2018 GENTRIFICATION AND DISPLACEMENT NEIGHBORHOOD TYPOLOGY ASSESSMENT
KEY FINDINGS AND METHODOLOGY REPORT

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Bureau of Planning and Sustainability
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City of Portland, Oregon

CONTENTS

INTRODUCTION

Portland residents face a complex and multi-faceted problem. Housing costs are increasing, and new housing production has not kept pace with population growth or provided housing for families across different income levels. The cost of housing alone does not explain some of the challenges that many residents have experienced. The character of some neighborhoods is changing rapidly, and some communities are seeing eroding social cohesion as they are pushed out from increasing rents. **This is the process of gentrification and involuntary displacement.**

This process happens when an under-valued neighborhood becomes desirable, which leads to increasing property values and demographic change. These changes force existing residents and businesses out of a neighborhood because they cannot afford to compete in the changing market or the inability for the neighborhood to meet their cultural needs.

Gentrification and displacement disproportionately impacts communities of color. The primary focus of this report is on communities who are vulnerable to economic changes—in particular, communities of color. This report aims to provide a framework for guiding public investments and planning efforts that address past historical and structural harms that communities of color have endured. The list of tools and practices that have been used to inhibit the prosperity of people of color is lengthy: Jim Crow laws, racialized mortgage-lending practices, restrictive covenants and deeds, public works projects condemning entire Black neighborhoods, and zoning rules that reinforce segregation are only a few to be named.

Another practice that has had disproportionate impacts on communities of color is uncoordinated public investment. **Decision makers have not fully appreciated how the cumulative impact of public investments can harm vulnerable populations.** For example, streetscape projects layered on top of transit enhancement services and commercial revitalization programs without the provision of affordable housing can make an area already experiencing gentrification become yet more desirable, leading to increased property values. Without adequate and timely affordable housing interventions, these investments exacerbate displacement.

This report presents the most recent findings of the gentrification and displacement neighborhood typology assessment, prepared by Portland Bureau of Planning and Sustainability staff in winter 2017-18. It builds off the previous work conducted by Dr. Lisa Bates of Portland State University in 2012, as well as her contributions around the topic for the Powell-Division Bus Rapid Transit project in 2016.

The Social Equity Investment Strategy is supported by the work in this report. The strategy recognizes the harm caused by public investments and aims to provide a framework for mitigating these impacts on vulnerable communities. It considers economic vulnerability and access to opportunity. **This gentrification and displacement report provides additional context on the housing market conditions and associated relative risk of displacement.**

DEFINING GENTRIFICATION AND DISPLACEMENT

With long-standing racial and economic disparities, some of which stem from racialized land-use and mortgage-lending practices, gentrification and displacement of communities is one of the most important issues to address in ensuring equity.

The 2035 Comprehensive Plan defines **gentrification** as "an under-valued neighborhood that becomes desirable, resulting in rising property values and changes to demographic and economic conditions of the neighborhood. These changes include a shift from lower-income to higher-income households, and often there is a change in racial and ethnic make-up of the neighborhood's residents and businesses."

Bates (2013) offers a similar definition, summarizing previous work on the issue: Gentrification is "housing market changes, economic status changes, and demographic changes in a neighborhood that alter its character. Gentrification occurs when a neighborhood has attractive qualities—for example, location or historic architecture—but remains relatively low value."

Market and socioeconomic changes are problematic to vulnerable communities because they cause displacement of households that have fewer resources to resist those changes. The 2035 Comprehensive Plan defines **displacement** as "households or businesses involuntarily forced to move from a neighborhood because of increasing market values, rents, or changes in the neighborhood's ability to meet basic needs in the case of households, or erosion of traditional client base in the case of businesses."

COMPREHENSIVE PLAN POLICIES

Several elements in the recently adopted 2035 Comprehensive Plan exist to help stem the pressures of gentrification and displacement. They call for evaluating plans and investments for their potential to impact vulnerable communities.

COMPREHENSIVE PLAN VISION

Portland is a prosperous, healthy, equitable and resilient city where everyone has access to opportunity and is engaged in shaping decisions that affect their lives.

