



CENTER FOR STUDIES  
IN DEMOGRAPHY AND ECOLOGY



POPULATION HEALTH INITIATIVE  
UNIVERSITY *of* WASHINGTON

# Population & Housing Trends in King County: Growth and Vulnerabilities

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**UW Population Health Initiative Applied Research Fellowship**  
September 23, 2021

# Introductions

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## Applied Research Fellows

- **Ali Ahmed**, BA student in Political Science
- **Adrien Allorant**, PhD candidate in Global Health and Health Metrics
- **Juliette Randazza**, MPA / MPH student in Environmental and Occupational Health and Public Administration
- **Grace Rossi**, BS student in Public Health - Global Health
- **Will von Geldern**, PhD student in Public Policy and Management

## Project Lead

- **Dr. Jessica Godwin**, Statistics and CSDE

## Advisory Team

- **Dr. Sara Curran**, CSDE Director
- **Rebecca Maskin**, King County Demographer
- **Arti Shah**, Assistant Director, Population Health Initiative

# Objectives

1. Use existing data on **household size**, **tenure**, and **family status** in King County to understand the demographic and spatial distribution of access to **adequate, affordable housing**.
2. Use existing data to identify spatial and demographic disparities that may exacerbate the **impacts** of **climate-related hazards** and **COVID-19** on **households**.
3. Identify **gaps** in **data and public policy** which hinder King County policymakers' ability to anticipate and plan for **future housing needs**.

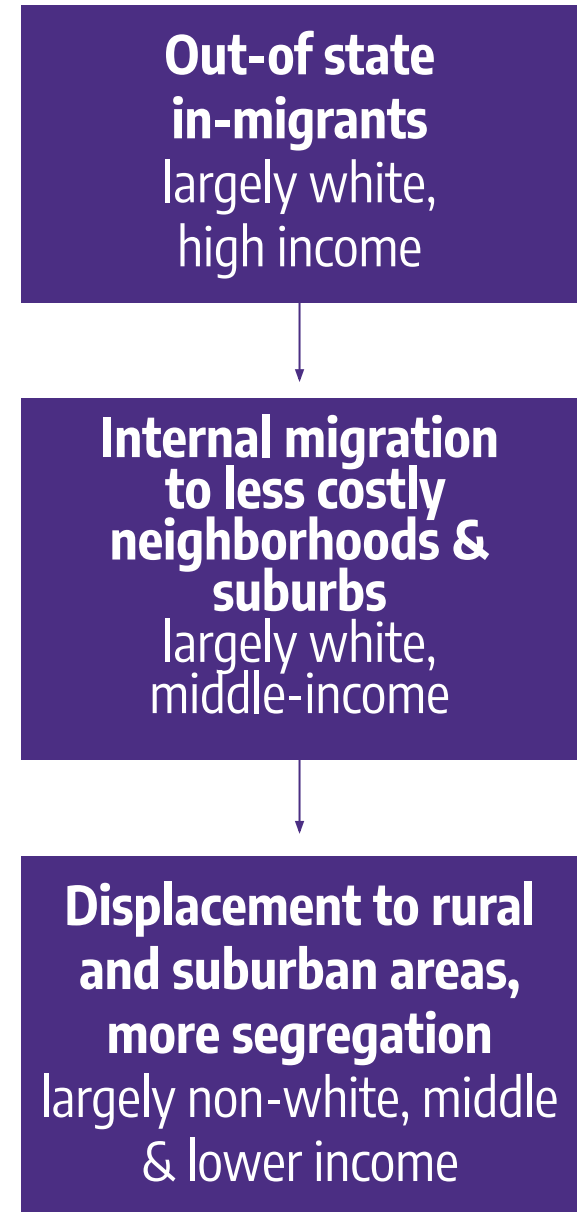
# Growth and Housing in King County

## In-migration

- Early 1980s: Tech-cluster economy
- Late 1990s - 2002: Dot-com boom and bust
- 1994: Amazon founded, by 2009 rapid development

## Housing and Displacement

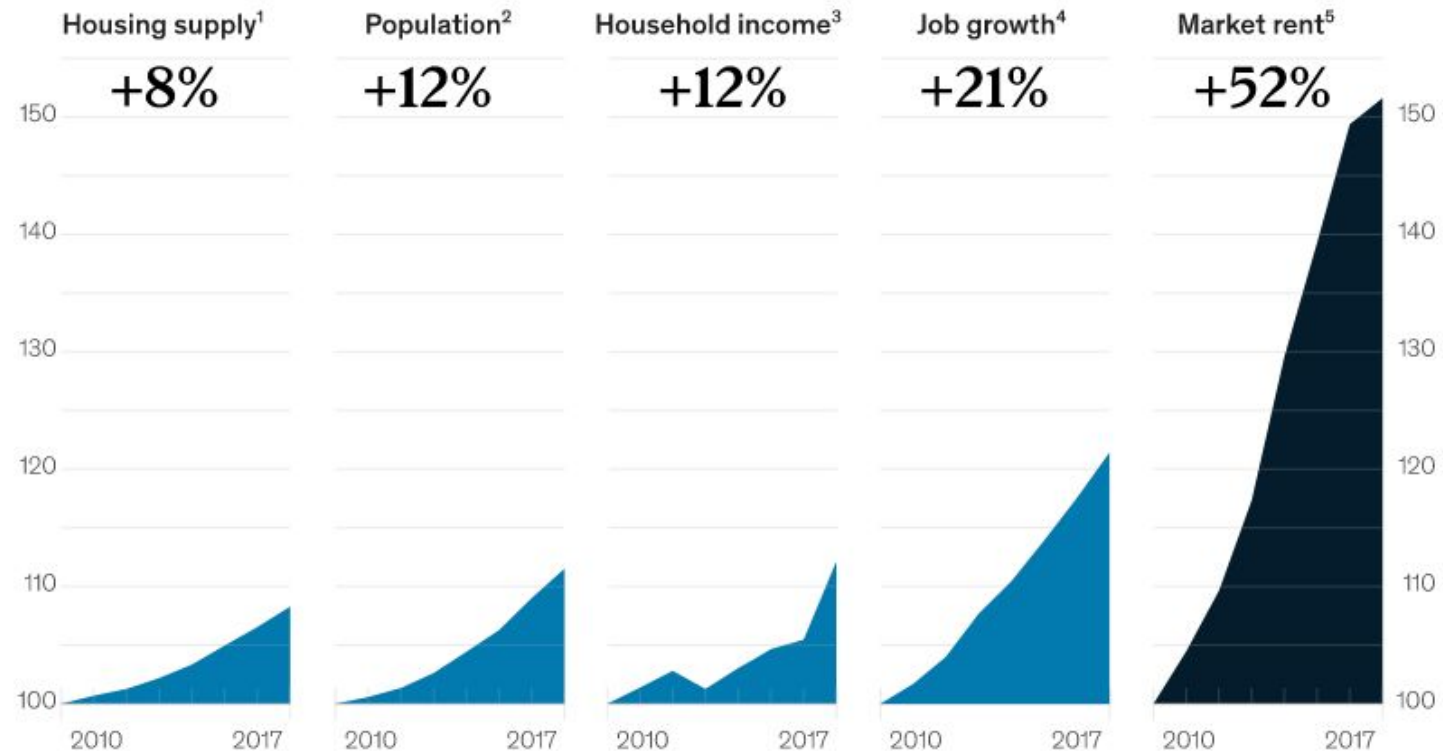
- 2008 foreclosure crisis disproportionately affected Black & Latinx households
- Single-family zoning in cities including Seattle limits ability to accommodate need for multi-family housing units
- Gentrification and neighborhood change marked by three types of movement



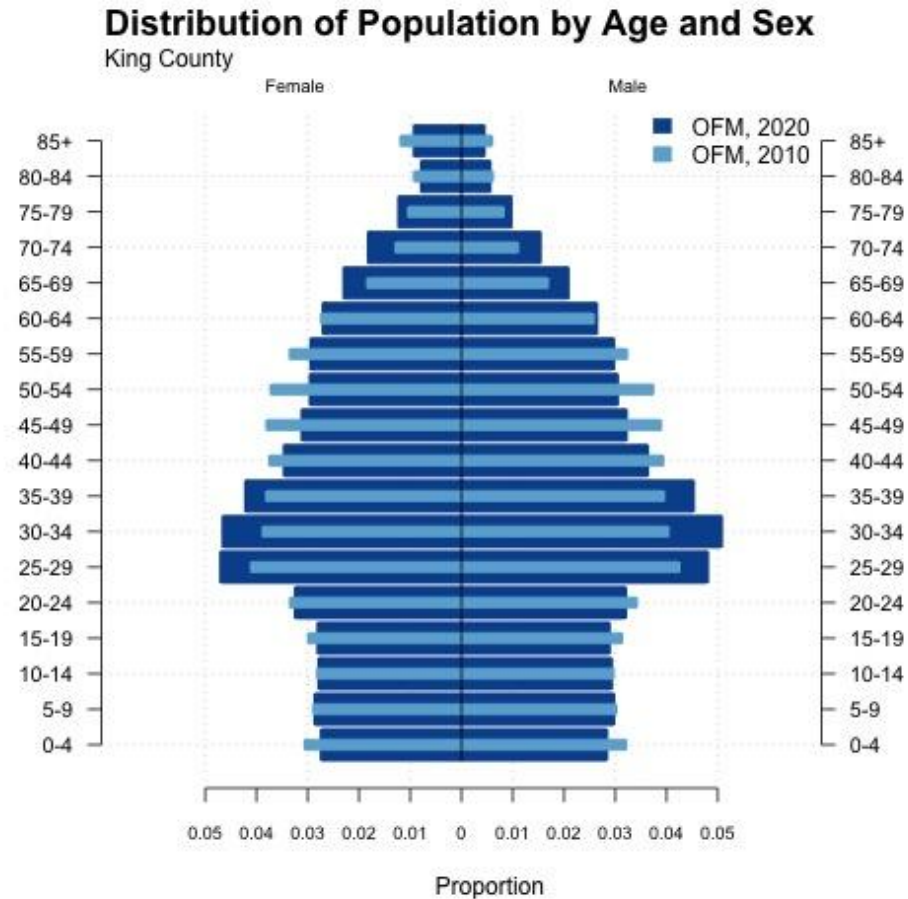
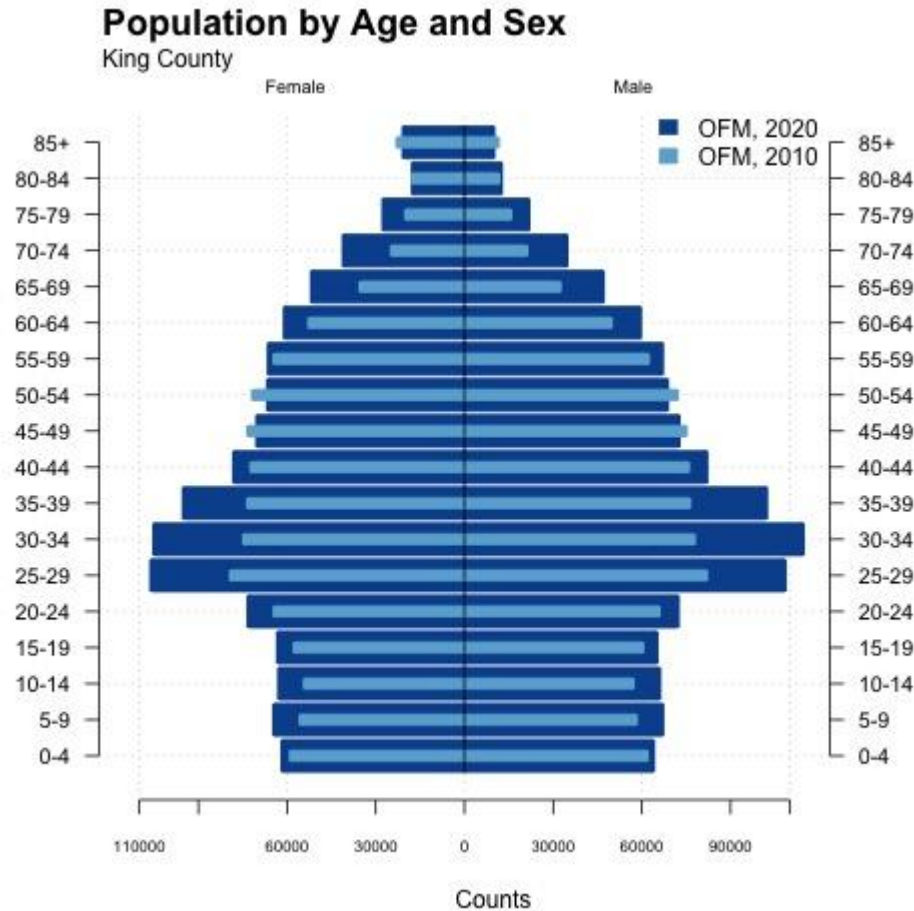
# Growth and Housing in King County

