IMPLEMENTING WASHINGTON STATE'S SSB 5587

METHODOLOGY FOR MEASURING PRODUCTION OF HOUSING AT DIFFERENT AFFORDABILITY LEVELS

Steven C. Bourassa

Christian P. Phillips

COLLEGE OF BUILT ENVIRONMENTS
UNIVERSITY OF WASHINGTON

WCRER
WASHINGTON CENTER FOR REAL ESTATE RESEARCH

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Introduction

This report presents the methodology to be used for tracking the production of housing at different affordability levels as required by Substitute Senate Bill 5587 (SSB 5587), which was passed into law in 2025. This legislation amended RCW 36.70A.610, adding paragraph (1)(e). That paragraph requires the Washington Center for Real Estate Research (WCRER) to report the following to the Washington legislature by October 15, 2026, and every two years thereafter:

> (i)(A) Except as provided in (e)(i)(B) of this subsection, an analysis of the estimated existing housing units and existing housing needs within each county at the following income levels: 0 to 30 percent of the area median income, 30 to 50 percent of the area median income, 50 to 80 percent of the area median income, 80 to 100 percent of the area median income, 100 to 120 percent of the area median income, and greater than 120 percent of the area median income;
>
> (B) If a county's estimated existing housing units, existing housing needs, or both, cannot be determined at the income levels under (e)(i)(A) of this subsection or at the individual county level due to insufficient data, alternative thresholds may be used to best determine existing housing units and existing housing needs;
>
> (ii) Each county's progress in closing the gap between estimated existing housing units within the county and existing housing needs; and
>
> (iii) Each county's progress in meeting emergency housing, emergency shelters, and permanent supportive housing needs within the county.

This report focuses on items (i) and (ii) above; the methodology for measuring progress in meeting emergency and permanent supportive housing needs will be addressed in a separate report.[1]

Under the Growth Management Act, fully planning counties are required to adopt, in cooperation with their cities, countywide planning policies that consider the need for affordable housing (RCW 36.70A.210(2) and (3)(e)). In 2021, House Bill 1220 amended the Growth Management Act to require these jurisdictions to "plan for and accommodate housing affordable to all economic segments of the population of the state" (RCW 36.70A.020(4)). The bill also updated the housing element requirements in RCW 36.70A.070(2). Under these provisions, comprehensive plans must include an inventory and analysis of existing and projected housing needs, as provided by the Washington State

[1] The data discussed in this report include permanent supportive housing in the 0% to 30% of area median income affordability category as well as other housing affordable to households within that income range.

Department of Commerce, for moderate-, low-, very low-, and extremely low-income households, as well as emergency housing, emergency shelters, and permanent supportive housing.

To assist counties with the affordable housing planning process, the Department of Commerce has developed the Housing for All Planning Tool (HAPT) that allows counties to project needs for permanent housing at different income levels and emergency housing based on a range of assumptions.[2] Working together, jurisdictions within each county use HAPT to identify the countywide existing and projected housing needs as required under RCW 36.70A.070(2), allocate those needs to each jurisdiction, and incorporate them into their comprehensive plan periodic updates (Figure 1).

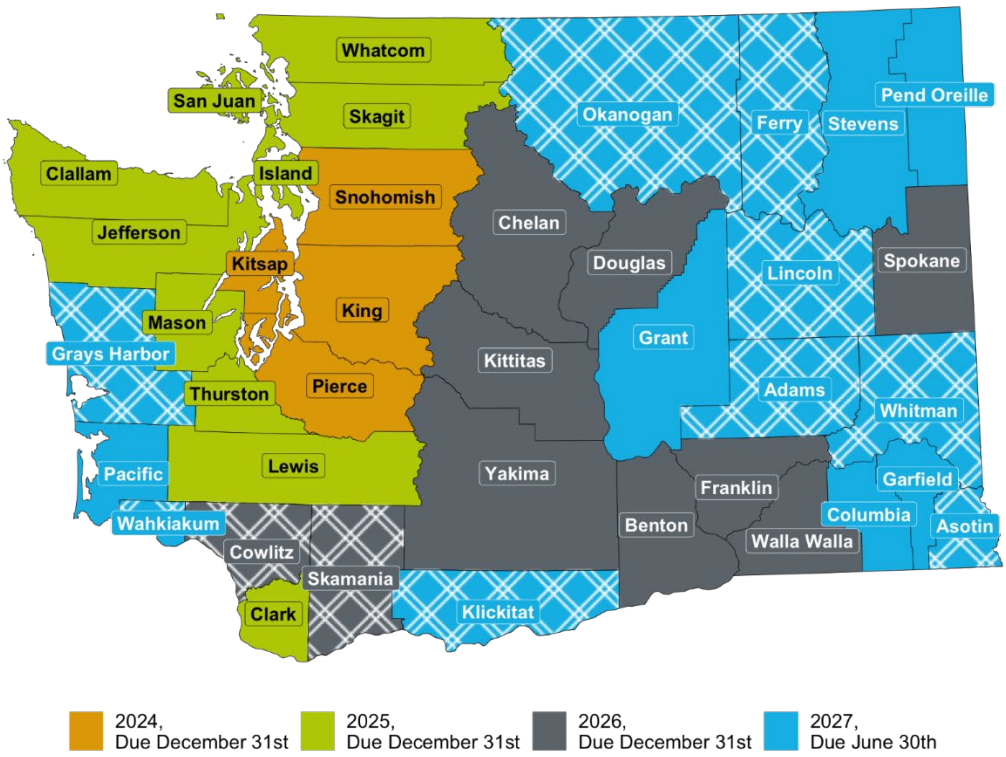

Figure 1: Comprehensive Plan Update Schedule, Washington Counties

Source: Department of Commerce

Note: Cross hatching denotes partially planning counties under the GMA.

HAPT presents permanent housing needs in terms of housing units and emergency housing and emergency shelter needs in terms of beds. It includes baseline estimates of the housing stock allocated to area median income (AMI) ranges as of 2020. The AMI limits vary

[2] The Department of Commerce has also published guidance, such as Fritzel and Hodgson (2023).

by county or metropolitan region. Projected housing needs are calculated for each of the AMI ranges for the period between 2020 and the planning horizon year (20 years after the date of the comprehensive plan update). For example, the comprehensive plans completed in 2024 anticipate needs through 2044, while the ones completed in 2025 anticipate needs through 2045. The new reporting requirement established by SSB 5587 reflects the Legislature's intent to monitor counties' progress in addressing housing needs across income levels during the planning period.

The methodology presented here reflects discussion at several meetings held during the latter half of 2025 with key regional, county, and city stakeholders. One clear message from those meetings was that the 2020 baseline numbers should not be changed for the purposes of assessing progress. Counties and cities have put significant effort into developing policies and plans based on those numbers and it would be too disruptive to change them at this point. Consistent with that, we are not proposing to make any changes to the baseline numbers.

A second message was that the methods for assessing progress should be consistent with the methods used to establish the baseline numbers.[3] A third message was that the AMI limits should be consistent with those used by the US Department of Housing and Urban Development (HUD) when producing the Comprehensive Housing Affordability Strategy (CHAS) data that is the source for some of the baseline statistics. The latter two points are to an extent at odds with each other because the baseline numbers were produced using a mix of (1) CHAS data based on AMI limits defined specifically for CHAS and (2) American Community Survey (ACS) Public Use Microdata Sample (PUMS) data based on AMI limits defined in a different way. For the sake of consistency, we have decided to use CHAS AMI limits where they are defined or limits congruent with the CHAS approach where they are not defined. However, we adjust all estimates of housing production to make them consistent with the baseline numbers.[4]

The balance of this report discusses the methods that were used to establish the baseline numbers, our application of those methods for the purpose of assessing achievement of goals, and some preliminary estimates based on the most recent data available.

[3] Alternative approaches were also proposed by stakeholders, such as using permitting or county appraisal data, but those methods would not have allowed us to accurately assign housing units to affordability levels, as required by SSB 5587.

[4] There are other discrepancies between the CHAS approach and the way the PUMS data were handled when creating the baseline numbers that we also avoid by using the CHAS methodology throughout.

Baseline Numbers

The baseline estimates of the distribution of housing affordability by county were created in part using 2018 CHAS data. The CHAS data are released by HUD several years after the year to which they pertain.[5] The 2018 CHAS data are based on the 2014-2018 five-year ACS. Unlike the publicly available ACS PUMS data, the CHAS statistics are based on the complete ACS results and are reported at a more disaggregated level of geographic detail.[6] Specifically, CHAS data are available for each county in the state, while the PUMS data are organized into Public Use Microdata Areas (PUMAs) that combine smaller counties into groups (see Appendix A).[7] A disadvantage of the CHAS data is that they are published about one year after the release of the ACS data, meaning that they are less timely.

Another disadvantage of the CHAS data is that they provide affordability details for only some of the income categories of interest. The CHAS data provide statistics on the affordability of owner-occupied and rental housing for the following AMI categories:

- Owner affordability: 0% to 50%, >50% to 80%, >80% to 100%, and >100% of AMI
- Rental affordability: 0% to 30%, >30% to 50%, >50% to 80%, and >80% of AMI

To allocate owner-occupied units between the 0% to 30% and >30% to 50% AMI categories, it was assumed that no units were affordable to the lower category. This meant that all owner-occupied units listed by CHAS as affordable to the 0% to 50% AMI category were assigned to the >30% to 50% category. Because the CHAS data do not provide a detailed breakdown of rental affordability above 80% of AMI or of owner affordability above 100% of AMI, PUMS data were used to allocate units above those levels.

To update the 2018 CHAS numbers to 2020, they were weighted using 2020 Washington State Office of Financial Management (OFM) housing stock numbers, adjusted to exclude seasonal and migrant worker housing.[8] This means that the sum of the housing units across all the affordability categories is consistent with the adjusted total in the OFM data for each county. Data from the 2020 PUMS (based on the five-year ACS data for 2016 to 2020) were used to allocate housing units to the upper AMI categories not delineated in the CHAS data. The allocations were distributed across the counties that were grouped within a single PUMA, on the basis of county populations.

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[5] The CHAS data are available at https://www.huduser.gov/portal/datasets/cp.html.
[6] The PUMS data are available at https://www.census.gov/programs-surveys/acs/microdata/access.html.
[7] The CHAS data are also available for cities.
[8] The OFM data are available at https://ofm.wa.gov/data-research/population-demographics/estimates/april-1-official/. The seasonal and migrant worker housing numbers are from the relevant five-year ACS, available at https://data.census.gov.

The method used in the CHAS data to allocate housing units to affordability categories is described in Joice (2014). Annualized gross rents (including utilities) are used to measure housing costs for rental housing. Given the assumption that 30% of household income is the maximum affordable housing cost, annualized rent is divided by 0.3 to obtain the minimum required annual household income:

$$Required\ Annual\ Household\ Income_{Renter} = (Monthly\ Gross\ Rent\ \times 12)/0.3$$

For owner-occupied housing, it is assumed that a house is affordable if the price of the house is no more than 3.36 times household income.[9] Hence:

$$Required\ Annual\ Household\ Income_{Owner} = House\ Price/3.36$$

Note that the prices of owner-occupied houses are estimated by the current occupants, meaning that they may be less accurate than the rents reported for renter-occupied units.[10]

As noted above, AMIs vary depending on household size. Starting with AMIs calculated for four-person households, CHAS then adjusts those for household size based on the number of bedrooms in each unit.[11] These adjustments are roughly consistent with those that HUD makes to its Section 8 AMIs to account for household size (Tables 1 and 2).[12] Once the appropriate adjustment is made to the relevant AMI categories, the required minimum household income can be assigned to an affordability category.