EQUITY GUIDING PRINCIPLE

Promote equity and environmental justice by reducing disparities, minimizing burdens, extending community benefits, increasing the amount of affordable housing, affirmatively furthering fair housing, proactively fighting displacement, and improving socio-economic opportunities for under-served and under-represented populations. Intentionally engage under-served and under-represented populations in decisions that affect them. Specifically recognize, address and prevent repetition of the injustices suffered by communities of color throughout Portland's history.

ANTI-DISPLACEMENT POLICIES

Goal 5.B: Equitable access to housing
Portland ensures equitable access to housing, making a special effort to remove disparities in housing access for people with disabilities, people of color, low-income households, diverse household types, and older adults.

Policy 5.12: Impact analysis
Evaluate plans and investments to identify potential disparate impacts on housing choice, access, and affordability for protected classes and low-income households. Identify and implement strategies to mitigate the anticipated impacts.

Policy 5.15: Gentrification/displacement risk
Evaluate plans and investments for the potential to increase housing costs for, or cause displacement of communities of color, low- and moderate-income households, and renters. Identify and implement strategies to mitigate the anticipated impacts.

Policy 5.16: Involuntary displacement
When plans and investments are expected to create neighborhood change, limit the involuntary displacement of those who are under-served and under-represented. Use public investments to create

permanently-affordable housing and to mitigate the impacts of market pressures that cause involuntary displacement.

Policy 5.18: Rebuild communities
Coordinate plans and investments with programs that enable communities impacted by involuntary displacement to maintain social and cultural connections and re-establish a stable presence and participation in the impacted neighborhoods.

This policy framework offers decision makers and community stakeholders an expanded set of tools to ensure equitable outcomes for vulnerable communities.

GENTRIFICATION AND DISPLACEMENT NEIGHBORHOOD TYPOLOGY ASSESSMENT

This section introduces the methodology for the gentrification and displacement typology update. It provides highlights of the results of the typology, as well as area-specific key findings.

KEY FINDINGS

- **The city has almost 34,000 households at risk of being displaced.** These are low-income renter households living in a gentrifying area who pay more than 30% of their income on rent. Regulated affordable housing units are not available or planned in areas that are most at risk. Even small increases in rents may push these households out of the city to places where they are better able to afford to live.
- **East Portland is most at risk for displacement.** There are over 14,000 low-income cost-burdened renter households in East Portland (a quarter of the city's share), and 97% of them live in a census tract that is in early- or mid-stage gentrification. East Portland households endured the fastest rise of housing costs citywide since 2008. Home sale values in East Portland neighborhoods rose 7.0 percent on average, compared to 5.5 percent for all neighborhoods citywide, accounting for inflation. Some areas are already losing shares of vulnerable populations, including Parkrose and Rosewood, although the lag in availability of timely Census data suggests this trend may already be underway in most parts of East Portland.
- **The Interstate and MLK Corridor has continued to gentrify in to late stages, having lost thousands of vulnerable residents.** More than 1,700 residents of color have been displaced since 2010, and low-income households have also dropped. The was experiencing mid-stage gentrification between 2000 and 2010, but almost the entire corridor has moved into later stages where home values are high and vulnerable populations have been displaced.
- **St. Johns and the Peninsula continue to gentrify.** Parts that were in early stages or not at all gentrifying have moved into the middle stages of gentrification, where home values are appreciating, and demographic change is actively occurring. The share of residents who were people of color dropped 4 percent since 2010 while the citywide share rose about 6 percent.
- **The Powell-Division Corridor continues to gentrify and lose vulnerable residents.** The corridor was in early stages of gentrification between 2000 and 2010, but it jumped to late-stage and mid-stage gentrification between 2010 and 2016.