Housing supply and area household incomes in King County have not kept pace with job growth and rent increases.

Growth in King County, index (100 = 2010)

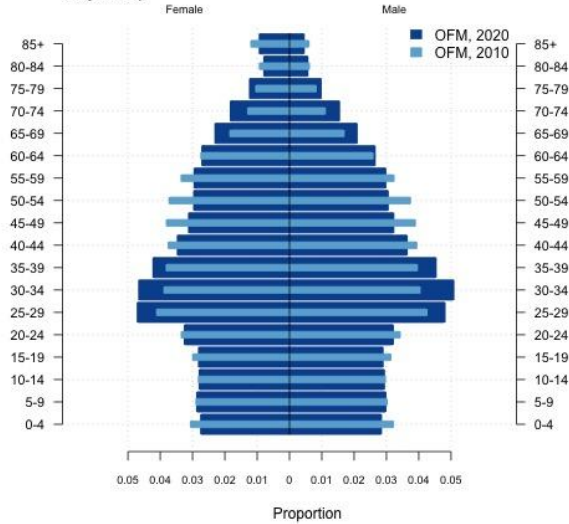


# Population Growth and Structure in King County

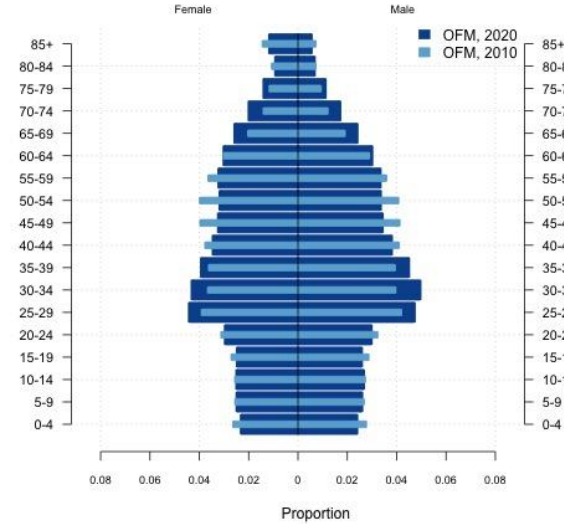


- Evidence of an **aging population** over the past decade.
- Bump indicative of **labor migration**, skews slightly male.
- **Growing number of children**, but not distribution.

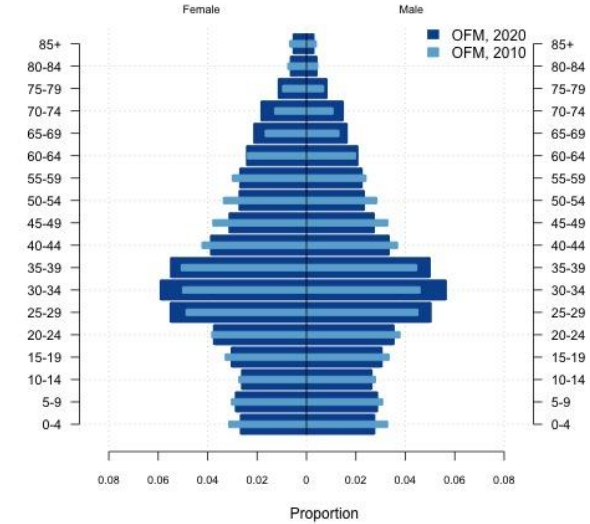
**Distribution of Population by Age and Sex**  
King County



**White**



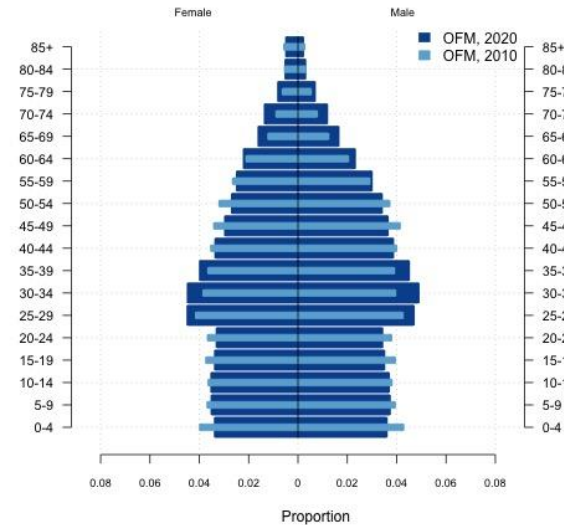
**Asian**



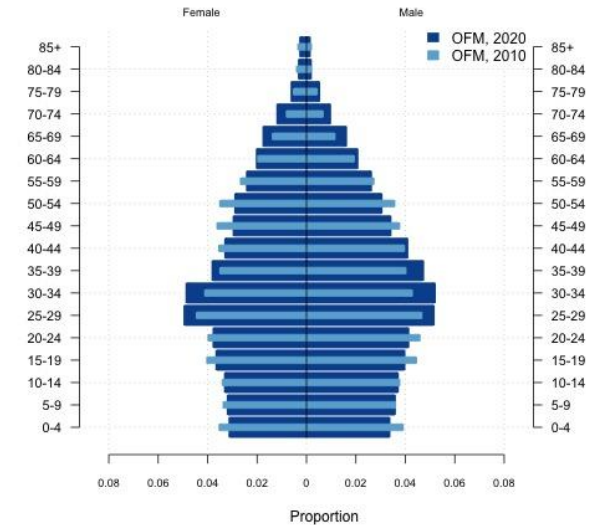
## By Race/Ethnicity

- Similar evidence of aging across groups.
- Working age in-migration evident in all groups, most pronounced with Asian population.
- Larger proportion of Black or African American and American Indian and Alaska Native youth.

**Black/African American**



**American Indian/Alaska Native**



# **Household Size in King County**

## **Population gains and household size**

→ Increase in households' size or increase in absolute number of households?

## **Household size and infrastructure planning**

→ Number of people in a household impacts demand for water, transportation, schools, etc.

## **Household tenure and family status**

→ Types of household influences type of housing needs, time of residence, wealth, housing quality, rent burden



# Household Size in King County

## Definitions

### Outcomes

- Households, Household population

### Household Size

- 1, 2, 3, 4, 5, 6, 7+
- Sometimes collapsed to 1, 2, 3, 4+

### Household Tenure

- Owner, Renter

### Household Status

- Family, non-Family
- No 1-person families

## Data

### Census

- **Years:** 2000, 2010
- **Geography:** County, Tract

### ACS 1-yr

- **Years:** 2005-2009, 2011-2019
- **Geography:** County

### ACS 5-yr

- **Periods:** 2005-2009, 2010-2014, 2015-2019
- **Geography:** County, Tract

# Household Size in King County

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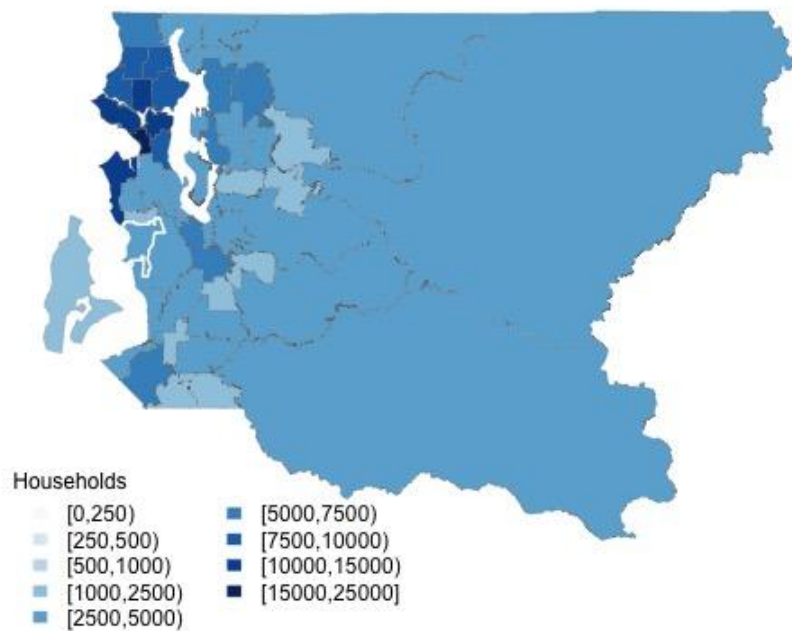
## Research questions

1. To what extent have recent demographic changes in King County's population attenuated or accentuated changes in the number of households by size and tenure or family status?
2. How have trends in household size, observed at the county level, changed at more granular geographies (census tracts or HRAs)?
3. Where do we expect to see the largest growth in the number of households in the future?