To give a hypothetical example, assume a two-bedroom rental unit with a gross monthly rent of $2,000. The required annual household income would be calculated as ($2,000 x 12)/0.3 = $80,000. If the CHAS 80% AMI for a four-person household is $85,000, then the 80% AMI limit for this two-bedroom unit would be $85,000 x 0.90 = $76,500. Assume that the relevant 100% AMI limit is $95,625. Because the required household income for this

[9] The rationale for this multiplier is explained by Joice (2014). Although a constant multiplier ignores changing factors that affect the cost of homeownership, such as mortgage interest rates, the same multiplier continues to be used to produce the CHAS data.

[10] Multiple studies have estimated the bias in homeowners' estimates of the values of their houses. These studies include Benítez-Silva et al. (2015), who found that homeowners tend to overestimate the values of their homes in surveys such as the American Housing Survey. This may be less of an issue today due to the widespread availability of objective estimates of home values, such as those provided by Zillow.

[11] The CHAS data are based on calculations of separate estimates of 50% and 80% of AMI for each metropolitan area or county and then bases all other income limits on multiples of the 50% limit. For example, the 100% limit is calculated as double the 50% limit. Note that the 80% limit is not necessarily 1.6 times the 50% limit.

[12] However, instead of assuming two persons per bedroom, the CHAS calculations assume one and one-half persons; see Joice (2014), fn. 3, p. 302. The AMIs are developed by HUD primarily for the Section 8 and related programs and are available at https://www.huduser.gov/portal/datasets/il.html. Note that a somewhat different method was applied to the PUMS data used to produce the baseline numbers.

unit ($80,000) is between the 80% and 100% AMI limits, it would be assigned to the >80% to 100% affordability category.

Table 1. Number of Bedrooms and Household income Adjustment Factors for Estimating Affordability in CHAS

Number of bedrooms	Household income adjustment factor
0	0.70
1	0.75
2	0.90
3	1.04
4	1.16
5	1.02 + (0.12 x [number of bedrooms − 3])

Source: Joice (2014), Exhibit 3, p. 303.

Table 2. Relationship Between Household Size, Section 8 AMI Adjustment Factors, and CHAS AMI Adjustment Factors

Household size	Section 8 income adjustment factor	Bedrooms (CHAS)	Bedrooms rounded (CHAS)	CHAS income adjustment factor
1	0.70	0.67	0	0.70
1	0.70	0.67	1	0.75
2	0.80	1.33	2	0.90
3	0.90	2.00	2	0.90
4	1.00	2.67	3	1.04
5	1.80	3.33	4	1.16
6	1.16	4.00	4	1.16
7	1.24	4.67	5	1.28
8	1.32	5.33	6	1.40

Source: Authors' calculations.

Notes: The CHAS AMI adjustment factors assumes 1.5 persons per bedroom. The number of bedrooms for a household consisting of one person is rounded both up and down to allow for both one-bedroom and studio apartments.

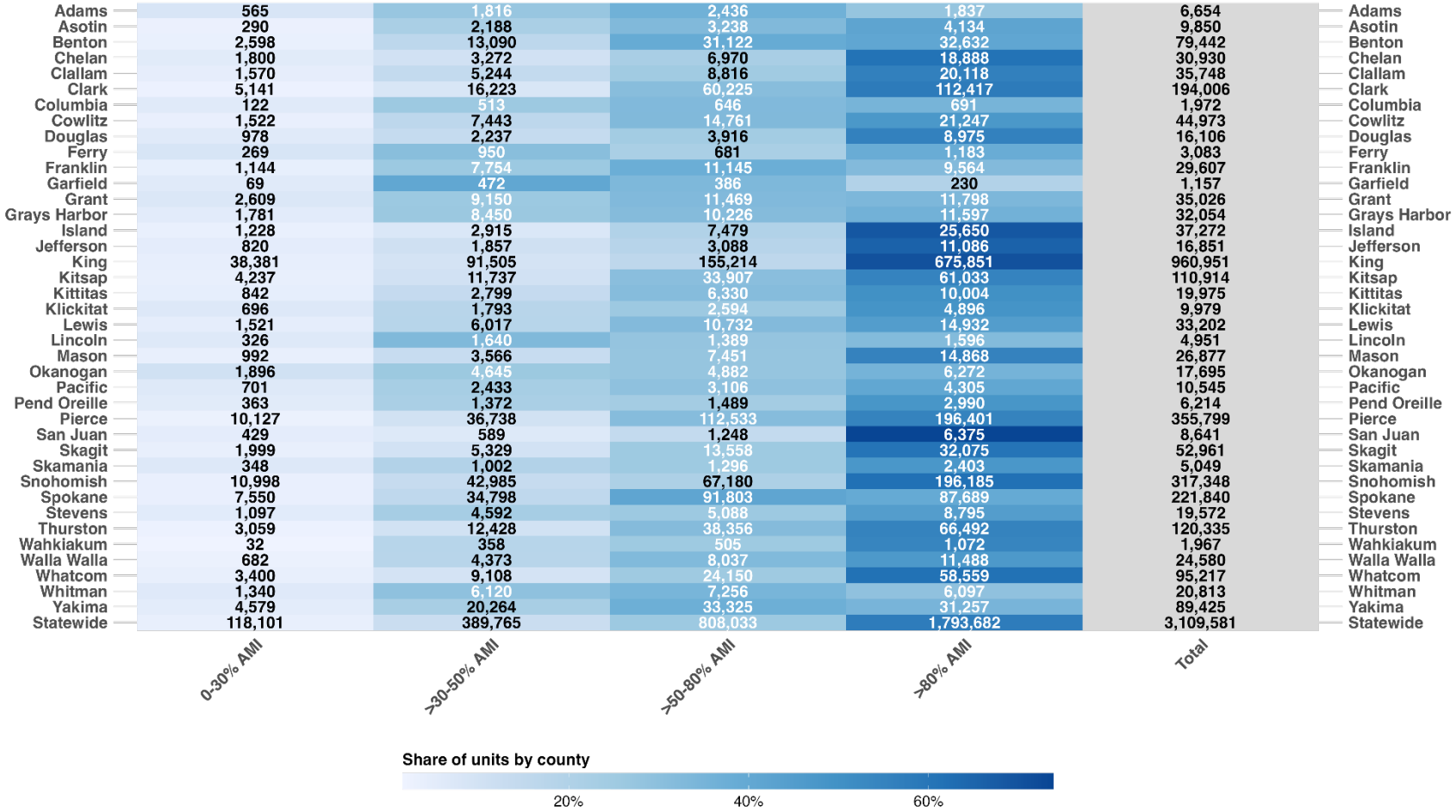
To give an example for an owner-occupied unit, assume a two-bedroom house with an estimated price of $300,000 in the same county (with the same AMI limits) as the rental example given in the preceding paragraph. The annual household income needed to afford

to purchase this house would be $300,000/3.36 = $89,286. Because it is a two-bedroom house, the AMI limits calculated for the rental example above apply here. The required income is between the 80% and 100% AMI limits, so this unit would also be assigned to the >80% to 100% affordability category.

Tables 3 and 4 provide the HAPT baseline numbers for the different affordability categories. Table 3 is based entirely on the 2018 CHAS data updated to 2020 based on OFM housing stock numbers for the latter year. Table 4 adds details for the >80% AMI categories based on the 2020 five-year PUMS data. We report the data in Table 4 by county group whenever the relevant PUMA is defined in terms of a group of counties. As noted above, for the purposes of HAPT, the grouped data were allocated to counties using county populations as weights. We chose not to do that here as we think population-weighting is unlikely to give accurate results.

Table 5 provides annualized projected need by level of affordability. These numbers are based on population projections selected by the counties where available, or else on OFM's medium population projections. These numbers are subject to change if more counties adopt population projections other than the OFM mediums.

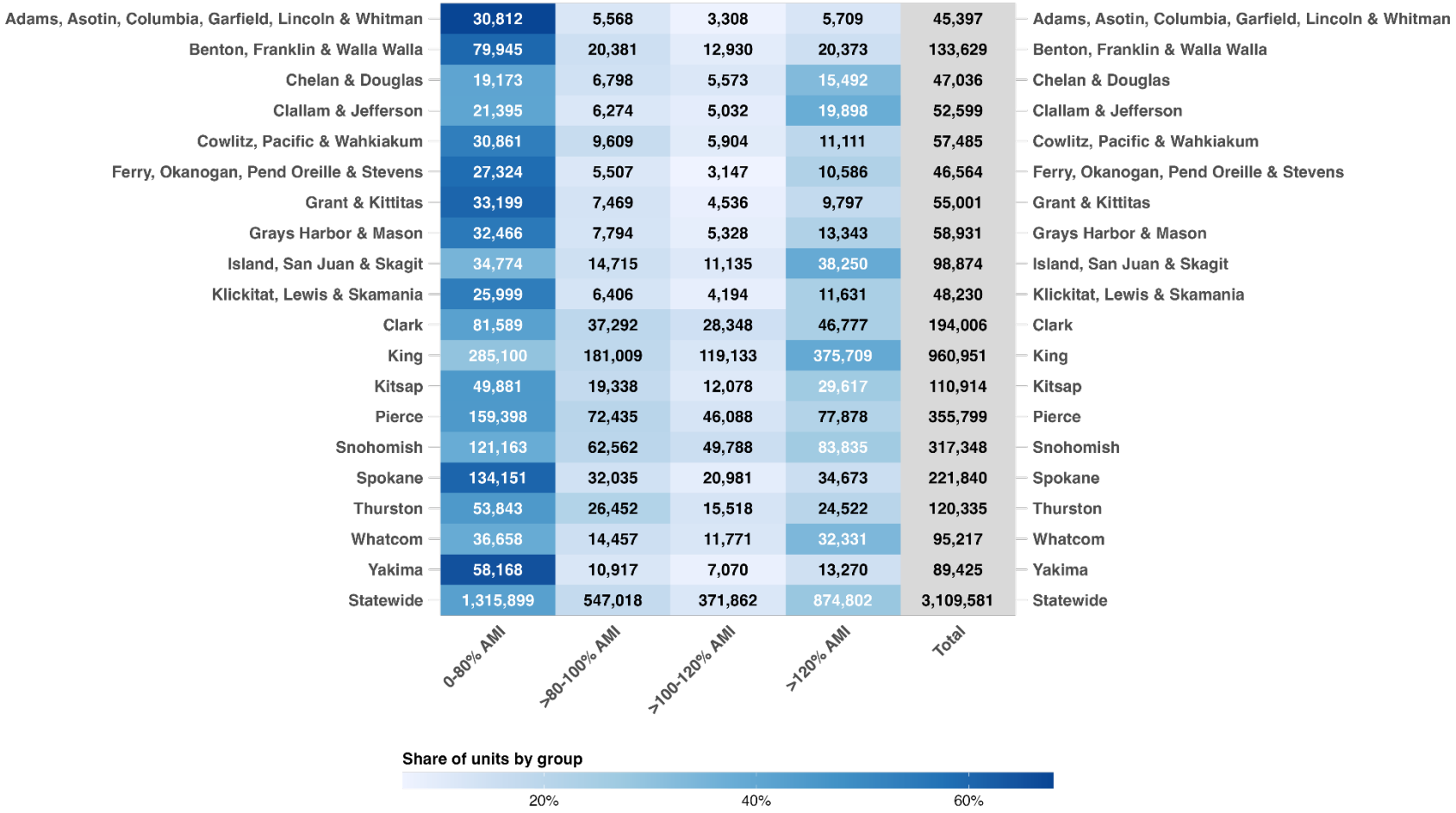
Table 3. HAPT Baseline Housing Units by Affordability Level for Counties, 2020



Source: Authors' calculations.