Figure 1. Gentrification and displacement neighborhood typology assessment using combined rental and home value data.
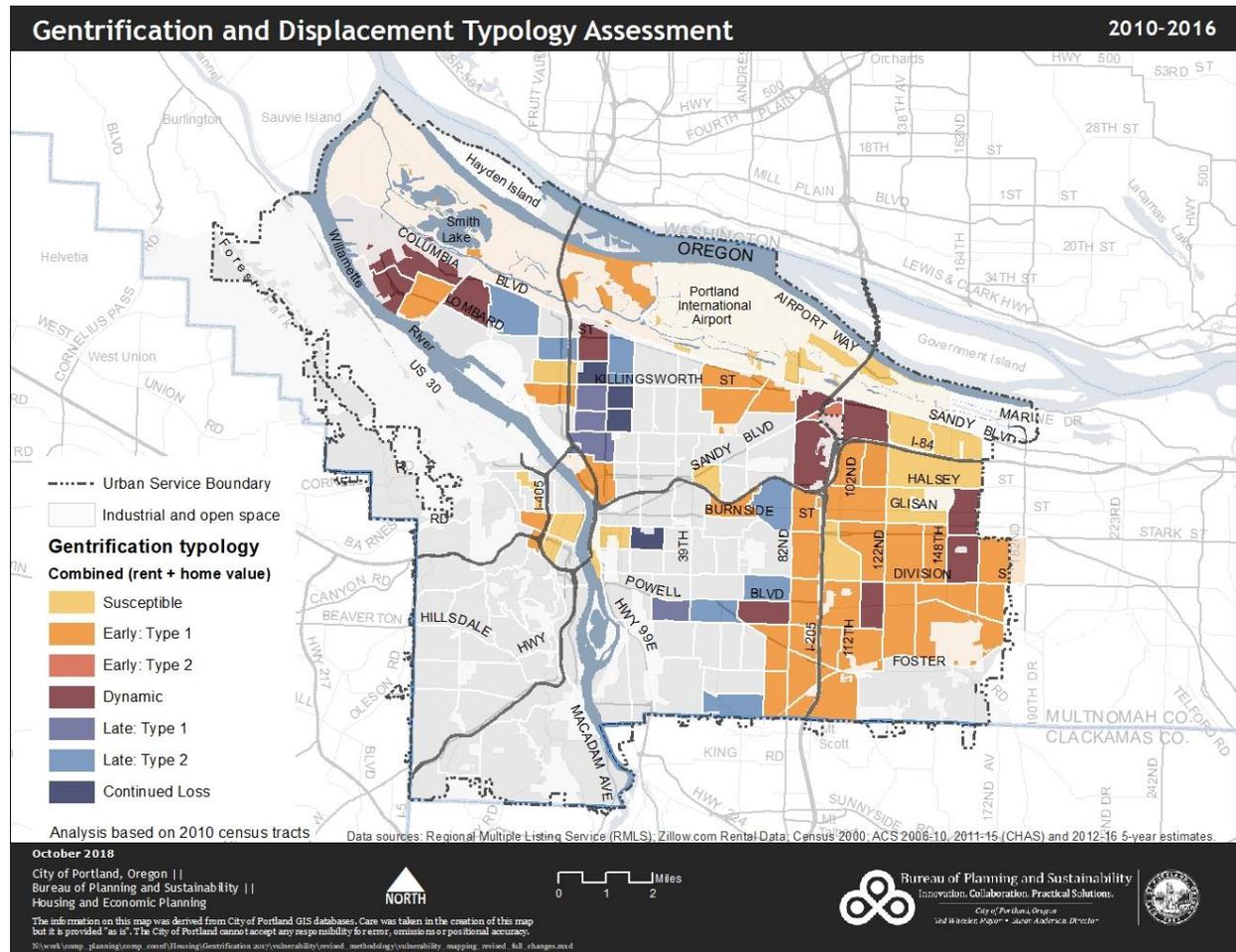
Table 1. Summary of gentrification typology by type for combined housing market analysis (rent + home values).