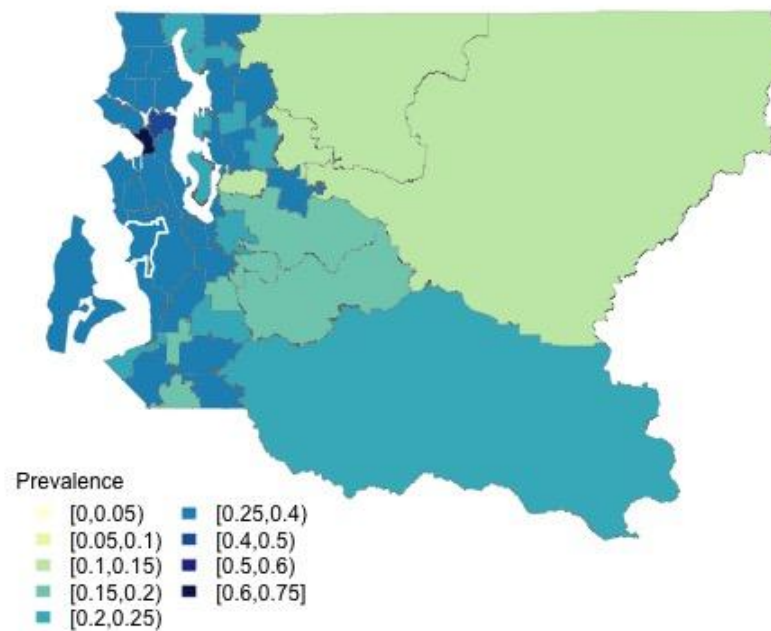
# How do we quantify housing needs?

## Counts, Prevalence, & Distribution

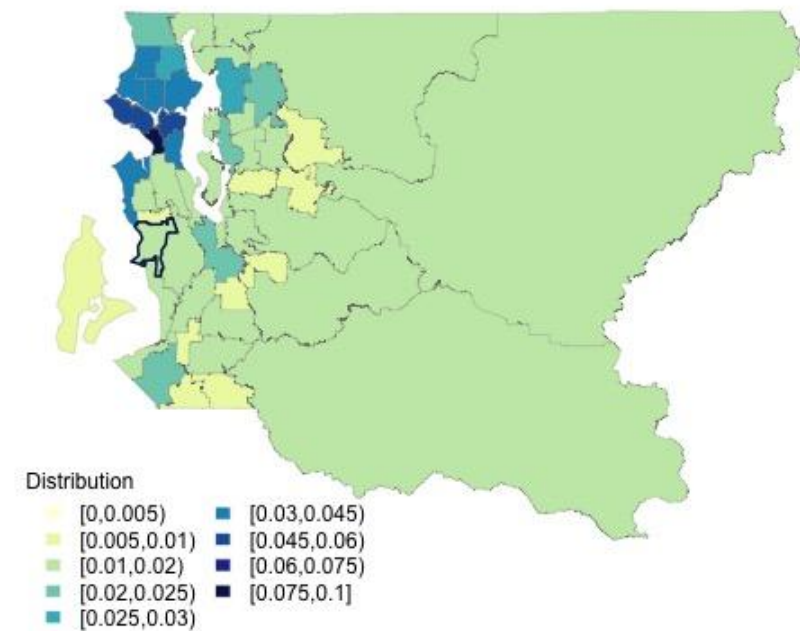
Counts of Households  
Size 1



Prevalence of Households  
Size 1



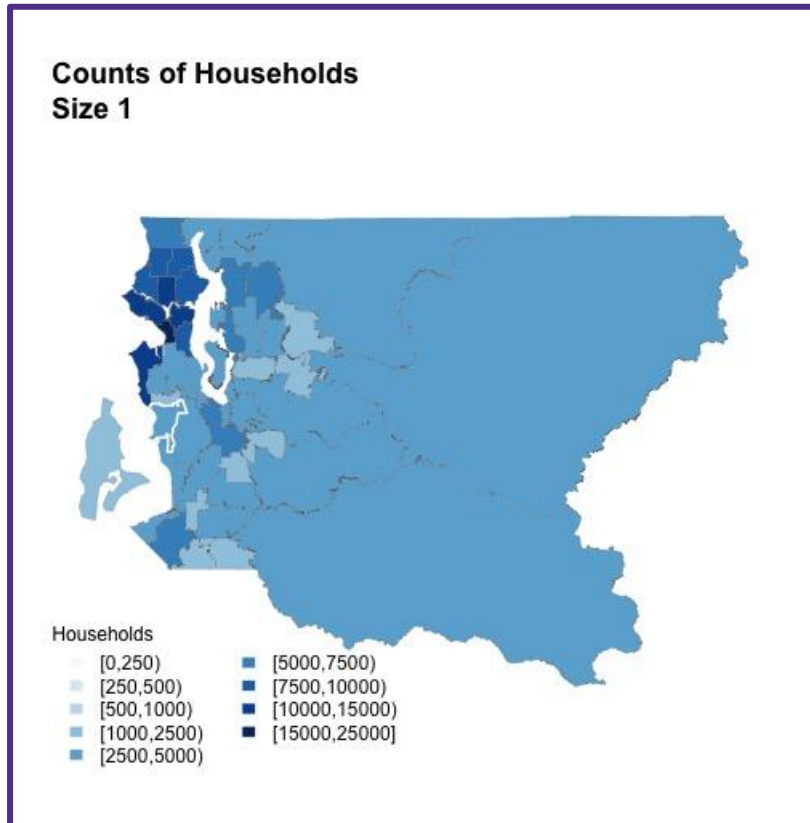
Distribution of Households  
Size 1



(Estimates from ACS 2015-19)

# How do we quantify housing needs?

Counts, Prevalence, & Distribution



## The Question

How many  
households  
of size 1  
are in Burien?

## The Answer

4914

### Data

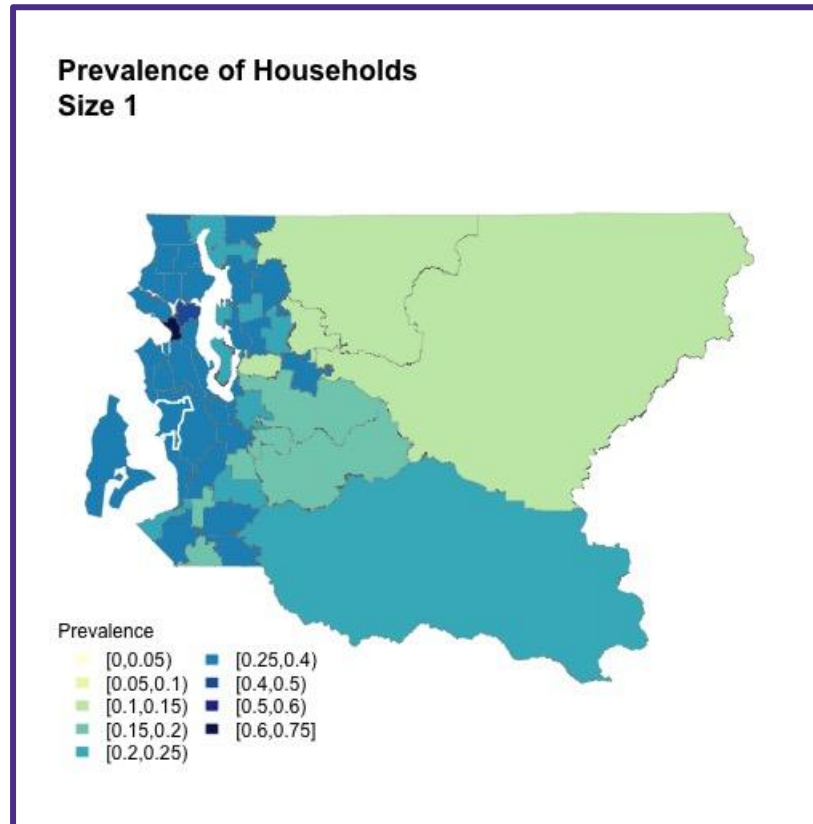
- Census counts
- ACS 5-yr estimates of totals

(Estimates from ACS 2015-19)

# How do we quantify housing needs?

Counts, **Prevalence**, & Distribution

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(Estimates from ACS 2015-19)

## The Question

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What proportion of  
households in  
Burien  
are of size 1?

## The Answer

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**0.28 or 28%**

### Prevalence Calculation

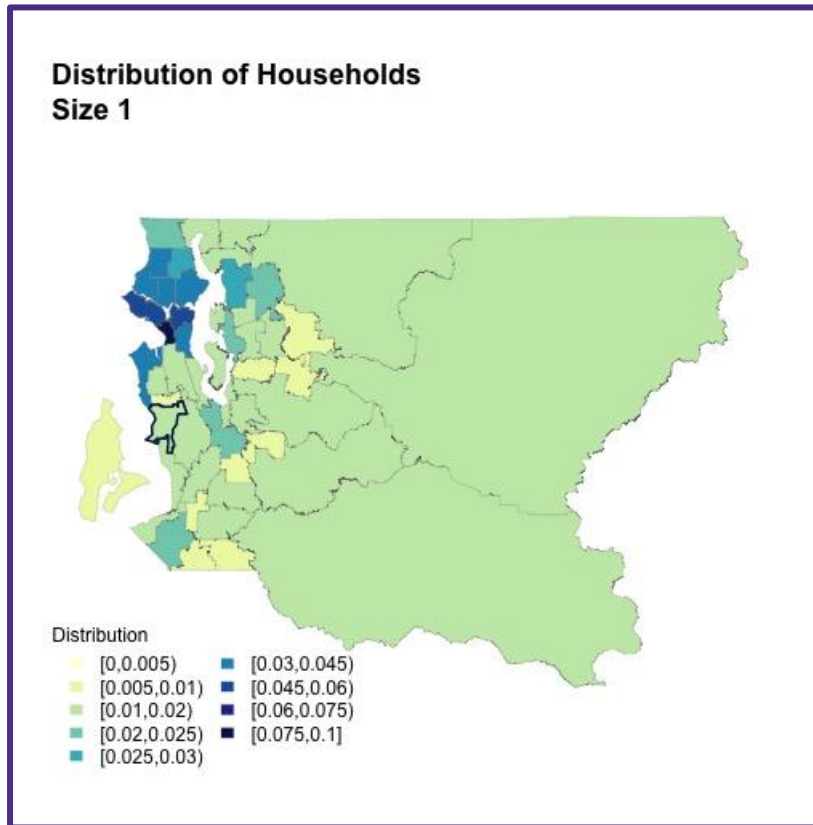
# households of  
size 1  
in Burien

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# households  
in Burien

# How do we quantify housing needs?

## Counts, Prevalence, & **Distribution**



(Estimates from ACS 2015-19)

## The Question

What proportion of  
King County's households  
of size 1  
are in Burien?