Note: The county data shown are based on 2018 CHAS data scaled so that the countywide totals equal the corresponding 2020 OFM housing stock numbers adjusted for seasonal and migrant housing.

Table 4. HAPT Baseline Housing Units by Affordability Level for County Groups, 2020

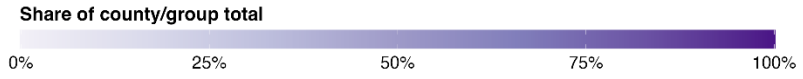


Source: Authors' calculations.

Notes: Renter-occupied units are allocated to the >80% to 100%, >100% to 120%, and >120% AMI categories and owner-occupied units were allocated to the >100% to 120% and >120% AMI categories based on 2020 five-year PUMS data. Allocations to lower AMI categories were based on 2018 CHAS data. All numbers are scaled so that the countywide totals equal the corresponding 2020 OFM housing stock numbers adjusted for seasonal and migrant housing.

Table 5. Projected Annual Need by Affordability Level, Counties and County Groups

	0-30% AMI	>30-50% AMI	>50-80% AMI	>80-100% AMI	>100-120% AMI	>120% AMI	Total
Adams	20	8	14	8	6	31	295
Asotin	18	19	6				
Columbia	3	1	0				
Garfield	3	1	0				
Lincoln	5	3	0				
Whitman	137	12	0				
Benton	276	265	180	194	202	830	2,467
Franklin	149	100	155				
Walla Walla	78	32	2				
Chelan	89	72	70	57	58	235	699
Douglas	38	34	46				
Clallam	97	61	29	17	17	65	404
Jefferson	75	23	19				
Cowlitz	170	101	36	18	19	80	489
Pacific	49	6	2				
Wahkiakum	5	2	2				
Ferry	7	1	0	19	16	72	333
Okanogan	55	16	7				
Pend Oreille	13	6	6				
Stevens	70	19	26				
Grant	107	102	127	71	69	300	933
Kittitas	102	42	15				
Grays Harbor	121	49	2	19	23	97	497
Mason	83	61	41				
Island	64	62	51	86	79	313	1,112
San Juan	25	20	17				
Skagit	179	115	100				
Klickitat	30	20	14	22	21	81	417
Lewis	110	48	29				
Skamania	27	7	8				
Clark	814	671	663	330	382	1,288	4,148
King	5,180	2,004	927	617	700	3,382	12,810
Kitsap	377	225	189	97	96	389	1,373
Pierce	1,411	862	681	293	266	1,133	4,646
Snohomish	1,839	977	714	582	683	2,182	6,977
Spokane	1,047	548	338	180	148	691	2,953
Thurston	494	337	331	175	175	662	2,174
Whatcom	476	288	116	80	108	372	1,441
Yakima	323	207	94	56	36	161	878
Statewide	14,166	7,427	5,057	2,921	3,104	12,364	45,046



Source: Authors' calculations.

Note: The numbers for Clallam, Clark, Island, Jefferson, King, Kitsap, Lewis, Mason, Pierce, San Juan, Skagit, Snohomish, Thurston, and Whatcom counties are based on population projections established by the counties, all others are based on OFM medium population projections and are subject to change if different projections are adopted. The numbers for groups of counties in the upper right part of the table represent the totals for those groups.

Assessing Progress

The sources of data for assessing progress in meeting projected needs are summarized in Figure 2. To recap, the CHAS data produced by HUD are used to allocate owner-occupied housing units to the >30% to 50%, >50% to 80%, and >80% to 100% AMI categories and to allocate rental units to the 0% to 30%, >30% to 50%, and >50% to 80% AMI categories. The >100% AMI categories for owner-occupied housing and >80% AMI categories for rental categories are allocated based on the proportions in those categories in the relevant five-year PUMS data. The numbers are scaled so that the totals for each county equal the OFM housing stock numbers adjusted for seasonal and migrant worker housing.

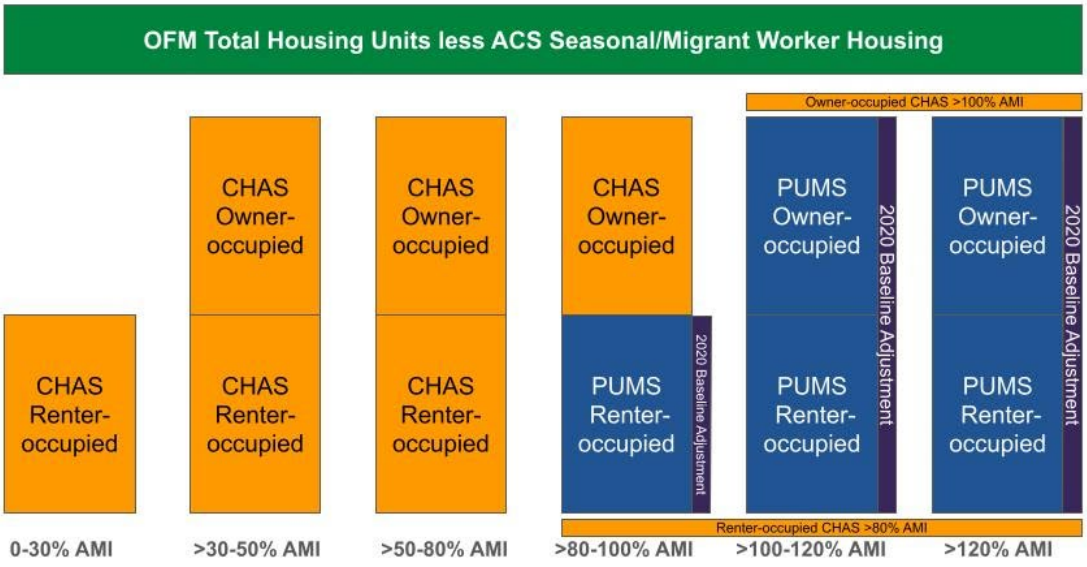


Figure 2. Sources of Data for Assessing Progress in Affordable Housing Supply

Note: Owner-occupied units that are nominally affordable at the 0% to 30% AMI category are assigned to the >30% to 50% category.

As noted above, the CHAS data are based on separate calculations of 50% and 80% limits for each metropolitan area or county, and all other limits are multiples of the 50% limits. We have obtained the 50% and 80% limits from HUD and we have used the former as the basis for calculating the other limits.

To give a simple example of how these calculations work, consider a hypothetical county with 60,000 owner-occupied units and 40,000 renter occupied units, according to CHAS. These units are allocated by CHAS into affordability categories as shown in Table 6.[13]

[13] A detailed example is provided in Appendix B.

Table 6. CHAS Allocation of Units to Affordability Categories for a Hypothetical County

Affordability category	Owner-occupied units	Renter-occupied units
0% to 30% AMI	5,000	2,500
>30% to 50% AMI		7,500
>50% to 80% AMI	15,000	15,000
>80% to 100% AMI	15,000	15,000
>100% to 120% AMI	25,000	
>120% AMI		
Total	*60,000*	*40,000*

As noted above, we assume that all the owner-occupied units assigned by CHAS to the 0% to 50% AMI level are affordable only to the households in the >30% to 50% AMI category. Assume also that the PUMS data show that, of the owner-occupied units affordable to households with >100% AMI, 60% are affordable at the >100% to 120% AMI level, while the remaining 40% are affordable to households at the >120% AMI level. Further assume that the PUMS data show that, for renter-occupied units affordable to households with >80% AMI, one-third are affordable at the >80% to 100% AMI level, one-third at the >100% to 120% AMI level, and one-third at the >120% AMI level. These assumptions result in the allocations shown in Table 7. If the OFM housing stock numbers indicate that there are a total of 110,000 units in the county, then all the estimates are scaled up by a factor of 1.1 as shown in Table 8.

Table 7. Combined CHAS and PUMS Allocation of Units to Affordability Categories for a Hypothetical County

Affordability category	Owner-occupied units	Renter-occupied units
0% to 30% AMI	0	2,500
>30% to 50% AMI	5,000	7,500
>50% to 80% AMI	15,000	15,000
>80% to 100% AMI	15,000	5,000
>100% to 120% AMI	15,000	5,000
>120% AMI	10,000	5,000
Total	*60,000*	*40,000*

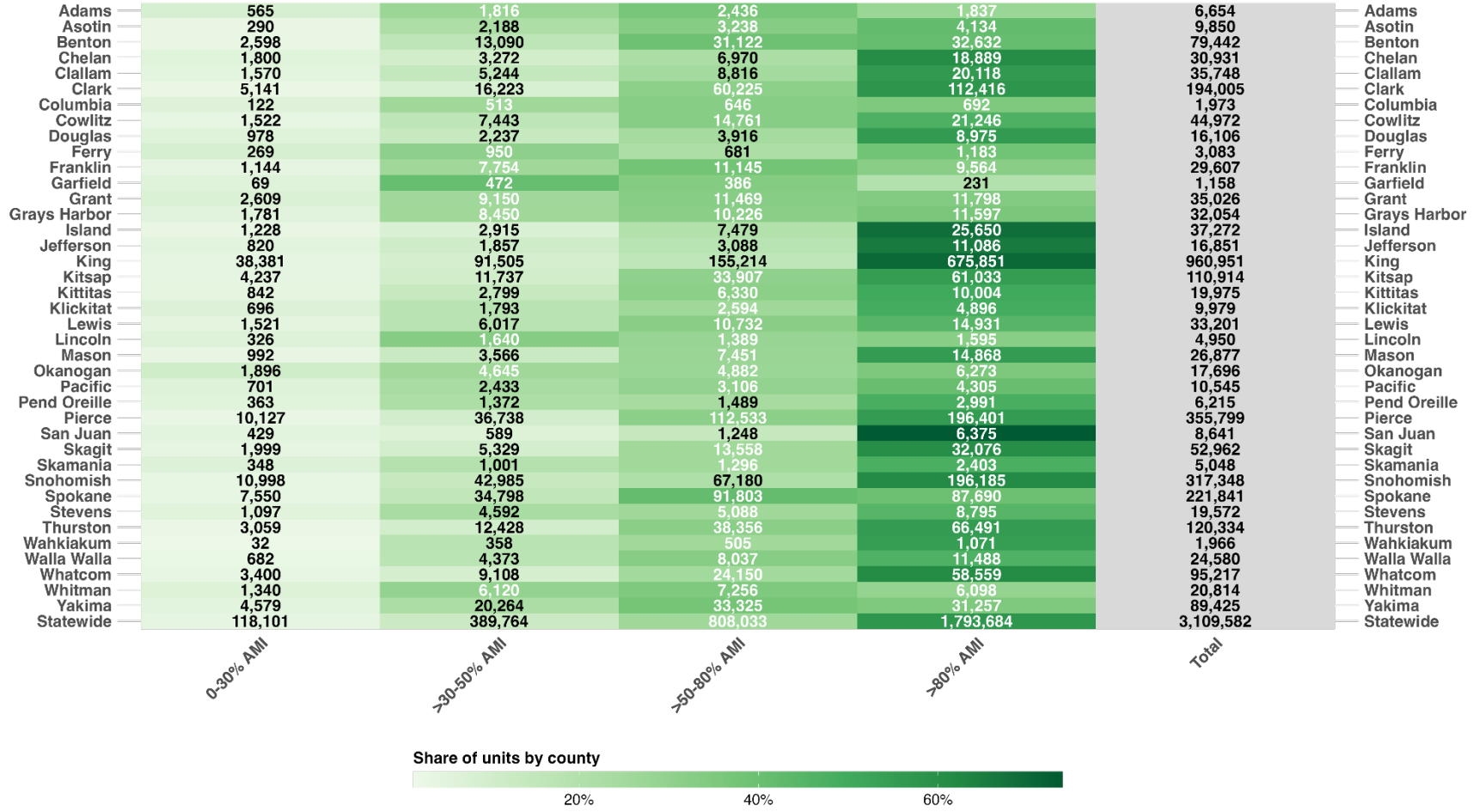
Table 8. Combined CHAS and PUMS Allocation of Units to Affordability Categories for a Hypothetical County, After Scaling to Equal OFM Numbers

