as single units and do not take into account incidence of doubling up due to household costs.

Appendix B: Estimating Affordable and Available Units

This report uses a common measure for affordable rental supply—affordable and available (AA)—that determines a rental unit's affordability regardless of whether the household living in the unit can afford it based on the 30 percent measure. [iv] A unit is considered affordable to an ELI household if the unit's annual gross rent is less than or equal to 30 percent of the maximum ELI income threshold (where bedroom size equals household size). A unit is affordable *and* available if it is affordable *and* occupied by an ELI household or vacant. A household may choose to live in a unit that is more expensive through personal choice or through a mismatch in the market caused by the unit's location and the timing of when the unit became available.

Vacant units are included under the same affordability definition, with utilities estimated based on the average utility cost for an occupied rental unit of similar bedroom size and unit type. This "hot-decking" method is the same one used in HUD's *Worst Case Needs* series of reports.[v] Of the supply of units affordable to ELI households, a certain number will be occupied by households with higher incomes. These units are classified as unavailable, meaning they are not likely to become available to rent by ELI households in a given year, because the occupants will likely continue residing in them. Thus, of the affordable units identified, only those that were affordable *and* available were counted. The result is an estimate of the maximum number of units in Massachusetts that were affordable and available to ELI households in 2011 and 2016. Unless otherwise stated, references in this report to the supply of AA units are specific to ELI households.

To estimate the number of AA units by their source (federal, state, or private market), this report expands on similar previous studies by including publically available data on Massachusetts state-funded subsidized housing. This data come from the National Housing Preservation Database (NHPD), which compiles data on subsidized units from a plethora of sources and links this information to distinct properties. The source of the Massachusetts data is the Community Economic Development Assistance Corporation (CEDAC), which provides an inventory of "expiring use properties in the state." These data are limited, however, and are not a complete and accurate inventory of all state-subsidized or rent restricted units.

Following methods similar to those in the 2017 Urban Institute report titled *The Housing Affordability Gap for Extremely Low-Income Renters*, a subsidized unit is assumed to be included in the total estimate of AA

units if it was occupied by an ELI household and the household did not pay more than 30 percent of its annual income toward gross rent. In total, 10 programs were included from three sources of funding:[vi]

- **HUD programs**
    o Housing Choice Vouchers (HCV)
    o Project Based Section 8 (PBS8)
    o Public Housing
    o Mod Rehab
    o RentSup/RAP
    o 202/PRAC
    o 811/PRAC
- **USDA programs**
    o Section 536
    o Section 511
- **Massachusetts state-only funded properties**
    o Various

A HUD rental-assistance program unit was included if it was occupied by an ELI household *and* the household did not pay more than 30 percent of its annual income toward gross rent. A USDA or Massachusetts state-funded rental-assistance program unit was included if it was occupied by an ELI household only; data on rent burden is not available for those units. Thus, it was assumed all occupants of units under these programs were in AA units based on the 30 percent threshold. Data for these programs come from the NHPD. If the NHPD reports the percentage of occupants that were ELI, that figure was used, otherwise an average of the properties active in 2011 and 2016 was assigned. To arrive at an estimate of market-supplied rental units the following formula was used:

Market units = Total AA units – (HUD AA units + USDA AA units + State AA units)

Data on rent burden among HUD program participants were taken from HUD's Public Use Microdata sample. Rates of rent burden were calculated at the national level.

Limitations

This report's estimates of the maximum number of AA units are based on the maximum income threshold for an ELI household. It is possible for a unit to be counted as AA but not be affordable and available based on the rent being 30 percent of household income if there are no ELI households with incomes at the maximum. For example, if the maximum annual income is $25,000 for a four-person household to qualify as ELI in a particular area, and all four-person ELI households in that area have annual incomes that are less than that amount, a unit would not be affordable, because all ELI households would, in practice, be spending more than 30 percent of their income on rent. This report also does not take into account unit quality, because a variety of measures have been used across different programs, and there is no way to verify if all subsidized units meet the same quality standards. Therefore, this report's estimates of the number of AA units available to ELI households are greater than they would be if unit quality were taken into account.

This report relies on reported contract rent and utility costs from the ACS to estimate AA units. For households receiving subsidies to help with rent payments, it is not stated whether they are reporting the full rental cost of the apartment or their share of the rent after receiving the subsidy. This report assumes the latter, and thus may erroneously identify an affordable unit as unaffordable if the household reports the full contract rent but pays less due to receiving a subsidy.[vii]

Finally, tax-credit and other supply-side subsidy programs are excluded from the estimate of AA units because these programs set maximum rents for units that are much higher than ELI households can afford. Units are affordable only if they are paired with an additional rental subsidy, as is the case with a Low-income Housing Tax Credit (LIHTC), which is commonly paired with PBS8 rental assistance when used by an ELI household.[viii] This report includes those programs most likely to be paired with LIHTC and other supply-side programs, but it is still possible for LIHTC-only units to be affordable and available for ELI households. If they are, this report would undercount the number of federally subsidized AA units. A similar limitation involves the exclusion of the Massachusetts Rental Voucher Program (MRVP) from estimates of state-funded affordable housing units. These vouchers have minimum rent-share payments of 35 percent to 40 percent, but there were no publically available data on MRVP vouchers at the time of this report.

