
Methods for Evaluating Housing Affordability

In interactive web map

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Prepared for:
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Introduction

The purpose of this document is to outline ECONorthwest's methods for creating an interactive mapping tool of housing affordability in the Portland Region from 1990 to 2020. The methodology is broken up into three main sections corresponding to the tool's three map pages as follows:

- Home ownership affordability
- Displacement vulnerability
- Tenure
- Non-white population

Home Ownership Affordability

ECONorthwest assessed home ownership affordability from 2000 to 2015 and projected affordability in 2020 by calculating the percentage of regional median family income spent on housing. The map displays affordability assuming a 5% down payment or a 20% down payment.

Data

Housing data came from Metro RLIS tax lot shapefiles and median family income from the Department of Housing and Urban Development's (HUD) estimates for the Portland-Vancouver-Hillsboro OR-WA MSA. Using first quarter data from the following year (to account for lags in sales prices being recorded), ECONorthwest:

1. Selected all parcels with a sale date in the given year within the Portland urban growth boundary that were classified as single family homes, townhouses, or condominiums based on their RLIS property class.
ECONorthwest:
 - a. Included property classes 101, 102, 122, 141.
 - b. Dropped properties sold for less than \$75,000, as they are likely not arms length transactions.
 - c. Dropped properties sold for more than \$3 million, as they are likely for more than one unit: for example a multifamily building or several single family parcels sold at one price.
2. For each identified sale transaction, calculated the percent of HUD's Median Family Income a four-person family would have to spend on

housing. Homes that cost 30% or less of median family income are considered affordable.

3. Summarized selected parcels by a hex grid. We calculated the median affordability and sales price of all parcels that intersected a hex bin and assigned that value to said hex bin. Hex bins with fewer than 3 transactions in a given year were not shown due to data unreliability.

Affordability Assumptions

ECONorthwest calculated affordability based on the following cost assumptions:

- *Down payment:* 5% or 20% of the sales price.
- *Mortgage:* 30 year amortizing principal interest.
- *Interest rate:* Based on Annual Average Commitment Rates on 30-Year Fixed-Rate Mortgage from Freddie Mac (see Appendix A for rates by year). Projected 2020 interest based on the average difference between the federal prime rate and average 30-year mortgage rate (0.34%) and prime rate projections from the Oregon Office of Economic Analysis.
- *Private Mortgage Insurance:* For homes purchased with 5% down, PMI was calculated as 1% of the loan balance annually.
- *Property tax change ratio:* Based on Residential Changed Property Ratios for Multnomah County as reported by the Multnomah County Assessor. We used a linear trend to project the 2020 property tax change ratio based on trends from 2000 to 2016 (see Appendix A for change ratio by year).
- *Property tax assessment:* Calculated as a property's sale price deflated by the change ratio multiplied by \$20 per every \$1000 of sales value.
- *Insurance:* sales price divided by 1,000 multiplied by 3.5.
- *Utilities:* \$250 per month in 2015, inflated from 2016 to 2020 and deflated from 2000 to 2014 using the U.S. Bureau of Labor Statistics (BLS) Consumer Price Index (CPI) Inflation Calculator (see Appendix A for utilities by year).
- *Median family income:* Based on HUD's estimates for the Portland-Vancouver-Hillsboro OR-WA MSA. Data available until 2016. We calculated 2020 MFI assuming a conservative 1% annual growth in incomes between 2017 and 2020 (see Appendix A for MFI by year).

Calculation:

Yearly Housing Costs = (Mortgage Payment + Monthly Utilities) * 12 + Property Tax + Home Insurance

Percent of MFI Spent on Housing = Yearly Housing Costs / MFI

Trending forward

ECONorthwest projected housing affordability in 2020 based on historic trends over the 2000 to 2014 period. For each hex bin we calculated a linear trend of best fit based on values from 2000 to 2014. If the slope of this line of best fit was less than a 1% annual increase between 2000 and 2014, we assumed an annual growth rate of 1% in sales prices from 2015 to 2020. If the change between 2014 known and 2015 projected values was greater than 12%, we assumed an annual growth of 12% in sales prices between 2015 and 2020. These assumptions make our line-of-best fit more conservative, but also eliminate the possibility of outlier market increases or decreases continuing into the future.