Affordability category	Owner-occupied units	Renter-occupied units
0% to 30% AMI	0	2,750
>30% to 50% AMI	5,500	8,250
>50% to 80% AMI	16,500	16,500
>80% to 100% AMI	16,500	5,500
>100% to 120% AMI	16,500	5,500
>120% AMI	11,000	5,500
Total	*66,000*	*44,000*

Tables 9 and 10 report the results of our efforts to reproduce the HAPT baseline numbers shown in Tables 3 and 4, respectively. We were able to exactly replicate the numbers derived from CHAS, but we could not reproduce the numbers that depend on analysis of PUMS data.[14] Ultimately, we decided against trying to replicate the methodology used for the baseline numbers, in part because we wanted to use AMI limits consistent with CHAS as discussed above. The differences between the HAPT and WCRER baseline estimates are reported in Table 11. Numbers are provided only for the categories for which there are differences (i.e., the >80% AMI categories). To adjust for these differences, we will add the numbers in Table 11 to our estimates for subsequent years. This in effect controls for the differences between the way we are handling the PUMS data and the way those data were handled for the purposes of the baseline estimates.

[14] This was in part due to ambiguities in the documentation of the methods used to create the baseline numbers.

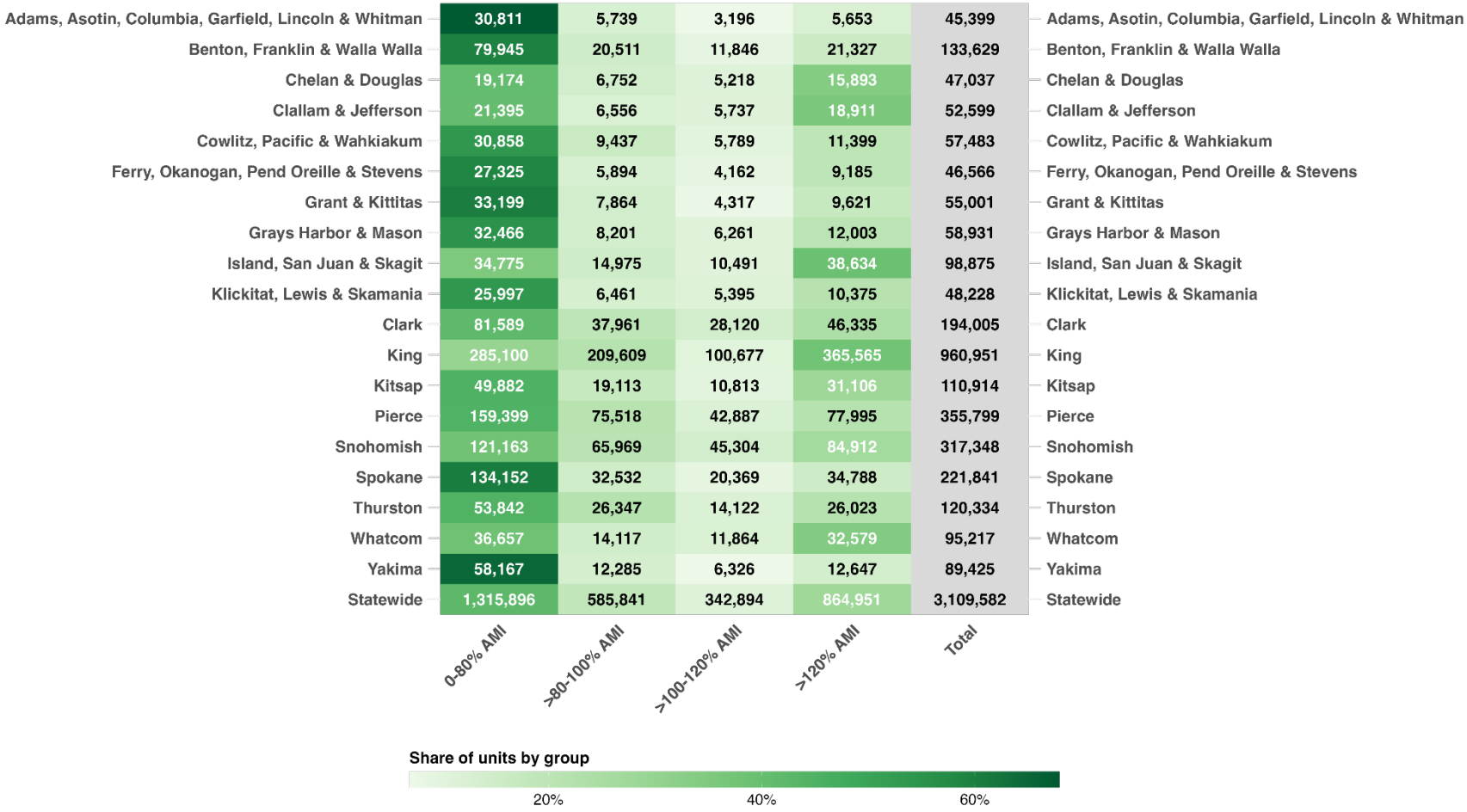
Table 9. WCRER Baseline Housing Units by Affordability Level for Counties, 2020



Source: Authors' calculations.

Note: Based on 2018 CHAS data scaled to OFM housing stock numbers adjusted for seasonal and migrant worker housing.

Table 10. WCRER Baseline Housing Units by Affordability Level for County Groups, 2020



Source: Authors' calculations.

Note: Based on 2018 CHAS and 2020 five-year PUMS data scaled to OFM housing stock numbers adjusted for seasonal and migrant worker housing.

Table 11. Differences Between HAPT and WCRER Baseline Estimates

	>80-100% AMI	>100-120% AMI	>120% AMI	
Adams, Asotin, Columbia, Garfield, Lincoln & Whitman	-171	112	56	Adams, Asotin, Columbia, Garfield, Lincoln & Whitman
Benton, Franklin & Walla Walla	-130	1,084	-954	Benton, Franklin & Walla Walla
Chelan & Douglas	46	355	-401	Chelan & Douglas
Clallam & Jefferson	-282	-705	987	Clallam & Jefferson
Cowlitz, Pacific & Wahkiakum	172	115	-288	Cowlitz, Pacific & Wahkiakum
Ferry, Okanogan, Pend Oreille & Stevens	-387	-1,015	1,401	Ferry, Okanogan, Pend Oreille & Stevens
Grant & Kittitas	-395	219	176	Grant & Kittitas
Grays Harbor & Mason	-407	-933	1,340	Grays Harbor & Mason
Island, San Juan & Skagit	-260	644	-384	Island, San Juan & Skagit
Klickitat, Lewis & Skamania	-55	-1,201	1,256	Klickitat, Lewis & Skamania
Clark	-669	228	442	Clark
King	-28,600	18,456	10,144	King
Kitsap	225	1,265	-1,489	Kitsap
Pierce	-3,083	3,201	-117	Pierce
Snohomish	-3,407	4,484	-1,077	Snohomish
Spokane	-497	612	-115	Spokane
Thurston	105	1,396	-1,501	Thurston
Whatcom	340	-93	-248	Whatcom
Yakima	-1,368	744	623	Yakima
Statewide	-38,823	28,968	9,851	Statewide

Source: Authors' calculations.

Note: These are the differences resulting from analysis of PUMS data. There are no differences in the CHAS data used for the <80% AMI categories.

Preliminary Estimates for 2022

The most recent CHAS data are based on the 2018-2022 five-year ACS.[15] This means that the most recent year we can analyze at this point is 2022. Comparing the 2020 baseline numbers with data for 2022 requires some caution as there are overlapping years in the CHAS and PUMS data as shown in Table 12. The overlapping years introduce some smoothing into the data, meaning that underlying trends will be less evident or pronounced.[16] Starting with the 2023 analysis, there will be no overlap with respect to the CHAS data and, starting with the 2025 analysis, there will be no overlap with respect to the PUMS data.

Table 12. Overlaps in Comparison of 2020 HAPT Baseline Numbers with 2022 Data

Data source	2020 years covered	2022 years covered	Overlap
CHAS	2014-2018	2018-2022	2018
PUMS	2016-2020	2018-2022	2018-2020

Table 13 gives projected needs for the two-year period from 2020 to 2022. These are the annual projected needs from Table 4 multiplied by two. Table 14 compares the housing stock in 2022 with the 2020 HAPT baseline numbers, adjusting for the differences between the HAPT and WCRER baseline estimates shown in Table 11. A detailed example of the calculations performed to produce the numbers in Table 14 is given in Appendix B. The R code used to perform the calculations is given in Appendix C.