	Number of tracts	Population	Households	Low-income cost-burdened renter-occupied households
Susceptible	12	46,851	21,276	6,029
Early: Type 1	31	157,389	58,564	16,327
Early: Type 2	1	1,958	743	177
Dynamic	11	57,828	21,404	5,485
Late: Type 1	4	15,338	6,679	1,839
Late: Type 2	7	37,349	14,785	2,780
Continued Loss	4	14,251	5,991	1,334
Total	70	330,964	129,442	33,971

METHODOLOGY

Before devising a gentrification and displacement typology, we must first define what these terms mean. Is a loss of a single household due to rising rents enough to qualify an area as undergoing displacement? Does a new multifamily development qualify an area as being gentrified? This section retells the framework developed by Dr. Lisa Bates to define gentrification, with some modifications in methodology.

NEIGHBORHOOD GENTRIFICATION TYPOLOGIES

The gentrification typologies of this analysis were developed by Dr. Lisa Bates (2013), with some modifications. The method considers whether a neighborhood has a vulnerable population, has experienced demographic change, and the housing market conditions that the area is undergoing (Table 2). These conditions are explained in subsequent sections. Based on these three conditions, each neighborhood could fall into one of seven gentrification typologies, or none at all.

Table 2. Gentrification typology definitions derived from Bates (2013). Housing market condition explained on page 12.

Typology	Vulnerable population?	Demographic change?	Housing market condition
Susceptible	Yes	No	Adjacent
Early: Type 1	Yes	No	Accelerating
Early: Type 2	Yes	Yes	Adjacent
Dynamic	Yes	Yes	Accelerating
Late: Type 1	Yes	Yes	Appreciated
Late: Type 2	Used to be in 2000 or in 2006-10	Yes	Accelerating
Continued Loss	Used to be in 2000 or in 2006-10	Increasing share of white people and adults with a bachelor's degree	Appreciated

EARLY-STAGE GENTRIFICATION

These neighborhoods are not yet gentrifying or are showing early signs that they could be gentrifying.

Susceptible: These neighborhoods have higher shares of vulnerable populations but have not yet experienced demographic changes. Their housing market is low or moderate, but they are adjacent to tracts whose values are already high or are increasing rapidly.

Early: Type 1: These neighborhoods have higher shares of vulnerable populations but have not yet experienced demographic changes. Their housing market is still low or moderate but has experienced high appreciation since 2008 (or 2012 for rents).

Early: Type 2: These neighborhoods have higher shares of vulnerable populations but have experienced demographic changes whereby they are losing vulnerable populations proportionally. Their housing market is low or moderate, but they are adjacent to tracts whose values are already high or are increasing rapidly.

MID-STAGE GENTRIFICATION

Dynamic: These neighborhoods are currently undergoing gentrification. They have higher shares of vulnerable populations but have experienced demographic changes by losing vulnerable populations proportionally. Their housing market is still low or moderate but has experienced high appreciation since 2008 (or 2012 for rents).

LATE-STAGE GENTRIFICATION

These neighborhoods have mostly gentrified but vulnerable populations may still reside in there. The housing market has completely shifted from low or moderate to high value.

Late: Type 1: These neighborhoods have higher shares of vulnerable populations but have experienced demographic changes by losing vulnerable populations proportionally. Their housing market used to be low or moderate in 2000 but has appreciated rapidly since, and now values are high.

Late: Type 2: A new typology in 2018, these neighborhoods no longer have high shares of vulnerable populations like they used to in 2000 or in 2006-10. They have experienced demographic changes by losing their once-high share of vulnerable populations. Their housing market is still low or moderate but has experienced high appreciation since 2008 (or 2012 for rents).

Continued loss: These neighborhoods no longer have high shares of vulnerable populations like they used to in 2000 or in 2006-10. The share of white people is growing and/or the share of people with a four-year degree is growing. Their housing market used to be low or moderate in 2000 but has appreciated rapidly since, and now values are high.

ECONOMIC VULNERABILITY

Economic vulnerability is measured across four variables: households that rent; people who identify with a community of color; people without four-year degrees; and low-income households. These socioeconomic factors indicate a reduced ability to withstand housing market price increases caused by gentrification.

Each census tract is assigned an economic vulnerability score in two ways. The first way, detailed by Bates' (2013) gentrification and displacement study, assigns each tract a score between 0 and 4. One point is awarded for each condition that is true below. Under the 2013 definition, a census tract is considered vulnerable if its vulnerability score is 3 or 4.