## Distribution Calculation

# households of  
size 1  
in Burien

# households of  
size 1 in  
King County

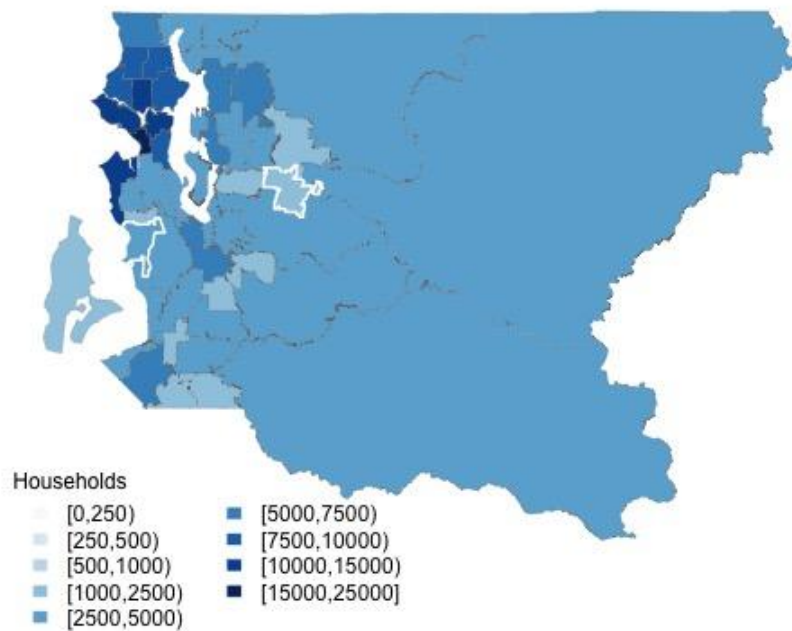
## The Answer

**0.019 or 1.9%**

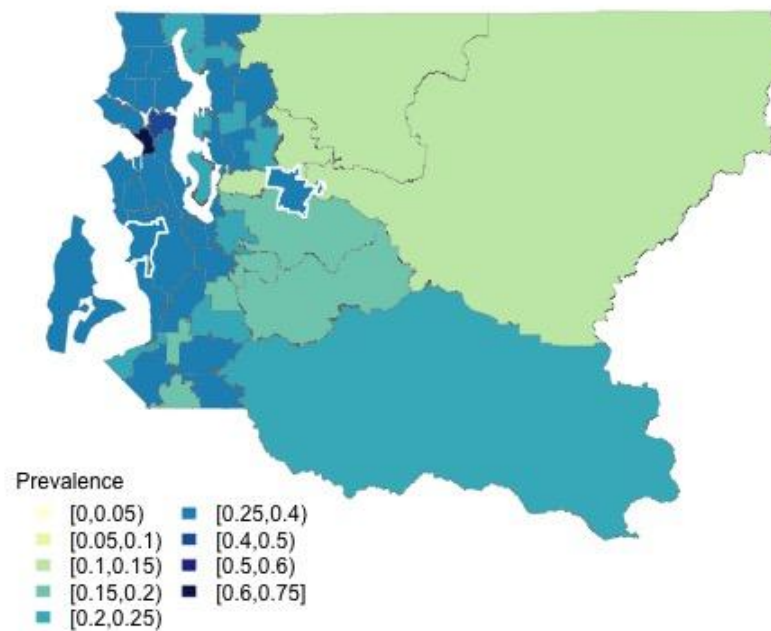
# How do we quantify housing needs?

## Counts, Prevalence, & Distribution

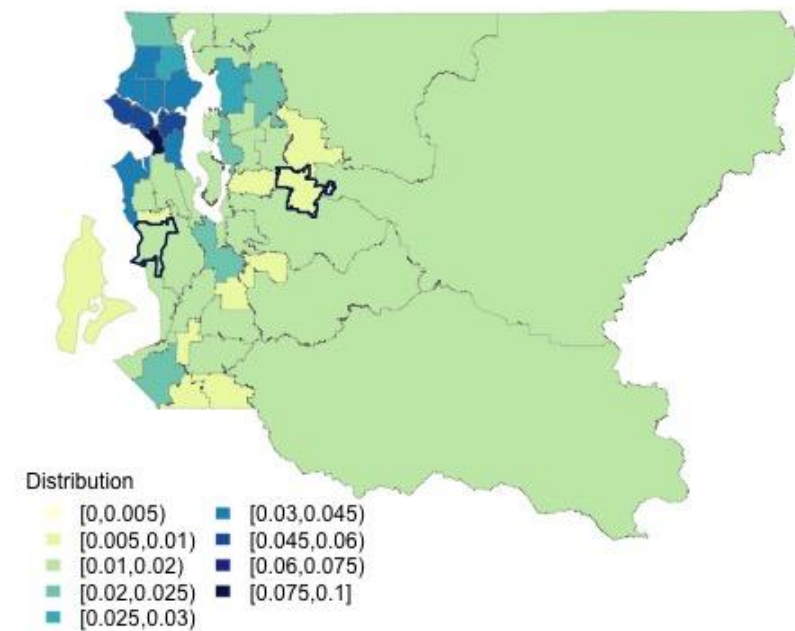
Counts of Households  
Size 1



Prevalence of Households  
Size 1



Distribution of Households  
Size 1



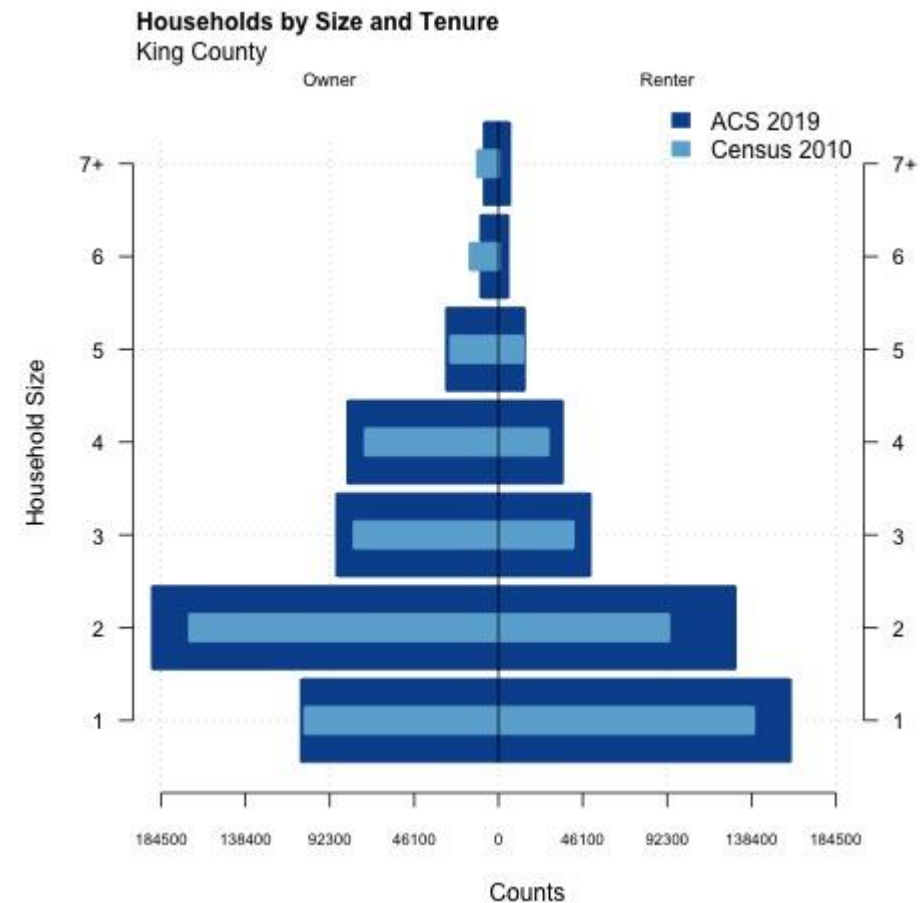
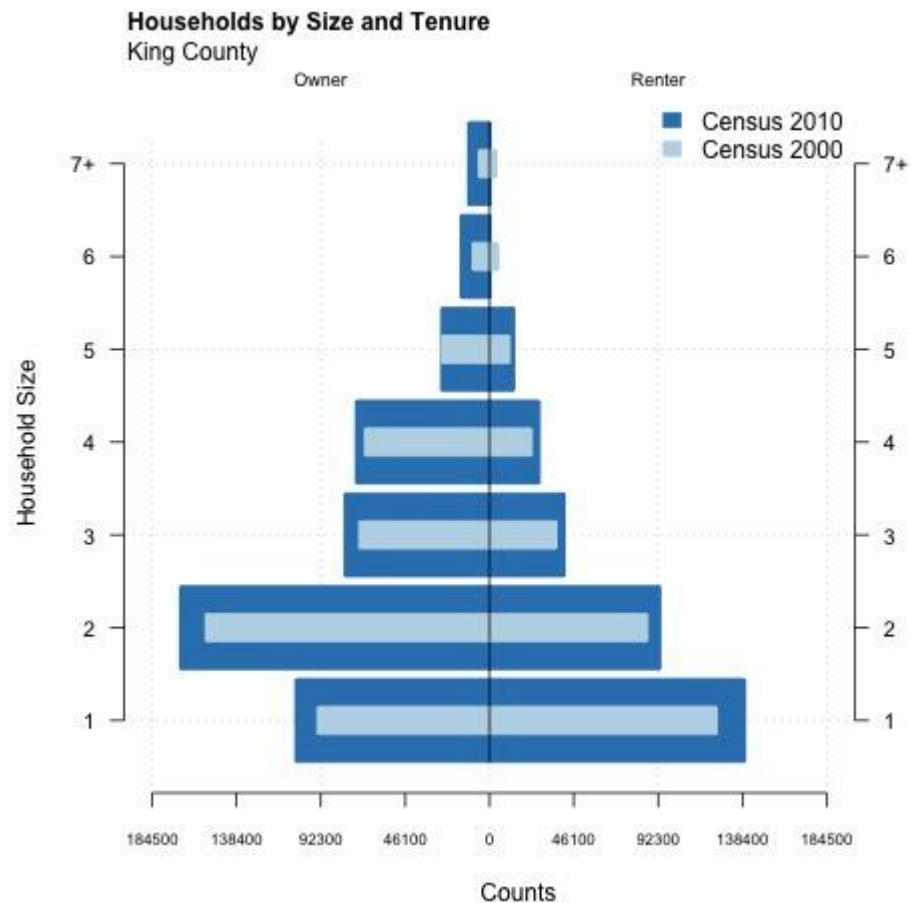
(Estimates from ACS 2015-19)



# Changes in Household Size by Tenure

## Counts of Households (2000, 2010, 2019)

Almost all categories of household size and tenure grew between 2000 and 2010 & 2010 and 2019.