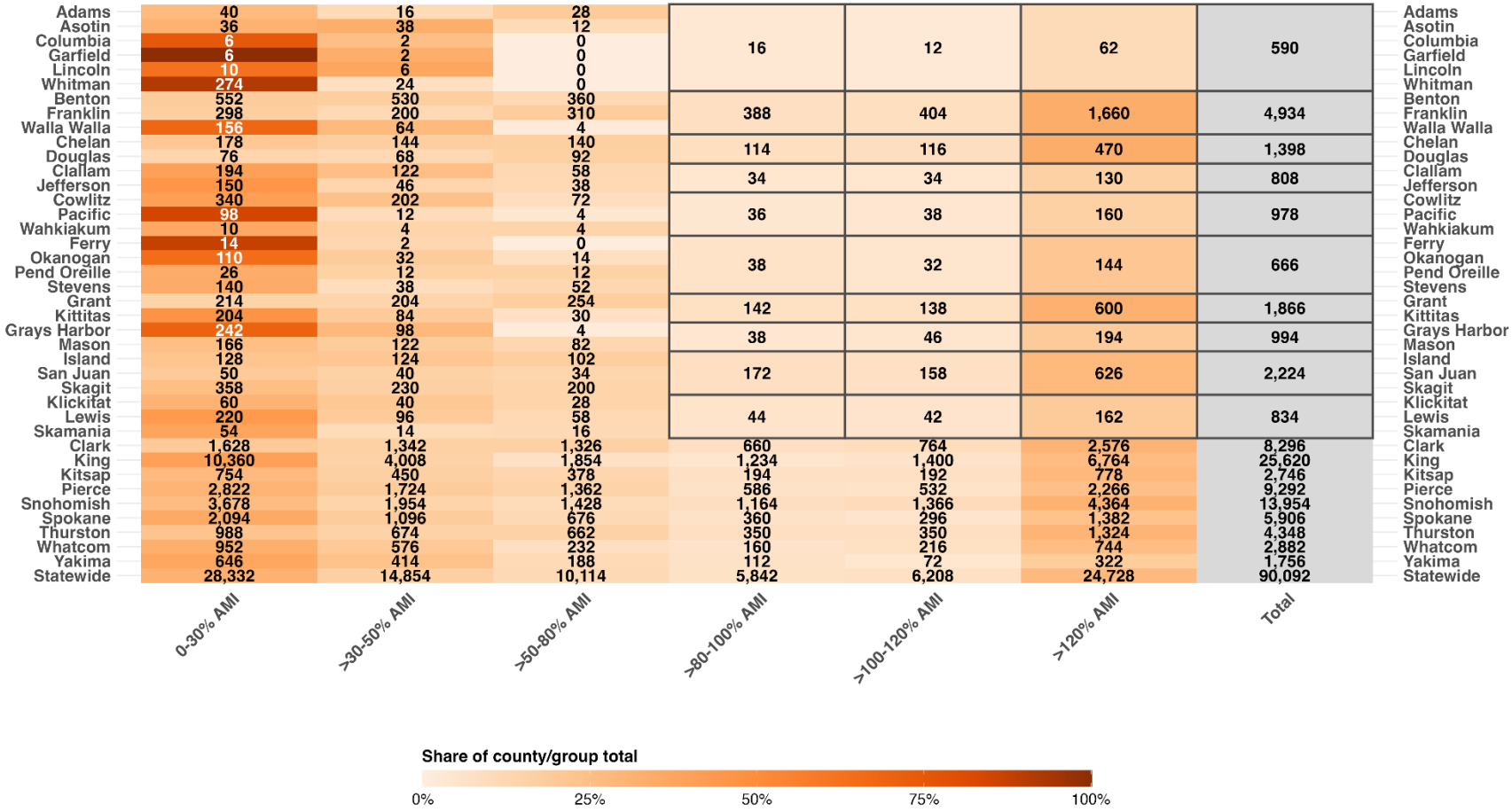
As the right-hand column in Table 14 shows, most counties or county groups produced larger total numbers of housing units than required by the projected needs. However, the only affordability level where the numbers consistently met or exceeded the projected needs was the >120% AMI category. Statewide, each of the other affordability categories lost units during the two-year period. Table 15 cumulates the numbers across affordability categories.

The reports to the legislature will include further discussion and explanation of trends.

[15] The 2022 CHAS data were released in December 2025.

[16] This also means that standard statistical tests (such as *t* tests) cannot be used to compare data for the two years due to lack of independence.

Table 13. Projected Need for Additional Housing, 2020-2022, Counties and County Groups

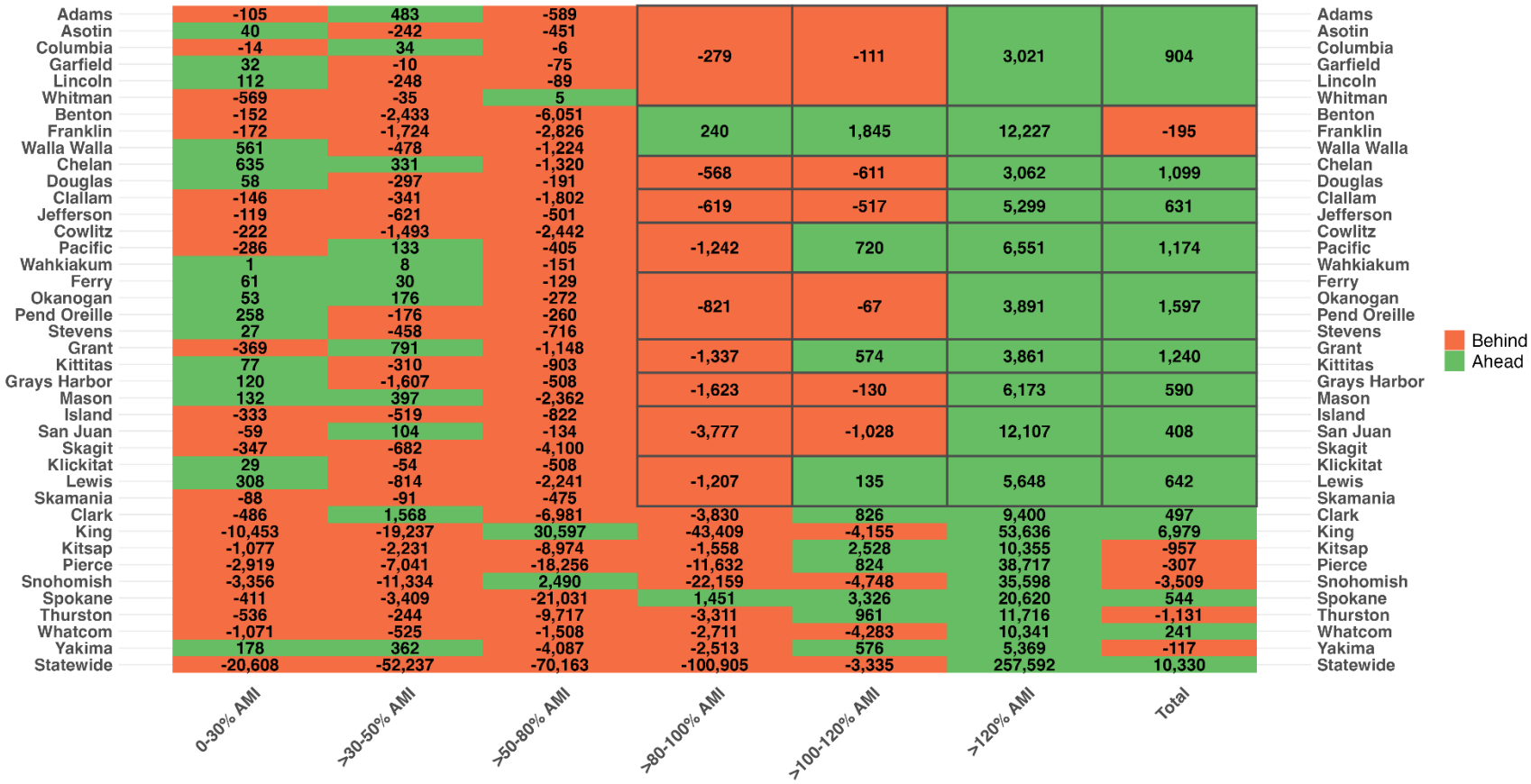


	0-30% AMI	>30-50% AMI	>50-80% AMI	>80-100% AMI	>100-120% AMI	>120% AMI	Total
Adams	40	16	28	16	12	62	590
Asotin	36	38	12				
Columbia	6	2	0				
Garfield	6	2	0				
Lincoln	10	6	0				
Whitman	274	24	0				
Benton	552	530	360	388	404	1,660	4,934
Franklin	298	200	310				
Walla Walla	156	64	4				
Chelan	178	144	140	114	116	470	1,398
Douglas	76	68	92				
Clallam	194	122	58	34	34	130	808
Jefferson	150	46	38				
Cowlitz	340	202	72	36	38	160	978
Pacific	98	12	4				
Wahkiakum	10	4	4				
Ferry	14	2	0	38	32	144	666
Okanogan	110	32	14				
Pend Oreille	26	12	12				
Stevens	140	38	52				
Grant	214	204	254	142	138	600	1,866
Kittitas	204	84	30				
Grays Harbor	242	98	4	38	46	194	994
Mason	166	122	82				
Island	128	124	102	172	158	626	2,224
San Juan	50	40	34				
Skagit	358	230	200				
Klickitat	60	40	28	44	42	162	834
Lewis	220	96	58				
Skamania	54	14	16				
Clark	1,628	1,342	1,326	660	764	2,576	8,296
King	10,360	4,008	1,854	1,234	1,400	6,764	25,620
Kitsap	754	450	378	194	192	778	2,746
Pierce	2,822	1,724	1,362	586	532	2,266	9,292
Snohomish	3,678	1,954	1,428	1,164	1,366	4,364	13,954
Spokane	2,094	1,096	676	360	296	1,382	5,906
Thurston	988	674	662	350	350	1,324	4,348
Whatcom	952	576	232	160	216	744	2,882
Yakima	646	414	188	112	72	322	1,756
Statewide	28,332	14,854	10,114	5,842	6,208	24,728	90,092

Sources: HAPT and authors' calculations.

Note: The numbers for Clallam, Clark, Island, Jefferson, King, Kitsap, Lewis, Mason, Pierce, San Juan, Skagit, Snohomish, Thurston, and Whatcom counties are based on population projections selected by the counties, all others are based on OFM medium population projections and subject to change if other projections are adopted.