- Share of households that are **renters** greater than Portland average
- Share of population that are **communities of color** greater than Portland average
- Share of adults (25 or older) **without a four-year degree** greater than Portland average
- Share of households that are **low-income** (below 80% MFI) greater than Portland average

A second approach to measuring economic vulnerability reflects concurrent work around the vulnerability analysis for the Social Equity Investment Strategy (forthcoming) and the approach that other City agencies, such as PBOT, have begun to undertake. For each vulnerability factor, a score from 0 to 4 is allotted to each tract based on the quintile of each tract. A quintile is a value that represents 20% of a sample, ordered sequentially 1-20%, 21-40%, 41-60%, 61-80% and 81-100%. See Table 5 below for the quintile thresholds.

The score of the four factors is summed together for a composite vulnerability score of 0 to 16—a higher score indicates a higher economic vulnerability. **Tracts with a score of 10 or greater are generally considered highly vulnerable**. Let us illustrate an example with Census Tract 75 (Cully):

- 39.7% people of color (quintile score = 4)
- 65.0% of adults lacked a four-year degree (quintile score = 3)
- 38.1% of households were renters (quintile score = 2)
- 50.8% of households were low income (quintile score = 3)

The composite vulnerability score for Tract 75 is thus 4 + 3 + 2 + 3 = **12**. Since the score is greater than 10, Tract 75 is considered vulnerable.

The gentrification and displacement neighborhood typology analysis accepts both definitions of economic vulnerability as valid when determining whether a tract is considered vulnerable—both Bates' (2013) approach and the quintile approach developed by City staff will flag a tract as vulnerable. This allows for both methodological compatibility and for a greater sensitivity when measuring potentially vulnerable communities.

DATA SOURCES AND THRESHOLD CALCULATION

Three time periods were used in this analysis: 2000; 2006-2010; and 2012-2016. There are three data sources from which the economic vulnerability score is derived: the Decennial Census; the American Community Survey (ACS) five-year estimates; and HUD Comprehensive Housing Affordability Strategy (CHAS) data, which is derived from ACS five-year estimates. At the time of analysis, more recent CHAS data were not available, so 2011-2015 CHAS data were paired with 2012-2016 ACS data. CHAS data are used to determine the share of low-income households that are under 80% of the HUD-adjusted median family income (MFI). ACS and Census data are used to determine the share of renter-occupied households, the share of the population that is a community of color, and the share of adults without a four-year degree. Table 3 lists all data sources used in developing the typologies.

Census tract boundary changes occurred across a few tracts between 2000 to 2010. In some cases, tracts were combined, and in others, tracts were split. In these instances, staff used the Tract Relationship Files published by the Census Bureau to approximate the vintage (2000) figures through weighting the estimates by share of households or population residing in each tract portion of the revised boundaries.

In the first method (Bates 2013) to determine economic vulnerability, each tract is weighed against a threshold based on the citywide average. The threshold is determined by subtracting the margin of error (MoE) from the estimate. Using the lower-bound estimate allows for greater sensitivity when determining vulnerability. For example, the estimate for the share of communities of color in 2012-2016 was 28.4 percent with a margin of error of 0.4 percent. The lower-bound estimate—and as such the threshold above which a vulnerability point is awarded—is thus 28.0 percent.

No margins of error are available for 2000 Census data, but they are available for all other estimates across the four variables. Determining the thresholds sometimes involved aggregating the data and producing derived proportions, which requires further calculation to determine the margins of error. Staff consulted formulas in the Compass Handbooks published by the Census Bureau to calculate the margins of error.

The second method to calculate the economic vulnerability score does not utilize margins of error. The thresholds are determined by assigning a score 0 to 4 for each vulnerability factor and summing the resulting score. For each vulnerability factor, five ranges of scores were produced based on the quintile of the estimates (Table 5).

Table 3. Summary of data sources and periods used for demographic and housing market data.