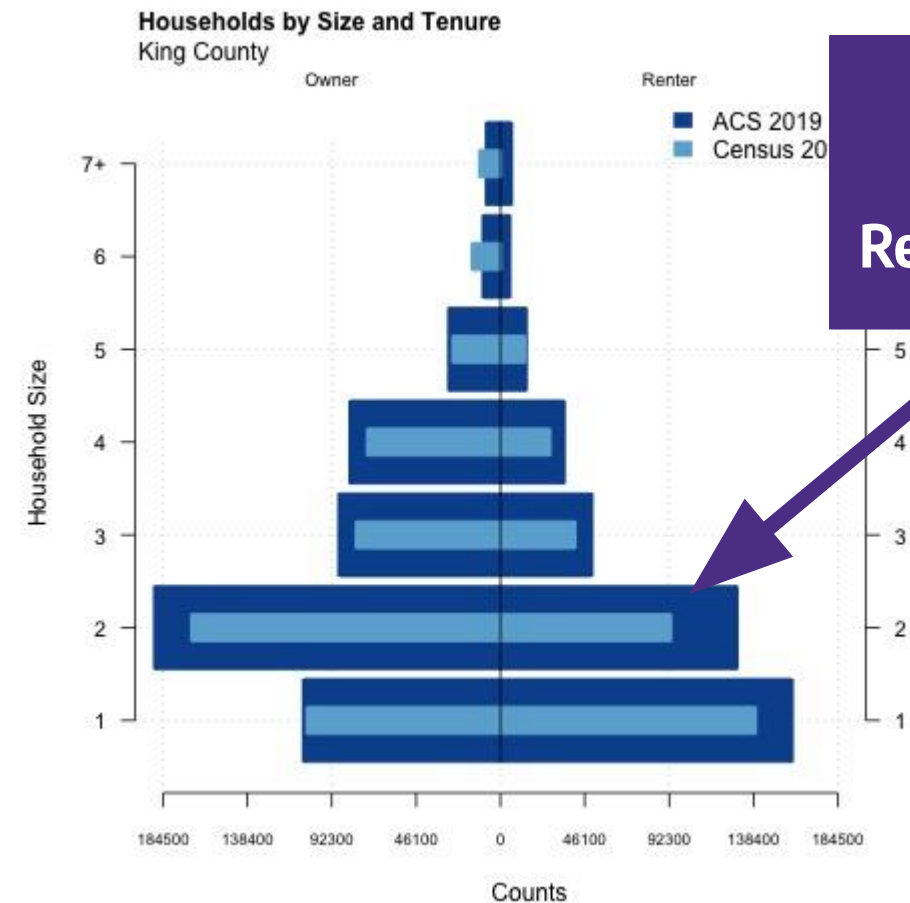
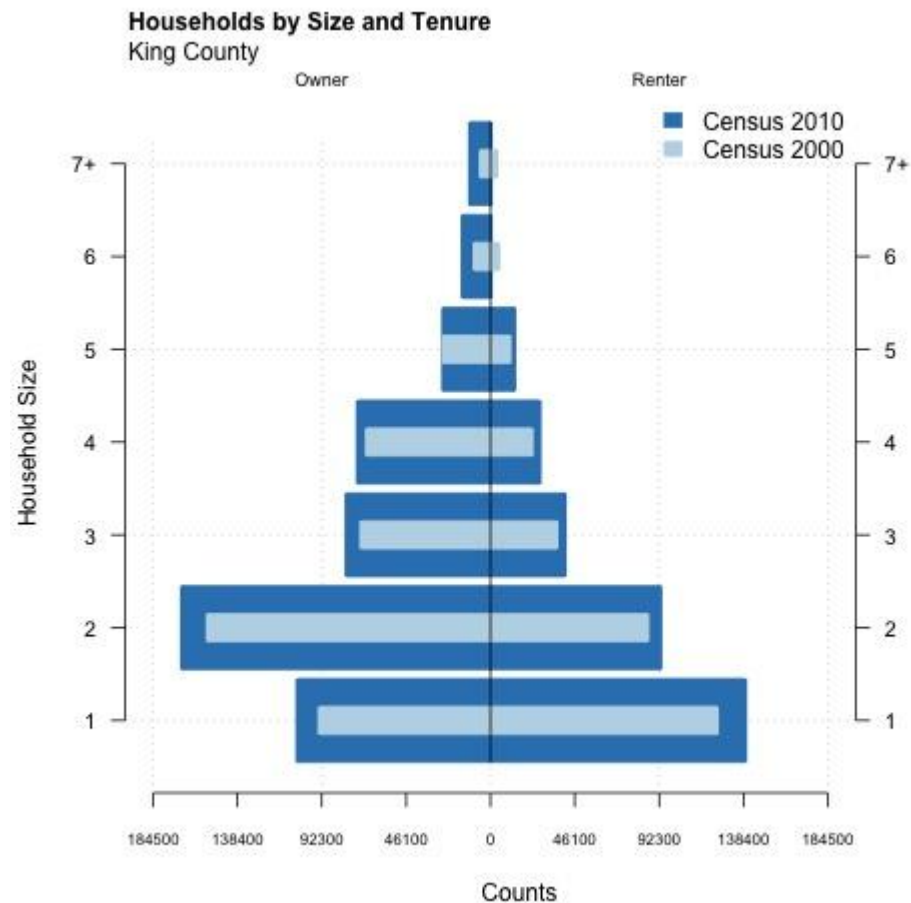




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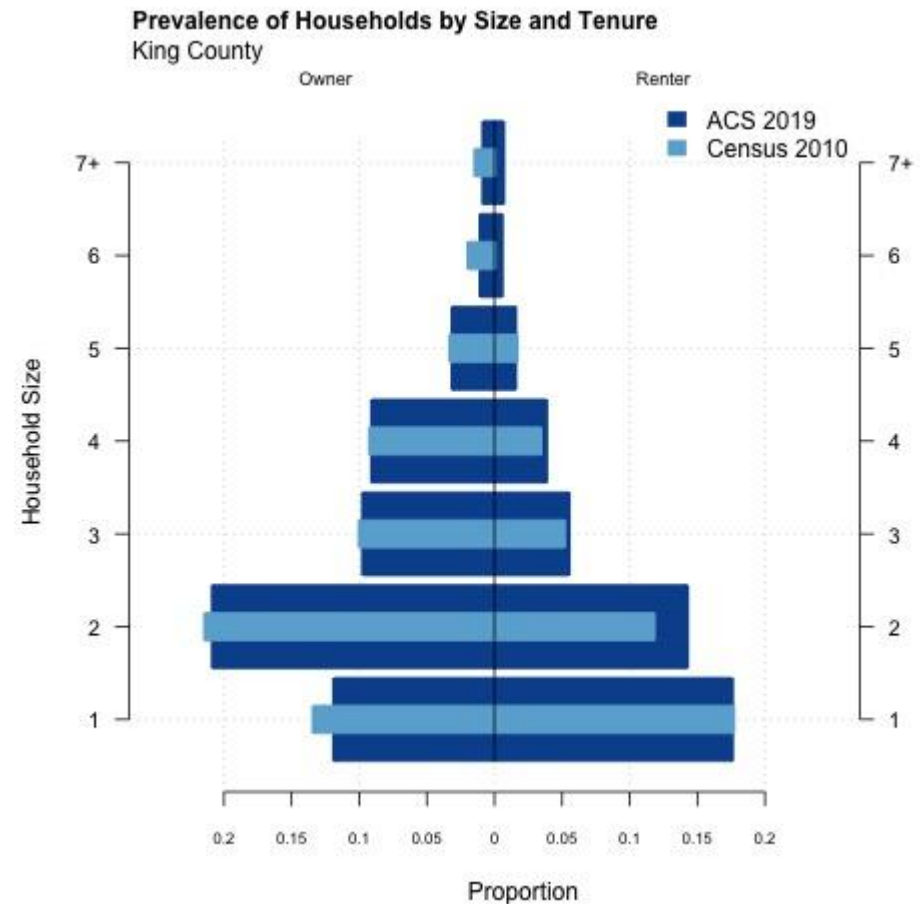
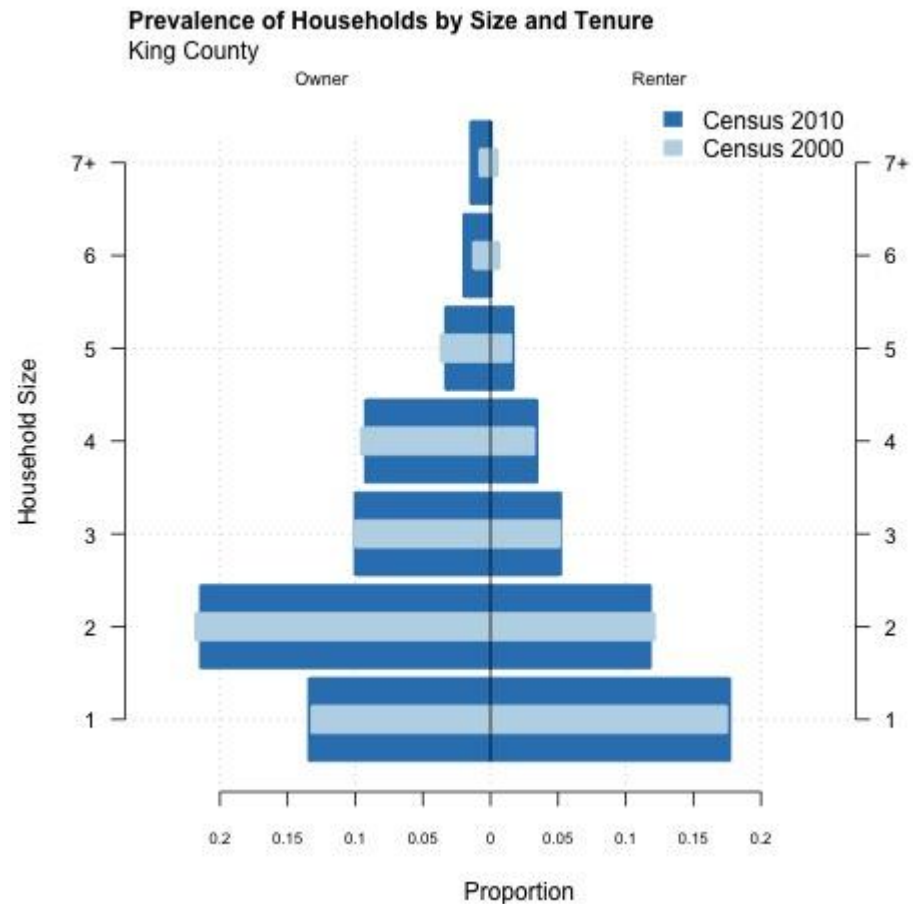