Table 14. Additional Housing Production Less Projected Need, 2020-2022

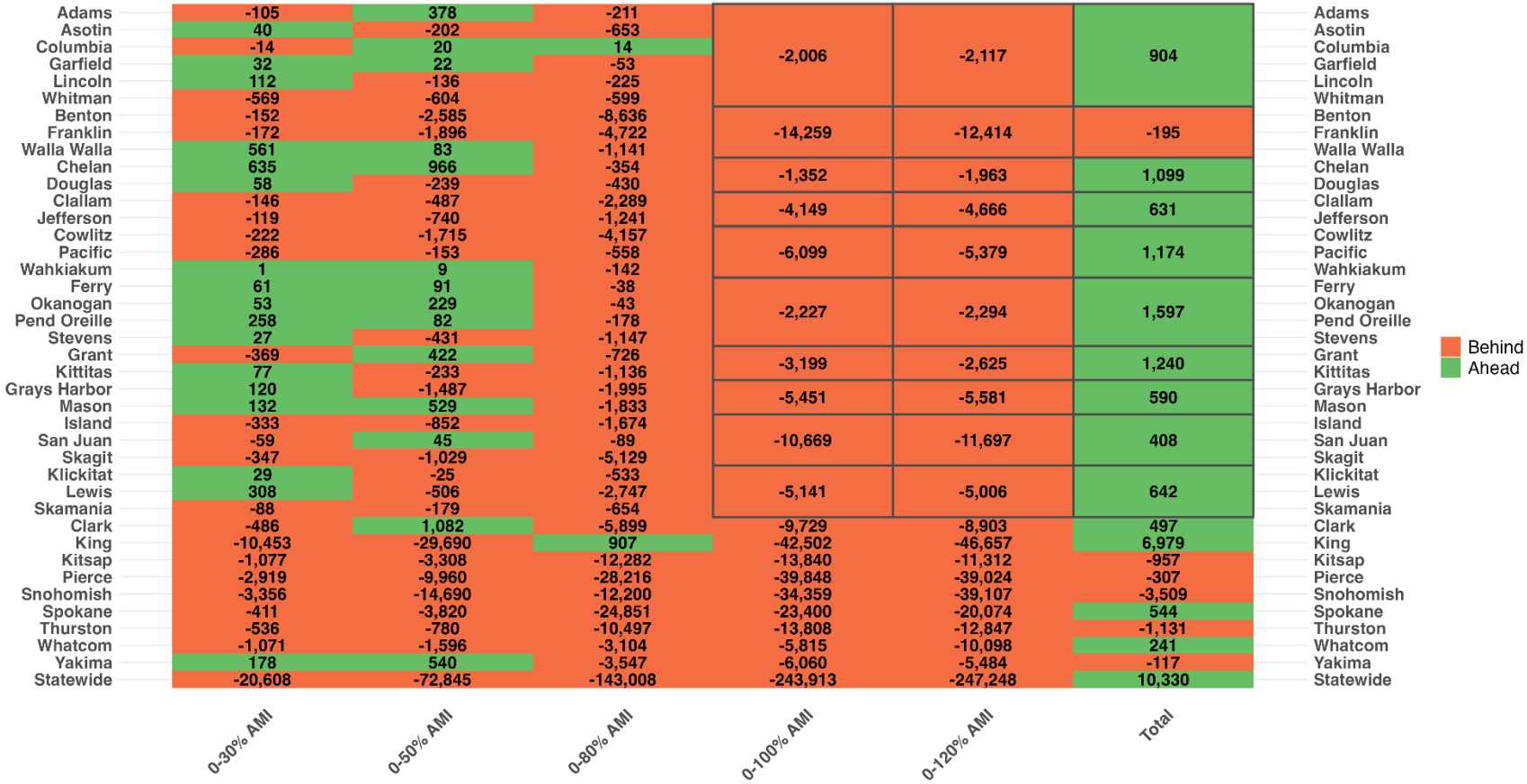


	0-30% AMI	>30-50% AMI	>50-80% AMI	>80-100% AMI	>100-120% AMI	>120% AMI	Total
Adams	-105	483	-589	-279	-111	3,021	904
Asotin	40	-242	-451				
Columbia	-14	34	-6				
Garfield	32	-10	-75				
Lincoln	112	-248	-89				
Whitman	-569	-35	5				
Benton	-152	-2,433	-6,051	240	1,845	12,227	-195
Franklin	-172	-1,724	-2,826				
Walla Walla	561	-478	-1,224				
Chelan	635	331	-1,320	-568	-611	3,062	1,099
Douglas	58	-297	-191				
Clallam	-146	-341	-1,802	-619	-517	5,299	631
Jefferson	-119	-621	-501				
Cowlitz	-222	-1,493	-2,442	-1,242	720	6,551	1,174
Pacific	-286	133	-405				
Wahkiakum	1	8	-151				
Ferry	61	30	-129	-821	-67	3,891	1,597
Okanogan	53	176	-272				
Pend Oreille	258	-176	-260				
Stevens	27	-458	-716				
Grant	-369	791	-1,148	-1,337	574	3,861	1,240
Kittitas	77	-310	-903				
Grays Harbor	120	-1,607	-508	-1,623	-130	6,173	590
Mason	132	397	-2,362				
Island	-333	-519	-822	-3,777	-1,028	12,107	408
San Juan	-59	104	-134				
Skagit	-347	-682	-4,100				
Klickitat	29	-54	-508	-1,207	135	5,648	642
Lewis	308	-814	-2,241				
Skamania	-88	-91	-475				
Clark	-486	1,568	-6,981	-3,830	826	9,400	497
King	-10,453	-19,237	30,597	-43,409	-4,155	53,636	6,979
Kitsap	-1,077	-2,231	-8,974	-1,558	2,528	10,355	-957
Pierce	-2,919	-7,041	-18,256	-11,632	824	38,717	-307
Snohomish	-3,356	-11,334	2,490	-22,159	-4,748	35,598	-3,509
Spokane	-411	-3,409	-21,031	1,451	3,326	20,620	544
Thurston	-536	-244	-9,717	-3,311	961	11,716	-1,131
Whatcom	-1,071	-525	-1,508	-2,711	-4,283	10,341	241
Yakima	178	362	-4,087	-2,513	576	5,369	-117
Statewide	-20,608	-52,237	-70,163	-100,905	-3,335	257,592	10,330

Source: Authors' calculations.

Note: The 2022 estimates are adjusted by the numbers in Table 11 to align with the HAPT 2020 baseline estimates. *These numbers are preliminary and may differ from those in the report to the legislature that will be delivered later in 2026.*

Table 15. Additional Housing Production Less Projected Need, 2020-2022, Cumulative Across AMI Categories



Source: Authors' calculations.

Note: This table cumulates the numbers in Table 14 by AMI category. For example, the data for the 0-50% AMI category are the sums of the 0-30% AMI and 0-50% AMI numbers in Table 14. The Total column also includes the >120% AMI category. *These numbers are preliminary and may differ from those in the report to the legislature that will be delivered later in 2026.*

References

Benítez-Silva, H., Eren, S., Heiland, F., and Jiménez-Martín, S., "How well do individuals predict the selling prices of their homes?" *Journal of Housing Economics*, vol. 29 (2015), 12–25.

Fritzel, A. A., and Hodgson, L., editors, *Establishing Housing Targets for Your Community: County-Level Considerations for Housing Planning*, Olympia, WA: Local Government Division, Growth Management Services, Department of Commerce, 2023.

Joice, P., "Measuring housing affordability," *Cityscape: A Journal of Policy Development and Research*, vol. 16, no. 1 (2014), pp. 299-307.

Appendix A: Public Use Microdata Areas (PUMAs) and Counties

Single counties contiguous with one or more PUMAs:

- Clark
- King
- Kitsap
- Pierce
- Skagit
- Snohomish
- Spokane
- Thurston
- Whatcom
- Yakima

Multiple-county PUMAs:

- Adams, Asotin, Columbia, Garfield, Lincoln, and Whitman
- Benton, Franklin, and Walla Walla
- Chelan and Douglas
- Clallam and Jefferson
- Cowlitz, Pacific, and Wahkiakum
- Ferry, Okanogan, Pend Oreille, and Stevens
- Grant and Kittitas
- Grays Harbor and Mason
- Island and San Juan
- Klickitat, Lewis, and Skamania

Notes: PUMAs are the geographic areas for which PUMS data are reported. For example, data for King County can be obtained by aggregating data for the PUMAs within that county; however, data for Chelan and Douglas counties are available only for the two counties combined. The three PUMAs that make up Benton, Franklin, and Walla Walla counties are not contiguous with county boundaries, unlike the other PUMAs in the state; for this reason, the three counties are combined for the purposes of reporting PUMS data.

Appendix B: Example Calculations (for King County)

Line	Measure	AMI ranges						Totals
	Baseline 2020 HAPT data	0-30	>30-50	>50-80	>80-100	>100-120	>120	
1	Owner-occupied and rental units combined	38,381	91,505	155,214	181,009	119,133	375,709	960,951
	CHAS 2018 data (unweighted)	0-30	>30-50	>50-80	>80-100	>100		
2	Owner-occupied units	0	28,670	35,055	52,460	380,400		496,585
		0-30	>30-50	>50-80	>80			
3	Rental units	34,700	54,060	105,275	178,180			372,215
4	Grand total units							868,800
5	Multiplier (to scale to OFM numbers)							1.1061
	CHAS 2018 data (weighted to match OFM 2020 adjusted total)	0-30	>30-50	>50-80	>80-100	>100		
6	Owner-occupied units	0	31,711	38,773	58,024	420,748		549,256
		0-30	>30-50	>50-80	>80			
7	Rental units	38,381	59,794	116,441	197,079			411,695
8	Grand total units							960,951
	Percentage allocations from 2020 PUMS					>100-120	>120	
9	Owner-occupied units					16.81%	83.19%	
					>80-100	>100-120	>120	
10	Rental units				76.92%	15.21%	7.88%	
	CHAS and PUMS 2020 data combined and baseline adjustment	0-30	>30-50	>50-80	>80-100	>100-120	>120	
11	Owner-occupied and rental units combined	38,381	91,505	155,214	209,609	100,677	365,565	960,951
12	Baseline adjustment	0	0	0	(28,600)	18,456	10,144	
	CHAS 2022 data (unweighted)	0-30	>30-50	>50-80	>80-100	>100		
13	Owner-occupied units	0	21,955	23,370	37,585	434,160		517,070
		0-30	>30-50	>50-80	>80			
14	Rental units	38,288	52,689	162,559	184,523			438,059
15	Grand total units							924,830
16	Multiplier (to scale to OFM numbers)							1.0743
	CHAS 2022 data (weighted to match OFM 2022 adjusted total)	0-30	>30-50	>50-80	>80-100	>100		
17	Owner-occupied units	0	23,586	25,107	40,378	466,420		555,491
		0-30	>30-50	>50-80	>80			
18	Rental units	38,288	52,689	162,559	184,523			438,059
19	Grand total units							993,550

Line	Measure	AMI ranges						Totals
	Percentage allocations from 2022 PUMS					>100-120	>120	
20	Owner-occupied units					13.47%	86.53%	
					>80-100	>100-120	>120	
21	Rental units				68.86%	19.02%	12.12%	
	CHAS and PUMS 2022 data combined	0-30	>30-50	>50-80	>80-100	>100-120	>120	
22	Owner-occupied and rental units combined	38,288	76,276	187,665	167,434	97,922	425,965	993,550
	Projected housing needs 2020-2022	0-30	>30-50	>50-80	>80-100	>100-120	>120	
23	Owner-occupied and rental units combined	10,360	4,008	1,854	1,234	1,400	6,764	25,620
	Housing production versus needs 2020-2022	0-30	>30-50	>50-80	>80-100	>100-120	>120	
24	Owner-occupied and rental units combined	(10,452)	(19,237)	30,597	(43,410)	(4,154)	53,636	6,979

Notes to calculations (the numbers refer to lines in the table above):

1. The baseline numbers are taken from HAPT. These numbers are based on 2018 CHAS and 2020 PUMS data and have been scaled so that the total is consistent with the OFM housing stock count for 2020 (adjusted for seasonal and migrant worker housing).
2. These are the numbers of owner-occupied units reported in the 2018 CHAS data.
3. These are the numbers of rental units reported in the 2018 CHAS data.
4. This is the grand total of owner-occupied and rental units reported in the 2018 CHAS data.
5. This is the multiplier used to scale up the CHAS numbers for King County so that the total number of units matches the OFM total. It is the total from line 1 divided by the total from line 4.
6. These are the numbers of owner-occupied units after applying the multiplier from line 5 to the numbers in line 2.
7. These are the numbers of rental units after applying the multiplier from line 5 to the numbers in line 3.
8. This is the revised grand total after applying the multiplier in line 5. Note that it equals the total in line 1.
9. These are the percentage allocations of owner-occupied units to the >100-120% and >120% AMI categories based on the 2020 PUMS data.
10. These are the percentage allocations of rental units to the >80-100%, >100-120%, and >120% AMI categories based on the 2020 PUMS data.
11. These are the combined owner-occupied and rental units after allocating the upper AMI categories as shown in lines 9 and 10.
12. This is the difference between the baseline HAPT numbers in line 1 and the recalculated baseline numbers in line 11. These numbers will be added to estimates for any subsequent years to adjust for differences in methodology between the calculation of the HAPT numbers and the approach outlined in this report.
13. These numbers are owner-occupied units from the 2022 CHAS data.
14. These numbers are rental units from the 2022 CHAS data.
15. This is the grand total number of units from the 2022 CHAS data.
16. This is the multiplier used to scale the CHAS data to match the adjusted 2022 OFM total.
17. These are the numbers of owner-occupied units in the CHAS 2022 data after applying the multiplier in line 16.