Table numbers		Parameter	2000	2006-10	2012-16
2000 Census/CHAS	ACS/CHAS				
H004	B25003	Tenure (renter/homeowner)	✓	✓	✓
P007	B03002	Race (communities of color/white)	✓	✓	✓
P037	B15002	Educational attainment	✓	✓	✓
Tables A2A & A2B	Table 8	Income level by MFI (CHAS)	✓	✓	2011-15
P053	B19013	Median household income	✓	✓	✓
H063	N/A	Median gross rent	✓	N/A	N/A
N/A	N/A	Regional Multiple Listing Service (RMLS) to determine home value appreciation	N/A	2008	2017
N/A	N/A	Zillow (ZRI time series for multifamily, single-family and condo/co-op) to determine rent appreciation	N/A	2012	2017

Table 4. Thresholds for determining vulnerability (Bates 2013) across four vulnerability factors by year/period.

Period	Portland estimate	Margin of error	Lower-bound estimate	Period	Portland estimate	Margin of error	Lower-bound estimate
Percent communities of color				*Percent without four-year degree*			
2012-16	28.4%	0.4%	28.0%	2012-16	53.0%	0.7%	52.3%
2006-10	27.1%	0.5%	26.5%	2006-10	58.9%	0.8%	58.1%
2000	24.6%	N/A	N/A	2000	67.4%	N/A	N/A
Percent renter households				*Percent low-income households*			
2012-16	46.9%	0.6%	46.3%	2011-15	44.4%	0.9%	43.5%
2006-10	44.8%	0.6%	44.2%	2006-10	43.8%	0.8%	42.9%
2000	44.2%	N/A	N/A	2000	45.8%	N/A	N/A

Table 5. Quintile score thresholds for four vulnerability factors by year/period.

Adults lacking a four-year degree					Low-income households			
Score	2000	2006-10	2012-16		Score	2000	2006-10	2011-15
0	Up to 47.2%	Up to 37.9%	Up to 31.9%		0	Up to 30.8%	Up to 28.4%	Up to 29.4%
1	47.3% to 61.2%	38.0% to 50.7%	32.0% to 42.7%		1	30.9% to 42.8%	28.5% to 39.8%	29.5% to 40.5%
2	61.3% to 77.5%	50.8% to 62.9%	42.8% to 53.0%		2	42.9% to 48.9%	39.9% to 46.4%	40.6% to 47.7%
3	77.6% to 83.7%	63.0% to 78.1%	53.1% to 74.3%		3	49.0% to 55.4%	46.5% to 55.2%	47.8% to 55.0%
4	83.8% or more	78.2% or more	74.4% or more		4	55.5% or more	55.3% or more	55.1% or more
Communities of color					Renter households			
Score	2000	2006-10	2012-16		Score	2000	2006-10	2012-16
0	Up to 12.2%	Up to 13.6%	Up to 14.7%		0	Up to 26.0%	Up to 24.9%	Up to 27.2%
1	12.3% to 18.9%	13.7% to 19.6%	14.8% to 20.1%		1	26.1% to 35.1%	25.0% to 34.5%	27.3% to 38.0%
2	19.0% to 23.7%	19.7% to 28.1%	20.2% to 29.2%		2	35.2% to 43.1%	34.6% to 44.5%	38.1% to 47.6%
3	23.8% to 31.2%	28.2% to 37.6%	29.3% to 38.8%		3	43.2% to 57.1%	44.6% to 57.9%	47.7% to 60.4%
4	31.3% or more	37.7% or more	38.9% or more		4	57.2% or more	58.0% or more	60.5% or more

DEMOGRAPHIC CHANGE

The second piece that defines each gentrification typology is whether the neighborhood (census tract) experienced demographic change between 2006-10 and 2012-16. Following Bates' (2013) method, gentrification-related demographic changes occurred in a census tract in either of these scenarios:

- **Either** three or four of the following four conditions were true:
    1. The share of **homeowners** increased or decreased slower than the citywide average
    2. The **white population** share increased or decreased slower than the citywide average
    3. The share of adults with a **four-year degree** increased faster than the citywide average
    4. **Median household income** increased faster than the citywide average
- **Or** the following two conditions (of the four factors above) were true:
    1. The **white population** share increased or decreased slower than the citywide average
    2. The share of adults with a **four-year degree** increased faster than the citywide average

The citywide average percentage change estimates are highlighted in Table 6. While only the periods 2006-10 to 2012-16 were used to determine demographic change, other periods are shown for comparison.