**Noticeable  
2-person  
Renter growth**

# Changes in Household Size by Tenure

## Prevalence of Households (2000, 2010, 2019)

However, the prevalence of households by size and tenure changed only in the most recent decade.

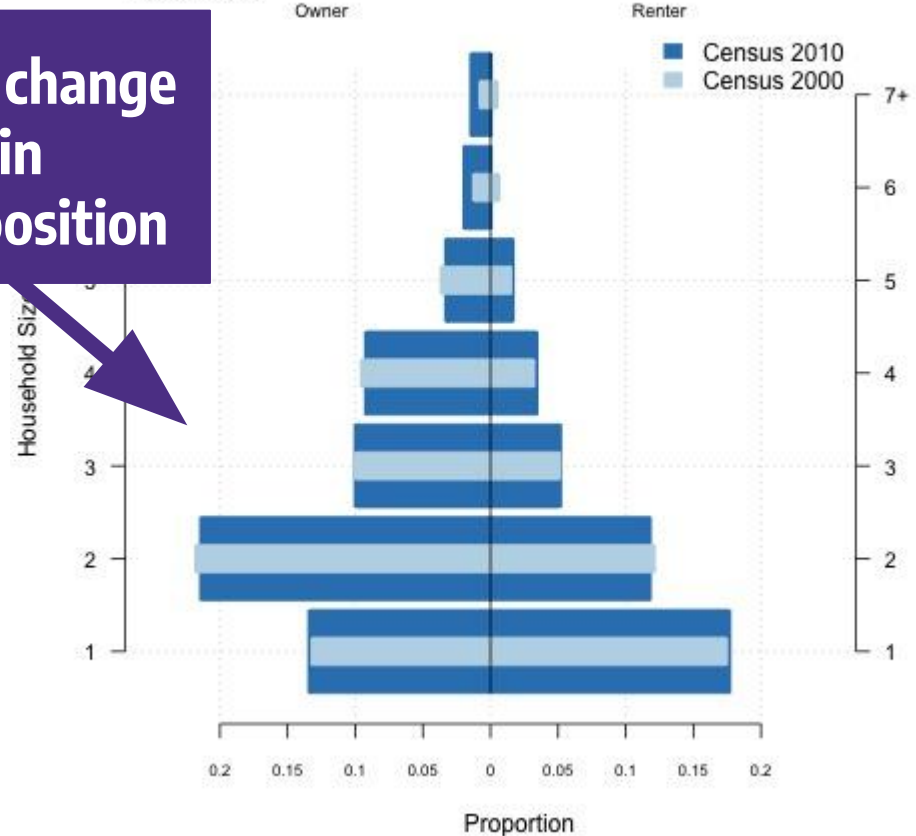


# Changes in Household Size by Tenure

Prevalence of Households (2000, 2010, 2019)

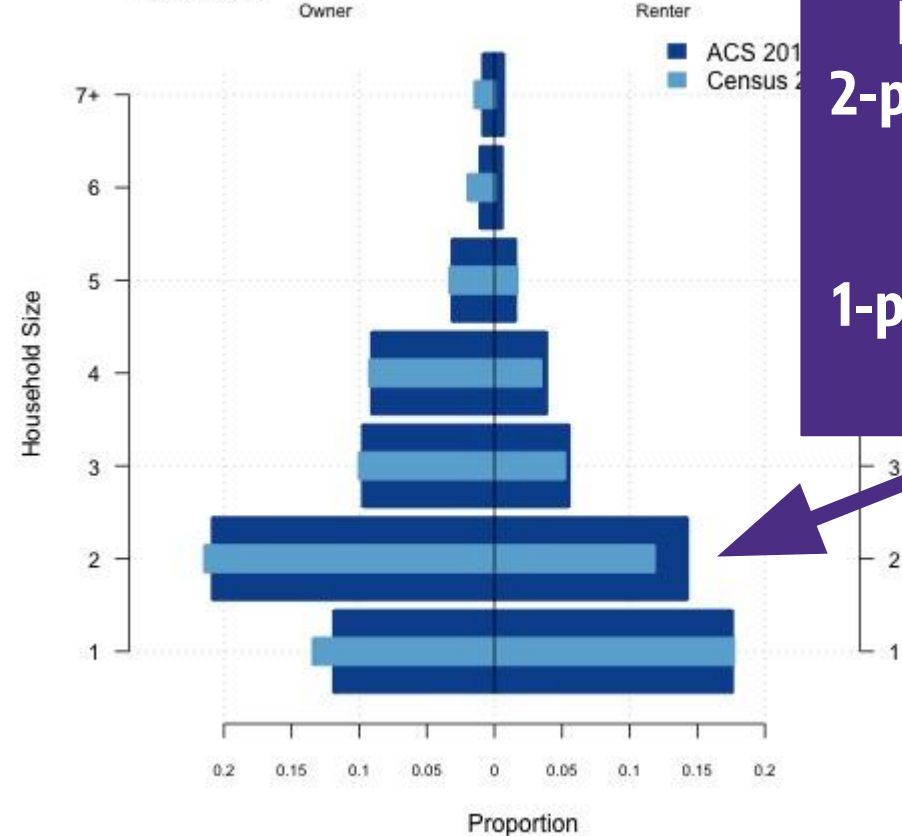
However, the prevalence of households by size and tenure changed only in the most recent decade.

Prevalence of Households by Size and Tenure  
King County



Little change  
in  
composition

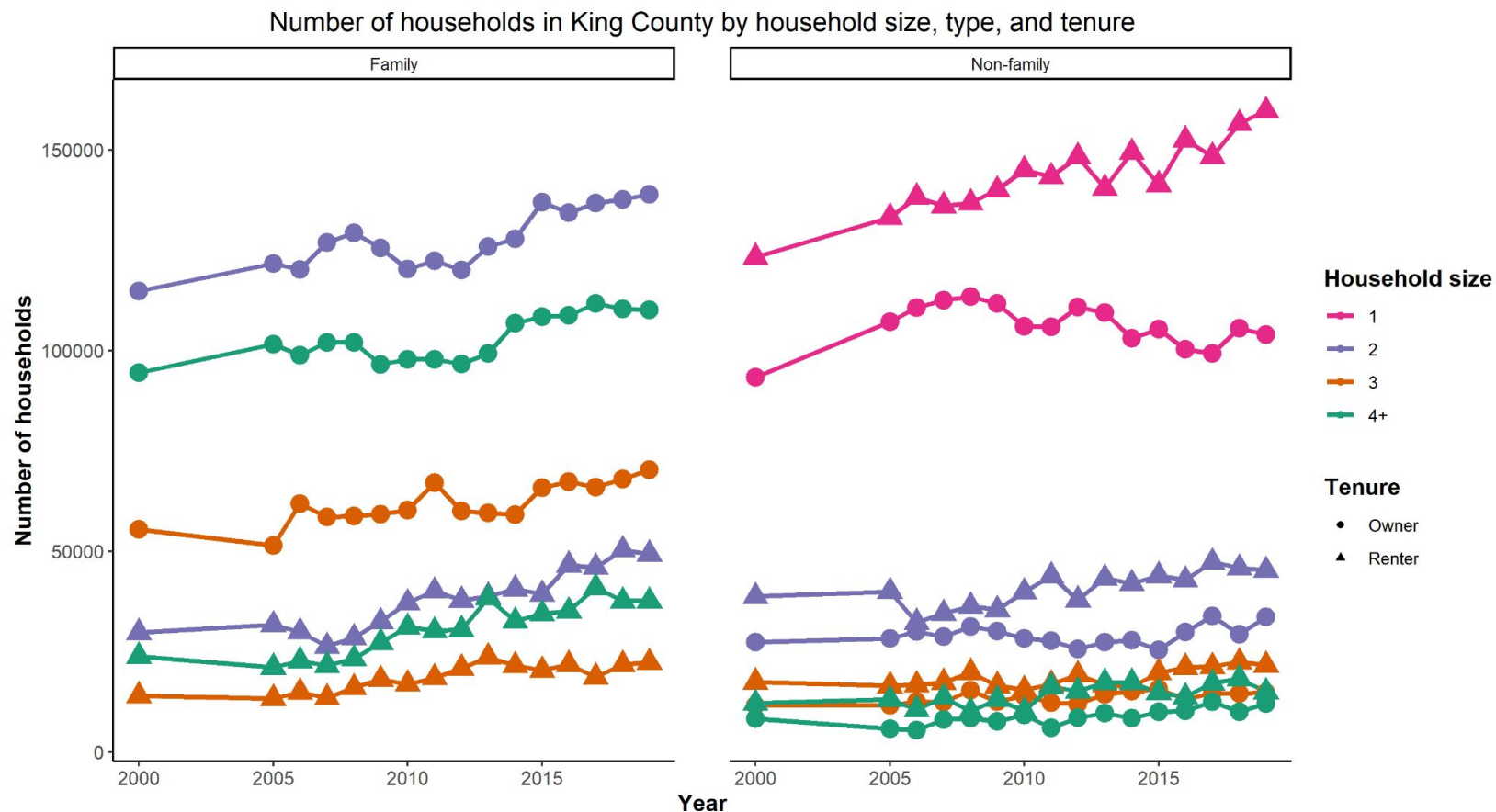
Prevalence of Households by Size and Tenure  
King County