Appendix C: Estimating the State's Supply of Subsidized Housing

To contextualize the current inventory of housing that is affordable and available to ELI renter households and project the future supply, this report relies primarily on the National Housing Preservation Database (NHPD). In addition to project-based subsidies that are directly used to create affordable and available (AA) units (such as Project Based Section 8 units), the NHPD also includes tax-credit and other subsidy programs that, on their own, are not likely to make units affordable for extremely low-income (ELI) households, but which are used to create subsidized housing. The NHPD contains both property- and subsidy-specific information from a variety of disparate datasets. However, the NHPD includes only those subsides that are linked to a property and cannot be moved to another unit.

For the first year the property was available, the date of the first subsidy available was assigned. The last date property subsidy was available was used as the end date for the property counting toward total affordable housing inventory.

If no data were available on the percentage of units occupied by ELI households, this report made three assumptions. First, if the program was a HUD rental-assistance program found in HUD's Picture of Subsidized Households dataset, the statewide ELI occupancy rate was assumed. Second, if the project was LIHTC funded and no other program was present, the minimum requirement of 10 percent ELI occupancy found in the state's Department of Housing and Community Development (DHCD) 2016 Qualified Allocation Plan was assumed. Third, for all other missing data, the average of the 2016 active property occupancy rates was assumed.

Limitations

Estimates based on the NHPD come with several caveats. The NHPD is compiled by the Pubic and Affordable Housing Research Corporation (PAHRC) and the National Low Income Housing Coalition (NLIHC), which take datasets from disparate areas and match specific subsidy programs to single properties based on available data. Data are updated on a rolling basis, and although previously entered data are maintained, it is not clear how changes to variables such as the percentage of ELI household are implemented. It is assumed that the reported variables represent the most up-to-date information available, and so estimating ELI-occupied units in the past is not possible with the NHPD. The assumptions

made for ELI occupancy likely overestimate the number of ELI-occupied units, because the bulk of assigned values are based on statewide average occupancy levels.

Not every variable in the NHPD is available for every type of subsidy program. In some cases, subsidy information is imputed based on program regulations and minimum requirements. This is the case with expiration dates of subsidies. The NHPD assumes subsidy programs will last the full length of the minimum required period under applicable regulations. In some cases this may suffice. In others, this assumption may overstate the duration of a subsidy if the owner chooses to exit the program early. In such an instance, the subsidy would continue to be listed as active until the database was updated.

Lastly, estimates of units with expiring subsidies based on the final date that any subsidy is available likely understate the real need for preserving subsidized housing. This is because the NHPD includes HUD mortgage insurance program units in its database if those properties receive some other form of subsidy (HUD, USDA, or other source). The terms on these mortgages last 40 or more years in some cases, but they do not necessarily represent when all of the subsidies that are important to rental affordability will end.

Endnotes

[i] Watson, Nicole, Barry L. Steffen, Marge Martin, and David A. Vandenbroucke. 2017. *Worst Case Needs: 2017 Report to Congress.* US Department of Housing and Urban Development Office of Policy Research and Development. Washington, DC.

[ii] Getsinger, Liza, Lily Posey, Graham MacDonald, and Josh Leopold. 2017. *The Housing Affordability Gap for Extremely Low-Income Renters in 2014.* Urban Institute. Washington, DC.

[iii] US Department of Housing and Urban Development (HUD). 2016c. 2011 and 2016 Data for Section 8 Income Limits. US Department of Housing and Urban Development. Washington, DC.

[iv] Vandenbroucke, David A. 2011. *Housing Affordability Data System.* US Department of Housing and Urban Development. Washington, DC; Mierzwa, Erin, Kathryn P. Nelson, and Harriet Newburger. 2010. *Affordability and Availability of Rental Housing in Pennsylvania.* Federal Reserve Bank of Philadelphia. Philadelphia, PA.; and Leopold, Josh, Liza Getsinger, Pamela Blumenthal, Katya Abazajian, and Reed Jordan. 2015. *The Housing Affordability Gap for Extremely Low-Income Renters in 2013.* Urban Institute. Washington, DC.

[v] Watson, Nicole, Barry L. Steffen, Marge Martin, and David A. Vandenbroucke. 2017. *Worst Case Needs: 2017 Report to Congress.* US Department of Housing and Urban Development Office of Policy Research and Development. Washington, DC.

[vi] Getsinger, Liza, Lily Posey, Graham MacDonald, and Josh Leopold. 2017. *The Housing Affordability Gap for Extremely Low-Income Renters in 2014.* Urban Institute. Washington, DC.

[vii] Kingkade W. Ward. 2017. "What Are Housing Assistance Support Recipients Reporting as Rent?" SEHSD Working Paper 2017-44. US Census Bureau: Social, Economic, and Housing Statistics Division. Washington, DC.

[viii] Massachusetts Department of Housing and Community Development (DHCD). 2017. *MRVP: Massachusetts Rental Voucher Program Administrative Plan.* Massachusetts Department of Housing and Community Development. Boston, MA.