DATA SOURCES AND THRESHOLD CALCULATION

As with the economic vulnerability score, the same data sources were used for determining demographic change (see Table 3 above). Dollar amounts for median household income were converted to 2016 dollars using CPI-U West.

The threshold is determined by subtracting the margin of error (MoE) from the estimated percentage change (Table 6). Using the lower-bound estimate allows for greater sensitivity when determining whether demographic change has occurred. For example, the estimate for the change in the share of the white population between 2006-10 and 2012-16 was -1.9 percent with a margin of error of 0.6 percent. The lower-bound estimate—and as such the threshold above which demographic change is determined to have occurred—is thus -2.5 percent.

Determining the thresholds sometimes involved aggregating the data and producing derived proportions, which requires further calculation to determine the margins of error. Staff consulted formulas in the Compass Handbooks published by the Census Bureau to calculate the margins of error.

Table 6. Demographic change thresholds for four factors by period. Relevant period for this study highlighted in yellow. Other periods' change thresholds shown for comparison.

Period	Portland estimate	Margin of error	Lower-bound estimate	Period	Portland estimate	Margin of error	Lower-bound estimate
Change in share of white population				Change in share of adults with four-year degree			
2000–2016	-5.1%	0.3%	-5.4%	2000–2016	43.9%	1.8%	42.1%
2010–2016	-1.9%	0.6%	-2.5%	2010–2016	14.1%	2.2%	11.9%
2000–2010	-3.3%	0.5%	-3.8%	2000–2010	26.1%	1.8%	24.3%
Change in share of homeowners				Change in median household income			
2000–2016	-4.8%	0.9%	-5.8%	2000–2016	2.7%	1.5%	1.2%
2010–2016	-3.9%	1.4%	-5.3%	2010–2016	6.8%	2.2%	4.6%
2000–2010	-1.0%	1.1%	-2.1%	2000–2010	-3.9%	1.4%	-5.3%

HOUSING MARKET CONDITIONS

The final component in defining gentrification typologies is the housing market conditions that characterize an area. The original (2013) method used only home values when assessing the housing market. Because better data on rents are now available, this analysis attempts to incorporate the rental market as well. In some instances, home values increased faster than rental rates, and in other cases the opposite was true. Because rental and for-sale markets do not always track together, conflicting housing typologies could occur if both rental market and real estate market data are used simultaneously. For this reason, the housing market component was **analyzed separately for home sales and for rental indices**. The combined map (Figure 1) assigns the **more severe typology** derived from home value and rental index data.

Each census tract was assigned a home value for 2000, 2008 and 2017. The value was the ratio of the tract's median sale value for single-family homes, townhomes and condominiums to the citywide median sale value. Tracts were considered to be low or moderate values if the ratios were in the bottom three quintiles. Tracts with home value ratios in the top two quintiles were considered high values.

Tracts were also assigned a rental value for 2000, 2012 and 2017. The value was the Zillow Rent Index (ZRI) for 2012 and 2017 or median gross rent for 2000. Tracts were considered to be low or moderate rental value if they fell in the bottom three quintiles. Tracts with rental rates in the top two quintiles were considered high values.

Lastly, each tract was assigned home value appreciation rates and rental appreciation rates for the periods 2008–2017 (2012–2017 for rents) and 2000–2008 (2000–2012 for rents). The appreciation rate is the percentage change in median sale values or in rental indices. Tracts were considered to be low or moderate appreciation if the appreciation rates were in the bottom three quintiles. Tracts with appreciation rates in the top two quintiles were considered high appreciation.