Noticeable  
2-person Renter  
growth  
and  
1-person Owner  
decrease

# Household Size by Tenure & Family Status

Number of Households (2000, 2005-2019)



## Family households

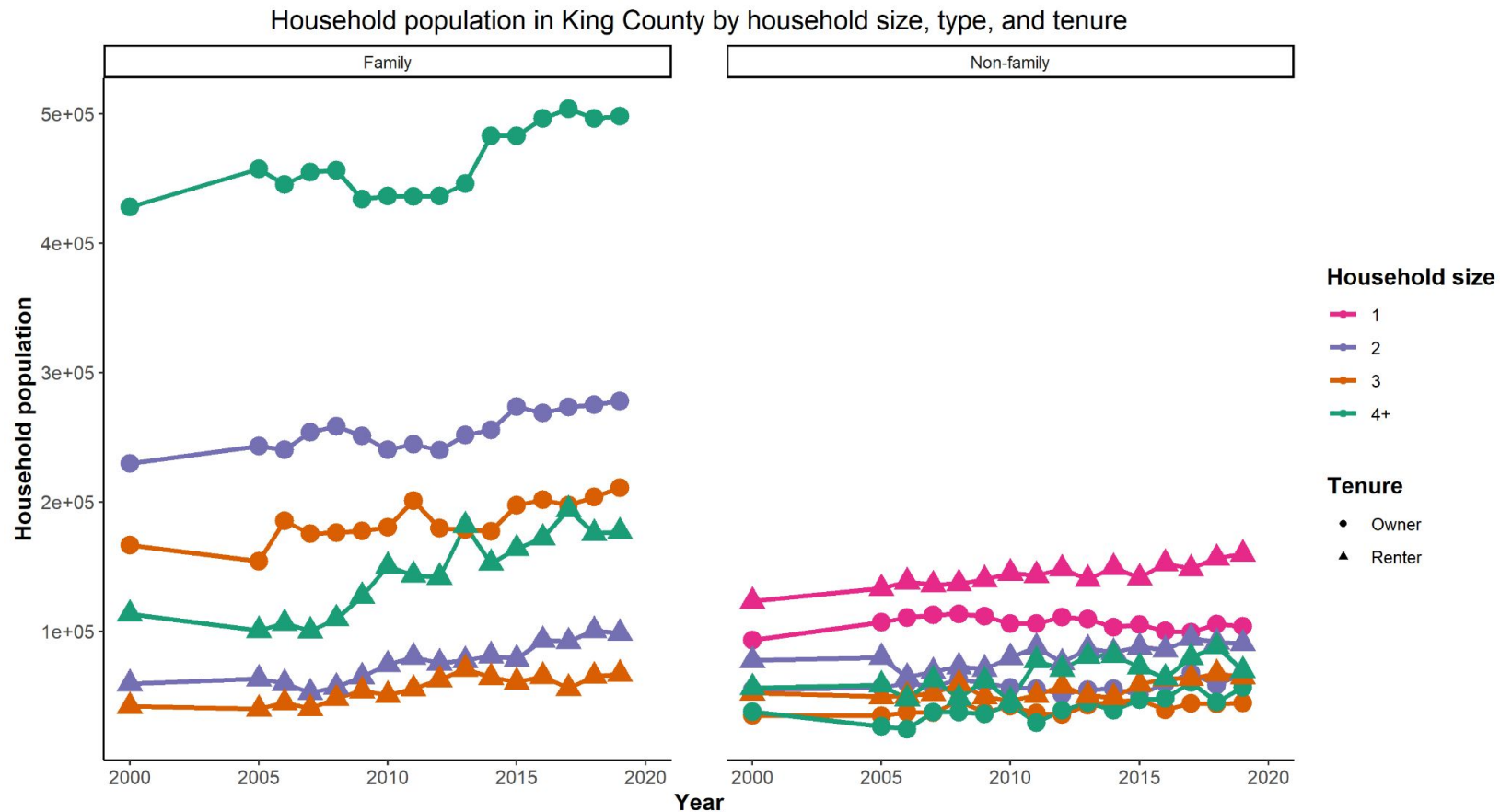
- Predominantly 2-person Owner, then 4+-person Owner
- More Owner than Renter at each size
- Similar number 2-, 3-person Renter to non-family

## Non-family households

- Predominantly 1-person Renter, then Owner
- More 2-person Renter than Owner

# Household Size by Tenure & Family Status

Population (2000, 2005-2019)



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## Family Population

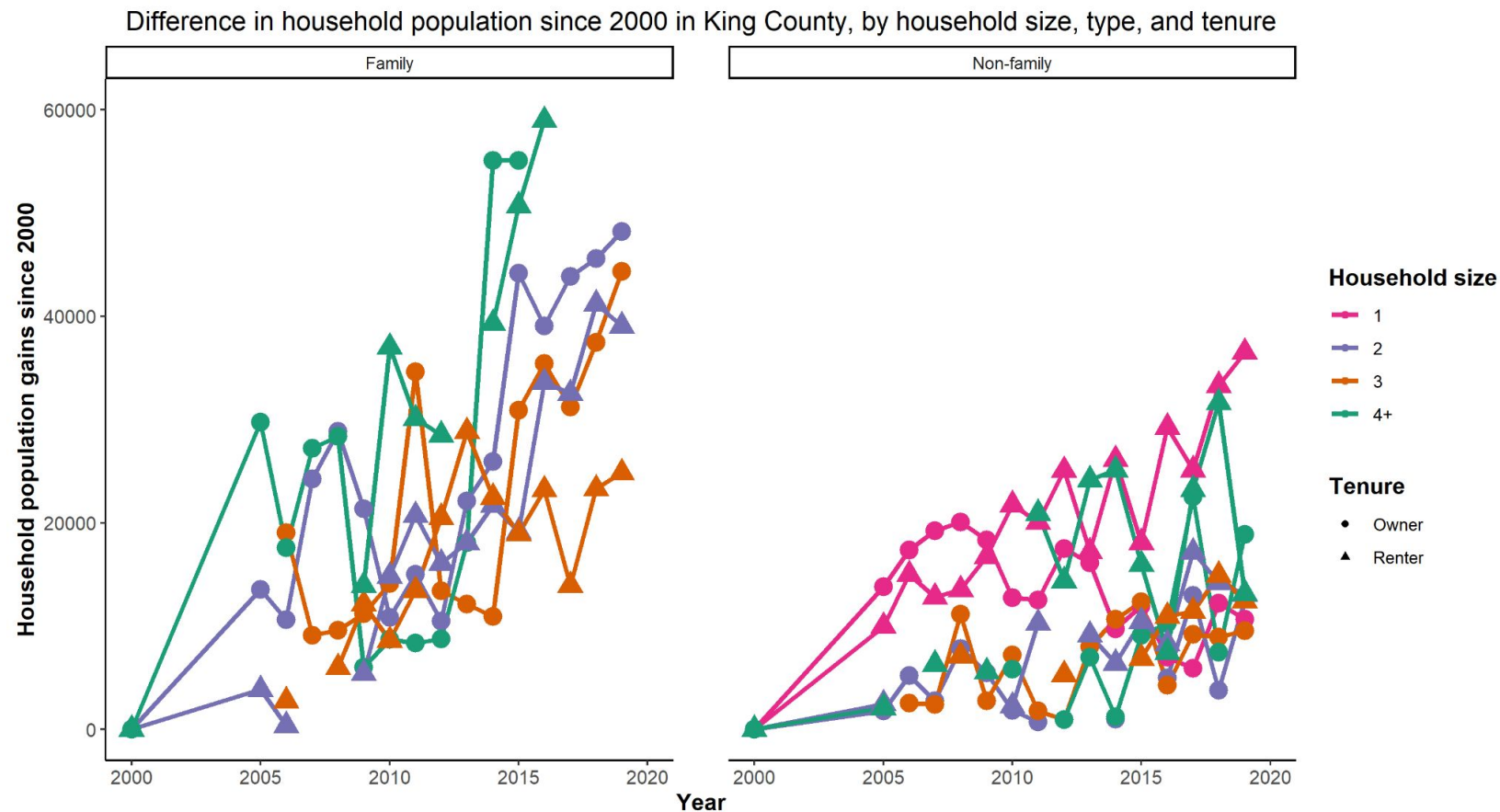
- Growth driven by 2-person Owner HHs, but 4+-person Owner is larger in population
- Growth in 4+-person Renter population substantial

## Non-family Population

- Large number of households, but predominantly 1-person → Smaller population

# Household Size by Tenure & Family Status

Added Population since 2000 (2000, 2005-2019)



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## Family Population

- Added ~60K in 4+-person Owner and 4+-person Renter
- Added ~40K-50K in 2-person Owner, 2-person Renter, 3-person Owner

## Non-family Population

- 1-person Owner never recovered from 2008
- Added ~40K 1-person Renter

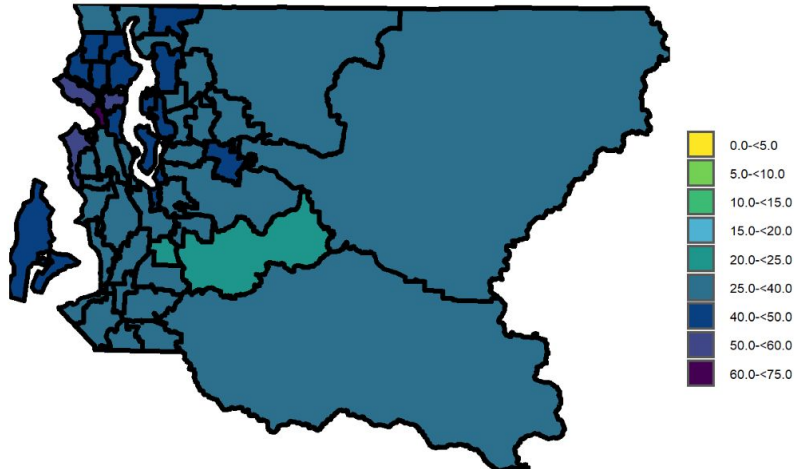
# Modelling Prevalence of Household Size

- 1) Incorporating **multiple data sources** with different survey design and precision
- 2) **Smoothing** over time and/or space can provide more precise estimate at granular levels, allows for borrowing of information between neighboring areas and time points
- 3) 'Filling-in' the blanks with **estimates** for years when no data was collected
- 4) Making **short-term predictions**