18. These are the numbers of rental units in the CHAS 2022 data after applying the multiplier in line 16.
19. This is the total number of owner-occupied and rental units after applying the multiplier. This equals the adjusted OFM total for 2022.
20. These are the percentage allocations of owner-occupied units to the >100-120% and >120% AMI categories based on the 2022 PUMS data.
21. These are the percentage allocations of rental units to the >80-100%, >100-120%, and >120% AMI categories based on the 2022 PUMS data.
22. These are the combined owner-occupied and rental units after allocating the upper AMI categories as shown in lines 20 and 21.
23. These are projected housing needs for the two-year period from 2020 to 2022.
24. These are the differences between housing production and projected housing needs for the two-year period from 2020 to 2022. These numbers are calculated as the difference between the 2022 housing stock numbers (line 22) and the baseline numbers (line 1), adjusted for the difference in methodology (line 12), less the projected housing need for the two-year period (line 23), i.e.:

$$Line\ 24 = Line\ 22 - Line\ 1 + Line\ 12 - Line\ 23$$

Appendix C: Sample R Code

```
```{r packages, include=FALSE}
# Clear working space
rm(list = ls())

library(tidyverse)
library(openxlsx)
library(stringr)
library(tidycensus)
library(beepr)
library(srvyr, warn.conflicts = FALSE)
library(scales)
library(zoo)

options(scipen = 999999)
```
```{r}
# Load Census API Key
# census_api_key("YOUR_API_KEY_HERE", install = TRUE)

# PUMA-County Crosswalk

PUMA20 <- read.xlsx("Data Sources/PUMA_County_crosswalk_10_20.xlsx", sheet = "PUMA20") %>%
mutate(PUMA_year = "2020")
PUMA10 <- read.xlsx("Data Sources/PUMA_County_crosswalk_10_20.xlsx", sheet = "PUMA10") %>%
mutate(PUMA_year = "2010")

PUMA_County_crosswalk <- PUMA20 %>% rbind(PUMA10) %>%mutate(PUMA = as.character(PUMA)) %>%
mutate(County = ifelse(County %in% c("Skagit","Island & San Juan"), "Island, San Juan & Skagit", County)) #
This is only for grouping these counties in 2023

# Load ACS 5-year vacancy estimates

years <- 2018:2024

SeasonalMigrant <- map_dfr(years, \(y) {
 get_acs(
  geography = "county",
  variables = c("B25004_006", "B25004_007"),
  year = y,
  state = "WA",
  survey = "acs5",
  output = "wide"
 ) %>%
  mutate(
   County = str_extract(NAME, "^[^,]+(?= County)"),
   TotalSeasonalMigrant = B25004_006E + B25004_007E,
   year = y
  )
}) %>% select(County, year,TotalSeasonalMigrant)

# OFM housing unit totals & share of county-group
```
```

```
OFM_housing <- read.xlsx("Data Sources/ofm_april1_housing_2025.xlsx", sheet = 2) %>%
 setNames(str_replace_all(names(.), "[^[:alnum:].]", "")) %>%
 filter(Filter == 1, County != "State") %>%
 pivot_longer(
  cols = matches("^\\d{4}\\.Postcensal\\.Estimate\\.of\\..*Housing\\.Units$"),
  names_to = "variable",
  values_to = "estimate"
 ) %>%
 mutate(
  year = str_extract(variable, "^\\d{4}"),
  unit_type = case_when(
   str_detect(variable, "One\\.Unit") ~ "One",
   str_detect(variable, "Two\\.or\\.More\\.Unit") ~ "Two",
   str_detect(variable, "Total\\.Housing\\.Units") ~ "Total",
   TRUE ~ NA_character_
  ),
  estimate = as.numeric(estimate)
 ) %>%
 group_by(County, Jurisdiction, year, unit_type) %>%
 summarise(estimate = sum(estimate, na.rm = TRUE), .groups = "drop") %>%
 pivot_wider(
  names_from = unit_type,
  values_from = estimate
 ) %>%
 select(County, year,One,Two,Total) %>%
 mutate(year = as.double(year)) %>%
 left_join(SeasonalMigrant, by = c("County", "year")) %>%
 mutate(Total_noseason = Total - TotalSeasonalMigrant) %>%
 mutate(Group = case_when(County %in% c("Cowlitz", "Pacific", "Wahkiakum") ~ "Cowlitz, Pacific &
Wahkiakum",
  County %in% c("Grays Harbor", "Mason") ~ "Grays Harbor & Mason",
  County %in% c("Grant", "Kittitas") ~ "Grant & Kittitas",
  County %in% c("Lewis", "Klickitat", "Skamania") ~ "Klickitat, Lewis & Skamania",
  County %in% c("Walla Walla", "Benton", "Franklin") ~ "Benton, Franklin & Walla Walla",
  #County %in% c("Island", "San Juan") ~ "Island & San Juan", # This is for > 2022
  County %in% c("Island", "San Juan", "Skagit") ~ "Island, San Juan & Skagit",
  County %in% c("Whitman", "Asotin", "Adams", "Lincoln", "Columbia", "Garfield") ~ "Adams, Asotin,
Columbia, Garfield, Lincoln & Whitman",
  County %in% c("Stevens", "Okanogan", "Pend Oreille", "Ferry") ~ "Ferry, Okanogan, Pend Oreille & Stevens",
  County %in% c("Clallam", "Jefferson") ~ "Clallam & Jefferson",
  County %in% c("Chelan", "Douglas") ~ "Chelan & Douglas",
  TRUE ~ County ) %>%
 group_by(Group, year) %>%
 mutate(OFM_Weight = Total_noseason/sum(Total_noseason, na.rm = TRUE)) %>%
 ungroup()

# CHAS AMI Limits

CHAS_Limit_2018 <- read.xlsx("Data Sources/CHAS AMI/Chas_IncomeLimits_2018.xlsx") %>% filter(State ==
53) %>% select(name, lim50_18p4, Lim80_18p4) %>% mutate(year = 2018) %>% rename(County =
name,l50_4 = lim50_18p4, l80_4 = Lim80_18p4)
```

```
CHAS_Limit_2020 <- read.xlsx("Data Sources/CHAS AMI/Chas_IncomeLimits_2020.xlsx"
) %>% filter(state_code == 53) %>% select(cntyname, lim50_20p4, lim80_20p4) %>% mutate(year = 2020)
%>% rename(County = cntyname,l50_4 = lim50_20p4, l80_4 = lim80_20p4)

CHAS_Limit_2022 <- read.xlsx( "Data Sources/CHAS AMI/Chas_IncomeLimits_2022.xlsx"
) %>% filter(state_code == 53) %>% select(cntyname, lim50_22p4, lim80_22p4) %>% mutate(year = 2022)
%>% rename(County = cntyname,l50_4 = lim50_22p4, l80_4 = lim80_22p4)

AMI_limits <- bind_rows(CHAS_Limit_2018, CHAS_Limit_2020, CHAS_Limit_2022) %>% mutate(County =
str_extract(County, ".*(?= County)"))

AMI_limits_OFM <- AMI_limits %>%
 left_join(OFM_housing %>% select(County, Group, year, OFM_Weight), by = c("County", "year")) %>%
  mutate(wMedian_50     = OFM_Weight * l50_4, # This weights the limits for the county-groups by their
respective housing unit share from OFM
   wMedian_80     = OFM_Weight * l80_4) %>% group_by(Group, year) %>%
 summarize(weighted_median_50 = sum(wMedian_50, na.rm= TRUE),
 weighted_median_80 = sum(wMedian_80, na.rm= TRUE)) %>% rename(County = Group)