With these data, three gentrification-related housing market typologies from Bates (2013) were identified:

1. *Adjacent* tracts:
   - Had low or moderate 2017 home values/rents
   - Experienced low or moderate 2008–2017 appreciation (or 2012–2017 rental appreciation)
   - Touched the boundary of at least one tract with a high 2017 value and/or high 2008–2017 appreciation (or 2012–2017 rental appreciation)
2. *Accelerating* tracts:
   - Had low or moderate 2017 home values/rents
   - Experienced high 2008–2017 appreciation (or 2012–2017 rental appreciation)
3. *Appreciated* tracts:
   - Had low or moderate 2000 home values/rents
   - Had high 2017 home values/rents
   - Experienced high 2000–2017 appreciation

Bates (2013) describes the Adjacent typology as an attempt to capture the spillover effects of gentrification, where neighborhoods near gentrifying areas are at risk of experiencing gentrification and displacement as housing pressures and commercial investments expand outward. She further describes the Accelerating and Appreciated typologies as a means to capture currently gentrifying (Accelerating) and already gentrified (Appreciated) neighborhoods.

DATA SOURCES AND NOTES

Median sale price data come from Regional Multiple Listing Service (RMLS). This database is the industry standard that real estate professionals and mortgage lenders use to assess comparable home sales in a neighborhood. It compiles comprehensive and accurate transaction data on almost all listings in the Portland-Vancouver metropolitan area. Condominium, single-family home, and attached/townhome housing types were included when calculating the median for each tract.

All dollar amounts were adjusted for inflation using CPI-U West and converted to 2016 dollars. Census tract boundary changes did not affect how home values were assigned, because RMLS listings are available at the address level.

Rent data were derived from the neighborhood-level Zillow Rent Index (ZRI) time series for multifamily, single-family and condo/co-op housing types. The neighborhood geographies defined by Zillow do not match census tract boundaries. Staff devised a method to assign each census tract a ZRI value based on the share of housing units in each census tract that fell in each Zillow "neighborhood" geography. Using the 250'-by-250' grid cells in the Buildable Lands Inventory (BLI), staff were able to determine a weighting mechanism based on the spatial distribution of housing units to assign rental rates. For example, examine Census Tract 20 (east portion of Kerns), which fell into three Zillow "neighborhood" geographies: About 2 percent of units were in

Laurelhurst, where rent was $2,914 in 2017; 19 percent of units were in Buckman, where rent was $1,964 in 2017; and 79 percent of units were in Kerns, where rent was $2,100 in 2017. The rent in Census Tract 20 is the weighted average of these neighborhoods' rents:

<div align="center">(2% * $2,914) + (19% * $1,964) + (79% * $2,100) = <u>**$2,090**</u></div>

This method was used across all tracts. Because ZRI are reported monthly, the average for each year was taken. ZRI for 2012 utilized the 2010 BLI housing unit estimates while the ZRI for 2017 utilized the 2015 BLI housing unit estimates. When no rental data were available at the neighborhood level, staff resorted to using the ZIP code-level ZRI to fill in remaining gaps. In a limited number of cases, 2017 ZRI were not available, so staff used 2016 ZRI estimates and adjusted calculations accordingly. Because no ZRI estimates for 2000 existed, staff used median gross rent reported in the Census 2000.

Readers will note that the time periods of the housing market do not precisely match the periods for determining vulnerability or demographic change; nor does the rental data period match the home value data period. There are several reasons for this:

- Demographic data are not published timely enough, and at the neighborhood level the data represent a five-year sampling period. It is better to use the most recent data when it's available. Thus with 2017 market data recently available, this year was selected as a comparison year.
- The year 2010 was a trough year in the real estate market cycle, and a better measure of change looks at peak-to-peak. Since 2008 was the midpoint of the 5-year sample in 2006-2010, and because 2007-08 was the real estate market peak, this year was selected as the base year for home values.
- Accurate, reliable and nonproprietary rental data at the neighborhood scale are not available prior to 2012. Proprietary data sources were cost-prohibitive, and each source had its own faults. For example, some sources only reported on very large (50+ unit) apartments, which represents only about 20 percent of the total rental housing stock in Portland. Citywide trends show a general flatline in rents during the recession (2008–2011), so staff felt comfortable using 2012 as the base year for rents.