Displacement Vulnerability

To assess populations' likelihood of displacement, ECONorthwest used a methodology developed for the Portland Bureau of Planning and Sustainability's Gentrification and Displacement Study¹ to create an index measuring vulnerability to displacement as a result of market changes. The index is composed of the following demographic factors compiled at the census tract level and compared to averages for the three-county area²:

- *Tenure*. The proportion of occupied housing units that are rented.
- *Racial/ethnic composition*. The proportion of residents who are non-white (including Hispanic whites).
- *Educational attainment*. The proportion of residents with a bachelor's degree or higher.
- *Household income*. The proportion of households with a median household income at or below 80% of regional median family income.

Results of the vulnerability assessment were summarized into a hex grid of the region. Hex bins received the values of the census tract their centroid fell within.

Data

Data came from the U.S. Census and the U.S. Department of Housing and Urban Development (HUD) for 1990, 2000, and 2009 to 2015. U.S. Census data was

¹ Bates, Lisa K. *Gentrification and Displacement Study: implementing an equitable inclusive development strategy in the context of gentrification*. Commissioned by City of Portland Bureau of Planning and Sustainability. Updated May 18, 2013. Available at: <https://www.portlandoregon.gov/bps/article/454027>

² The three-county area is composed of Multnomah, Clackamas, and Washington counties.

gathered at the census tract level and compared three county-level census and HUD regional data for the Portland-Vancouver-Hillsboro, OR-WA MSA.

Vulnerability factor	Source	Years	Data table
Tenure	U.S. Census Decennial Summary File 1	1990, 2000, 2010	QT-H3 Household Population and Household type by Tenure
	American Community Survey 5-year Estimates	2009, 2011-2015	B25003 Tenure
Racial/ethnic composition	U.S. Census Decennial Summary File 1, Summary File 3	1990, 2000, 2010	P10 Hispanic Origin by Race; P007 Hispanic or Latino by Race; P9 Hispanic or Latino and not Hispanic or Latino by Race
	American Community Survey 5-year Estimates	2009, 2011-2015	B03002 Hispanic or Latino Origin by Race
Educational attainment	U.S. Census Decennial Summary File 3	1990, 2000	DP-2 Profile of Selected Social Characteristics
	American Community Survey 5-year Estimates	2009-2014	B15002 Sex by Educational Attainment for the Population 25 years and over
Household income	U.S. Census Decennial Summary File 3	1990, 2000	DP-3 Profile of Selected Economic Characteristics
	American Community Survey 5-year Estimates	2009-2015	S1901 Income in the past 12 months (in the previous year's Inflation-Adjusted dollars)
	U.S. Department of Housing and Urban Development (HUD)	1990, 2000, 2009-2015	4-person Median Family Income

Assumptions

- Household income.** The Census reports household income in \$10,000 increments. In order to calculate the percentage of households with incomes at or below 80% of the HUD-adjusted regional MFI, we assumed that households were evenly distributed within that interval and calculated estimates and margins of error proportionally.

Evaluation

Each census tract was evaluated based on the following criteria. Scores for each vulnerability risk factor were summed to get total vulnerability scores. We considered census tracts to be at risk for gentrification if they receive a score of at least 3 out of 4 for the following:

Risk Factor	Evaluation Criteria	Vulnerability Score: Yes (1)	Vulnerability Score: No (0)
% Non-White	Is the proportion of non-white individuals greater than the three-county average in the given year?	1	0
% without Bachelor's degree	Is the proportion of the population 25+ without a bachelor's degree greater than the three-county average in the given year?	1	0
% Households with income at or below 80% Median Family Income	Is the proportion of households with income at or below 80% of median family income greater than the three-county average in the given year?	1	0
% Renters	Is the proportion of rented units greater than the three-county average in the given year?	1	0

Source: Portland Bureau of Planning and Sustainability Gentrification and Displacement Study.