```
```{r}
# Here you can select the CHAS/PUMS combination

#### For example, 2020 PUMS & 2018 CHAS

# Year for PUMS & OFM total
year_filter_num <- 2020 # or 2022
year_filter <- "2020" # or 2022

# Select the appropriate CHAS path
chas_path <- "CHAS_2018"
#chas_path <- "CHAS_2022"

######
pums_vars <- if(year_filter_num == 2020) {
 c(
  "PUMA",
  "GRNTP",
  "TYPEHUGQ",
  "BDSP",
  "TEN",
  "NP",
  "ADJHSG",
  "VALP"
 )
} else if(year_filter_num == 2022) {
 c(
  "PUMA10",
  "PUMA20",
  "GRNTP",
  "TYPEHUGQ",
  "BDSP",
```

```
  "TEN",
  "NP",
  "ADJHSG",
  "VALP"
 )
}

PUMS_download <- get_pums(
 variables = pums_vars,
 state = "WA",
 survey = "acs5",
 variables_filter = list(SPORDER = 1),
 year = year_filter_num,
 recode = TRUE,
 rep_weights = "housing"
)

# Alert that file is finished downloading, you can also save this file to your machine to avoid redownloading it since it is quite large
beep(sound = 2)

WA_pums_all_years <- PUMS_download  %>%
 {
  if (any(c("PUMA10", "PUMA20") %in% names(.))) {
   mutate(
    .,
    PUMA = case_when(
     "PUMA10" %in% names(.) & PUMA10 >= 0 ~ as.character(PUMA10),
     "PUMA20" %in% names(.) & PUMA20 >= 0 ~ as.character(PUMA20),
     TRUE ~ NA_character_
    )
   )
  } else {
   .
  }
 } %>%
 mutate(AffordAdjust = case_when(BDSP == 0 ~ 0.7,
                                 BDSP == 1 ~ 0.75,
                                 BDSP == 2 ~ 0.90,
                                 BDSP == 3 ~ 1.04,
                                 BDSP == 4 ~ 1.16,
                                 BDSP >= 5 ~ (1.04 + (0.12* (BDSP-3))),
                                 TRUE ~ NA_real_)) %>%
 select(-any_of(c("STATE", "STATE_label"))) %>% left_join(PUMA_County_crosswalk, by = "PUMA") %>%
 filter(TYPEHUGQ == "1",
        TEN != "b",
        !(NP %in% c(0))) %>% # Make sure # of people is greater than 0
 mutate(Tenure = case_when(TEN %in% c("1", "2") ~ "Owner-occupied",
                           TEN %in% c("3", "4") ~ "Renter-occupied")) %>%
 mutate(year = year_filter_num,
        ADJHSG = as.numeric(ADJHSG)*ifelse(year_filter_num %in% c(2018,2020), 1000000, 1),
        GRNTP = GRNTP/1000000*ADJHSG,
        VALP = VALP/1000000*ADJHSG,
```

```
      SPORDER = as.numeric(SPORDER))

## Step by step calculations

WA_pums_all_years_step1 <- WA_pums_all_years %>%
 left_join(AMI_limits_OFM, by = c("County", "year"))

WA_pums_all_years_step3 <- WA_pums_all_years_step1 %>%
 mutate(AffordabilityRatioOwn = VALP/3.36, # From CHAS
      AffordabilityRatioRent = (GRNTP * 12) / 0.3)  %>%
 mutate(TheoreticalAffordability = case_when(
Tenure == "Owner-occupied" ~ case_when(
   AffordabilityRatioOwn <=  weighted_median_50 * AffordAdjust ~ ">30-50% AMI",
   AffordabilityRatioOwn <= weighted_median_80 * AffordAdjust ~ ">50-80% AMI",
   AffordabilityRatioOwn <= weighted_median_50 * AffordAdjust * 2~ ">80-100% AMI",
   AffordabilityRatioOwn <= weighted_median_50 * AffordAdjust * 2.4 ~ ">100-120% AMI",
   AffordabilityRatioOwn > weighted_median_50 * AffordAdjust * 2.4 ~ ">120% AMI",
                                          TRUE ~ "Error"),
Tenure == "Renter-occupied"  ~ case_when(
 AffordabilityRatioRent <= weighted_median_50 * AffordAdjust * 0.6 ~ "0-30% AMI",
 AffordabilityRatioRent <=  weighted_median_50 * AffordAdjust ~ ">30-50% AMI",
 AffordabilityRatioRent <= weighted_median_80 * AffordAdjust  ~ ">50-80% AMI",
 AffordabilityRatioRent <= weighted_median_50 * AffordAdjust * 2 ~ ">80-100% AMI",
 AffordabilityRatioRent <= weighted_median_50 * AffordAdjust * 2.4~ ">100-120% AMI",
 AffordabilityRatioRent > weighted_median_50 * AffordAdjust * 2.4 ~ ">120% AMI",
 TRUE ~ "Error",
 TRUE ~ "Error"))) %>%
 mutate(TheoreticalAffordability = factor(TheoreticalAffordability, levels =
                              c("0-30% AMI",
                               ">30-50% AMI",
                               ">50-80% AMI",
                               ">80-100% AMI",
                               ">100-120% AMI",
                               ">120% AMI",
                               "Error"
)))


remainder_weights <- WA_pums_all_years_step3 %>%
 to_survey(type = c("housing")) %>%
 group_by(Tenure, County, TheoreticalAffordability) %>%
 summarize(
   N = sum(SPORDER),
   HHRepresented = survey_total(SPORDER, vartype = "ci"))  %>%
 mutate(HH_total_tenure = sum(HHRepresented),
        ShareTenure = HHRepresented / HH_total_tenure) %>%
 ungroup() %>%
 filter(TheoreticalAffordability != "Error") %>%
 # keep only remainder bins
 filter(
  (Tenure == "Renter-occupied" &
    TheoreticalAffordability %in% c(
     ">80-100% AMI",
```

```
      ">100-120% AMI",
      ">120% AMI"
    )) |
  (Tenure == "Owner-occupied" &
    TheoreticalAffordability %in% c(
      ">100-120% AMI",
      ">120% AMI"
    ))
) %>%

 # recompute shares within remainder
 group_by(County, Tenure) %>%
 mutate(
  HH_remainder_total = sum(HHRepresented),
  Share_remainder = HHRepresented / HH_remainder_total
 ) %>%
 ungroup() %>%
 rename(Affordability_disag = TheoreticalAffordability) %>% select(Tenure, County, Affordability_disag,
ShareTenure, Share_remainder)  %>%
 dplyr::rename(Group = County)

############
# CHAS files
############

t14a <- read_csv(file.path(chas_path, "Table14A.csv"))
t14b <- read_csv(file.path(chas_path, "Table14B.csv"))
t15a <- read_csv(file.path(chas_path, "Table15A.csv"))
t15b <- read_csv(file.path(chas_path, "Table15B.csv"))
t15c <- read_csv(file.path(chas_path, "Table15C.csv"))

chas <- t14b %>%      # base table
 left_join(t14a, by = c("geoid","source", "sumlevel","name","st","cnty")) %>%
 left_join(t15c, by = c("geoid","source", "sumlevel","name","st","cnty")) %>%
 left_join(t15a, by = c("geoid","source", "sumlevel","name","st","cnty")) %>%
 left_join(t15b, by = c("geoid","source", "sumlevel","name","st","cnty"))

chas_collapsed <- chas %>%
 mutate(name = str_trim(name)) %>%          # remove leading/trailing spaces
 separate(name, into = c("County", "State"),
       sep = ",\\s*", remove = FALSE) %>%  # split at comma
 mutate(County = str_replace(County, " County$", ""),
  # ----------------------------
  # Renter-occupied units by AMI
  # ----------------------------

  renter_0_30_ami    = T14B_est4  + T15C_est4,
  renter_30_50_ami   = T14B_est8  + T15C_est25,
  renter_50_80_ami   = T14B_est12 + T15C_est46,
  renter_80_plus_ami  = T14B_est16 + T15C_est67,

  # ----------------------------
  # Owner-occupied units by AMI
```

```
  # ----------------------------
  owner_0_50_ami     = T14A_est4  + T15A_est4  + T15B_est4,
  owner_50_80_ami    = T14A_est8  + T15A_est25 + T15B_est25,
  owner_80_100_ami   = T14A_est12 + T15A_est46 + T15B_est46,
  owner_100_plus_ami  = T14A_est16 + T15A_est67 + T15B_est67
 ) %>%
 filter(State == "Washington") %>%
  select(
   State,
   County,
   renter_0_30_ami,
   renter_30_50_ami,
   renter_50_80_ami,
   renter_80_plus_ami,
   owner_0_50_ami,
   owner_50_80_ami,
   owner_80_100_ami,
   owner_100_plus_ami
  )

######
# Scaling up the CHAS to OFM & assign counties to county groups
######
CHAS_collapsed_step1 <- chas_collapsed %>%
  pivot_longer(
   cols = matches("^(renter|owner)_"),
   names_to = "var",
   values_to = "households"
  ) %>%
  mutate(
   # ------------------------
   # Tenure
   # ------------------------
   Tenure = case_when(
    str_starts(var, "renter") ~ "Renter-occupied",
    str_starts(var, "owner")  ~ "Owner-occupied"
   ),

   # ------------------------
   # Affordability levels
   # ------------------------
   Affordability = case_when(
    var == "renter_0_30_ami"      ~ "0-30% AMI",
    var == "renter_30_50_ami"     ~ ">30-50% AMI",
    var == "renter_50_80_ami"     ~ ">50-80% AMI",
    var == "renter_80_plus_ami"   ~ ">80% AMI",
    var == "owner_0_50_ami"       ~ ">30-50% AMI",
    var == "owner_50_80_ami"      ~ ">50-80% AMI",
    var == "owner_80_100_ami"     ~ ">80-100% AMI",
    var == "owner_100_plus_ami"   ~ ">100% AMI",

    TRUE                          ~ "Error"
   )
```

```
 ) %>%
 select(State,County,Tenure,Affordability, households) %>% mutate(Group = case_when(
County %in% c("Cowlitz", "Pacific", "Wahkiakum") ~ "Cowlitz, Pacific & Wahkiakum",
County %in% c("Grays Harbor", "Mason") ~ "Grays Harbor & Mason",
County %in% c("Grant", "Kittitas") ~ "Grant & Kittitas",
County %in% c("Lewis", "Klickitat", "Skamania") ~ "Klickitat, Lewis & Skamania",
County %in% c("Walla Walla", "Benton", "Franklin") ~ "Benton, Franklin & Walla Walla",
#County %in% c("Island", "San Juan") ~ "Island & San Juan",     # This is for > 2022
County %in% c("Island", "San Juan", "Skagit") ~ "Island, San Juan & Skagit",
County %in% c("Whitman", "Asotin", "Adams", "Lincoln", "Columbia", "Garfield") ~ "Adams, Asotin,
Columbia, Garfield, Lincoln & Whitman",
County %in% c("Stevens", "Okanogan", "Pend Oreille", "Ferry") ~ "Ferry, Okanogan, Pend Oreille & Stevens",
County %in% c("Clallam", "Jefferson") ~ "Clallam & Jefferson",
County %in% c("Chelan", "Douglas") ~ "Chelan & Douglas",
 TRUE ~ County)) %>% left_join(OFM_housing %>%
                                filter(year == year_filter) %>%
                                select(County, Total_noseason)) %>%
 group_by(County) %>% mutate(Share = households/sum(households)) %>%
 mutate(housing_units = Share * Total_noseason) %>%
 select(-households)

# Aggregating top bins to apply remainder share
CHAS_group_topbins <- CHAS_collapsed_step1 %>%
 filter(
  (Tenure == "Owner-occupied"  & Affordability == ">100% AMI") |
  (Tenure == "Renter-occupied" & Affordability == ">80% AMI")
 ) %>%
 group_by(Group, Tenure, Affordability) %>%
 summarise(
  housing_units = sum(housing_units, na.rm = TRUE),
  .groups = "drop"
 ) %>% left_join(remainder_weights, by = c("Group", "Tenure")) %>%
mutate(housing_units = housing_units * Share_remainder) %>%
select(Group, Tenure, Affordability_disag, housing_units) %>%
rename(Affordability = Affordability_disag) %>% mutate(County = NA)

aff_levels <- c(
 "0-30% AMI", ">30-50% AMI", ">50-80% AMI", ">80-100% AMI", ">100-120% AMI",
 ">120% AMI"
)

tenure_levels <- c("Renter-occupied", "Owner-occupied")

# Drop CHAS upper bins and replace with disaggregated bins
CHAS_collapsed_step2 <- CHAS_collapsed_step1 %>%
 filter(
  !(
   (Tenure == "Owner-occupied"  & Affordability == ">100% AMI") |
   (Tenure == "Renter-occupied" & Affordability == ">80% AMI")
  )
 ) %>%
 select(-State) %>%
 bind_rows(CHAS_group_topbins) %>%
```

```
  mutate(
    Tenure       = factor(Tenure, levels = tenure_levels),
    Affordability = factor(Affordability, levels = aff_levels)
  ) %>%
  arrange(Group, Tenure, Affordability) %>% group_by(County, Group, Affordability) %>%
summarize(housing_units = sum(housing_units))

CHAS_collapsed_step3 <- bind_rows(
  # everything except the >80-100% bin since it is disaggregated in CHAS for owner-occupied but not for
renter-occupied
  CHAS_collapsed_step2 %>% filter(Affordability != ">80-100% AMI"),

  # >80-100 bin only: sum within the group
  CHAS_collapsed_step2 %>%
    filter(Affordability == ">80-100% AMI") %>%
    group_by(Group, Affordability) %>%
    summarize(
      County = NA_character_,
      housing_units = sum(housing_units, na.rm = TRUE),
      .groups = "drop"
    )
) %>%
  arrange(Affordability, Group,County) %>% mutate(housing_units = round(housing_units))

Statewide_sum <- CHAS_collapsed_step3 %>% group_by(Affordability) %>% summarize(housing_units =
sum(housing_units, na.rm = TRUE)) %>% ungroup() %>%
  mutate(County = "Statewide", Group = "Statewide")

# This reflects the CHAS estimates of affordability, scales them up to the OFM totals (less seasonal/migrant
housing) and distributes the remainder (>80% AMI for renter-occupied, and >100% AMI for owner-occupied)
using the PUMS procedure above.
CHAS_collapsed_step4 <- CHAS_collapsed_step3 %>% bind_rows(Statewide_sum)

```

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CONTACT US

WCRER staff

Steven C. Bourassa, Director
Mason Virant, Associate Director
Christian Phillips, Research Assistant
Shufan Yang, Research Assistant

Postal address

Washington Center for Real Estate Research
College of Built Environments
University of Washington
Box 355727
Seattle, WA 98195

Email

wcrer@uw.edu

Follow us on LinkedIn

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