Calculation of Threshold

Margins of error for aggregated values (for example, the number of renters in all three counties) were calculated using the following formula based on the methodology laid out by US Census:

$$\text{Aggregated MoE} = \sqrt{(\text{MoE } a)^2 + (\text{MoE } b)^2 + \dots (\text{MoE } n^2)}$$

Source: U.S. Census, "A Compass for Understanding and Using American Community Survey Data", October 2008.

Thresholds were be adjusted by the calculated margin of error to the lower bound for a more sensitive cutoff (see Appendix A for three-county estimates for every year).

Trending forward

ECONorthwest assessed displacement vulnerability in 2020 based on historic trends over the 2009 to 2015 period. Because of the gap in data from 1990 to 2000 and from 2000 to 2009, year 1990 and 2000 values were not included. We calculated a linear line of best fit for each hex bin to project to 2020 based on historic data from 2009 to 2015.

Tenure

Data on tenure was gathered at the census tract level and summarized into a hex grid. We calculated the home ownership rate of the census tract that fell in the hex bin's centroid.

Data

Data came from the U.S. Census for 1990, 2000, and 2009 to 2015 at the census tract level.

	Source	Years	Data table
Home Ownership Rate	U.S. Census Decennial Summary File 1	1990, 2000, 2010	QT-H3 Household Population and Household type by Tenure
	American Community Survey 5-year Estimates	2009, 2011-2015	B25003 Tenure

Trending forward

ECONorthwest calculated ownership rates in 2020 based on historic trends over the 2009 to 2015 period. Because of the gap in data from 1990 to 2000 and from 2000 to 2009, year 1990 and 2000 values were not included. We calculated a linear line of best fit for each hex bin to project to 2020 based on historic data from 2009 to 2015.

Appendix A

Home ownership assumptions, Portland Urban Growth Boundary, 2000-2016, 2020.

Year	Interest Rate	Property Tax Change Ratio	Utilities (monthly)	HUD Median Family Income
2000	8.05%	0.72	\$182	\$53,700
2001	6.97%	0.73	\$187	\$55,900
2002	6.54%	0.72	\$190	\$57,200
2003	5.83%	0.70	\$194	\$65,800
2004	5.84%	0.69	\$199	\$67,900
2005	5.87%	0.66	\$206	\$67,900
2006	6.41%	0.62	\$213	\$66,900
2007	6.34%	0.57	\$219	\$63,800
2008	6.03%	0.52	\$227	\$67,500
2009	5.04%	0.50	\$226	\$70,000
2010	4.69%	0.55	\$230	\$71,200
2011	4.45%	0.60	\$237	\$72,000
2012	3.66%	0.69	\$242	\$73,000
2013	3.98%	0.73	\$246	\$68,300
2014	4.17%	0.70	\$250	\$69,400
2015	3.85%	0.64	\$250	\$73,900
2016	3.77%	0.59	\$251	\$73,300
2020	6.59%	0.58	\$283	\$76,276

Adjusted average rates for the Portland Three-County Area, 1990, 2000, 2009-2015, 2020.

Year	% Non-White	% without Bachelor's degree	% Households with income at or below 80% Median Family Income	% Renters
1990	11.27%	74.76%	47.43%	39.63%
2000	20.16%	68.72%	45.00%	38.82%
2009	23.77%	63.53%	51.99%	37.57%
2010	25.81%	62.97%	52.94%	40.08%
2011	25.32%	62.39%	52.91%	38.80%
2012	25.74%	61.94%	53.34%	39.42%
2013	26.11%	61.63%	48.25%	40.08%
2014	26.51%	61.29%	48.79%	40.50%
2015	27.05%	60.72%	48.41%	40.94%
2020	29.19%	58.48%	44.17%	43.13%