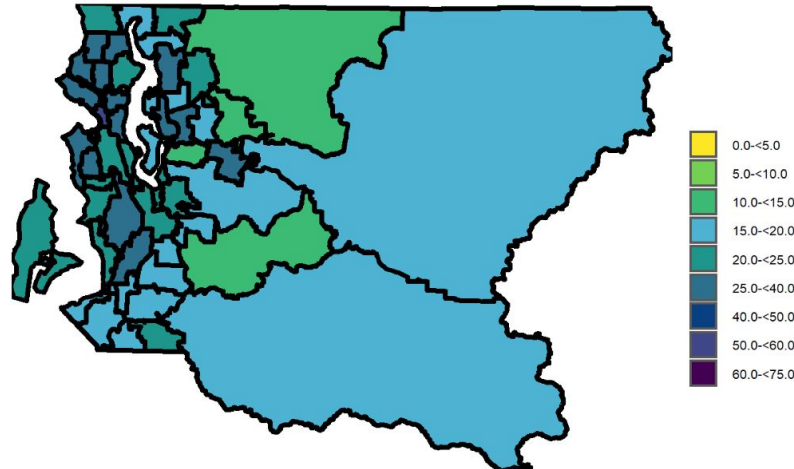


# Prevalence of 1-person households by Tenure

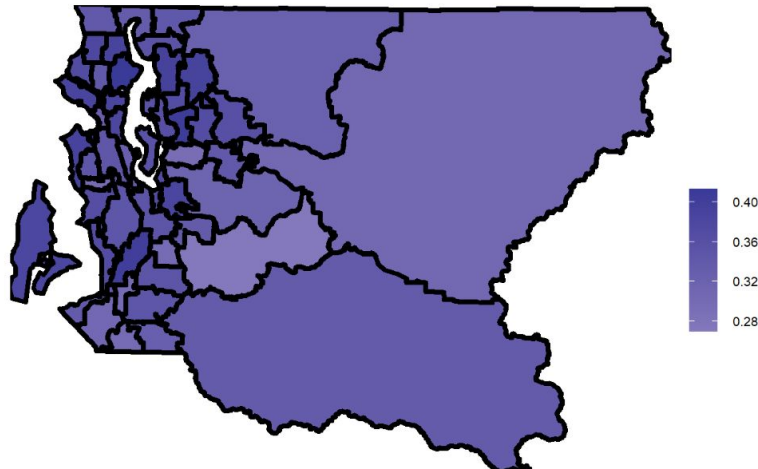
A. Prevalence among renters 2020



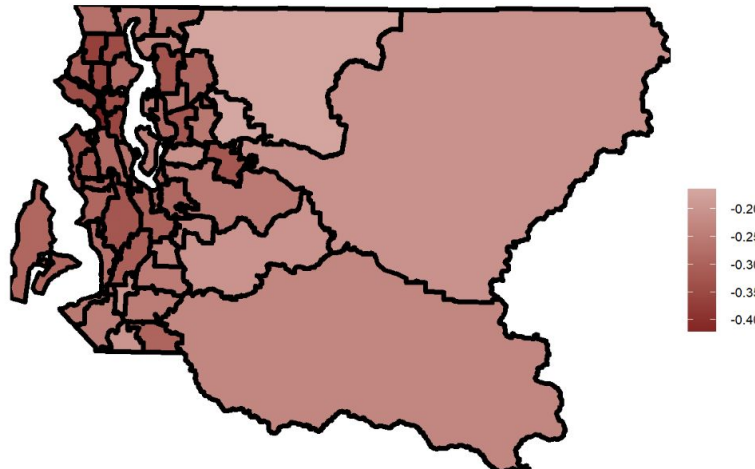
C. Prevalence among owners 2020



B. Change renters (2010-2020)



D. Change owners (2010-2020)



→ 1-person household more common among renters in general  
→ Marginal temporal variation across tenure category

## Renters

- Ranged between 22% (11-40) in Covington/Maple Valley to 73% (52-86) Downtown in 2020

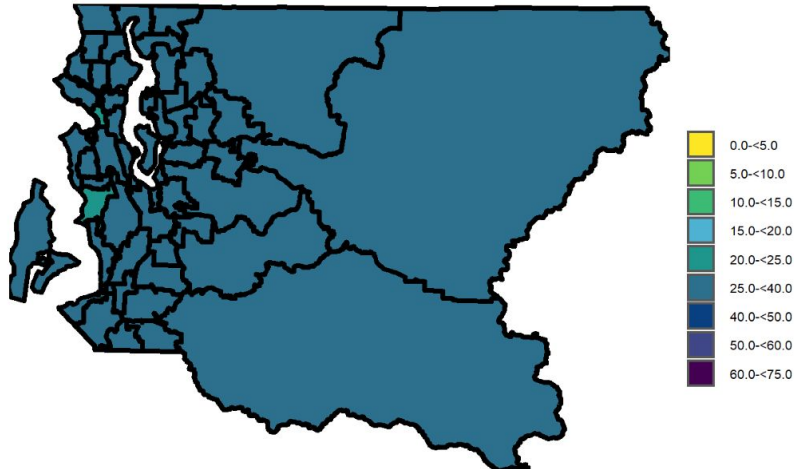
## Owners

- Ranged between 11% (4-23) in Bear Creek to 58% (36-77) Downtown in 2020

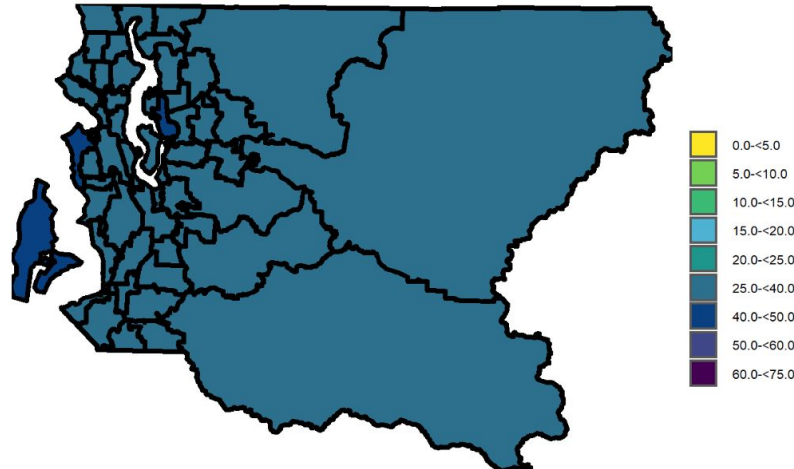


# Prevalence of 2-person households by Tenure

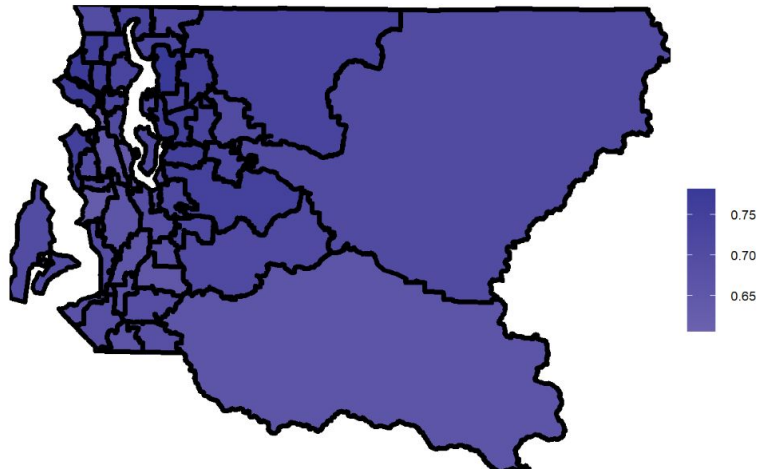
A. Prevalence among renters 2020



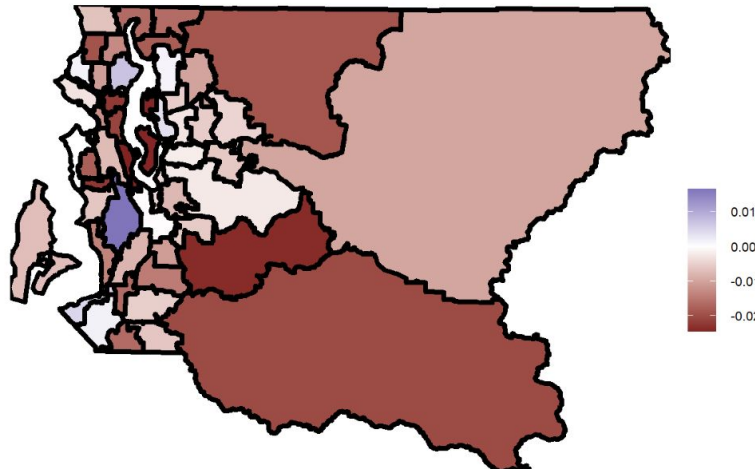
C. Prevalence among owners 2020



B. Change renters (2010-2020)



D. Change owners (2010-2020)



→ Little spatial variation  
→ Marginal temporal variation  
across tenure category

## Renters

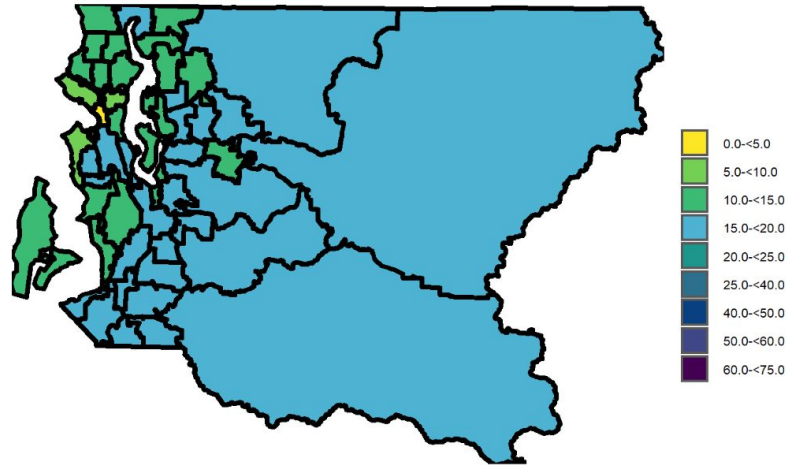
- Ranged between 22% (19-26) to 34% (30-38) in Ballard in 2020

## Owners

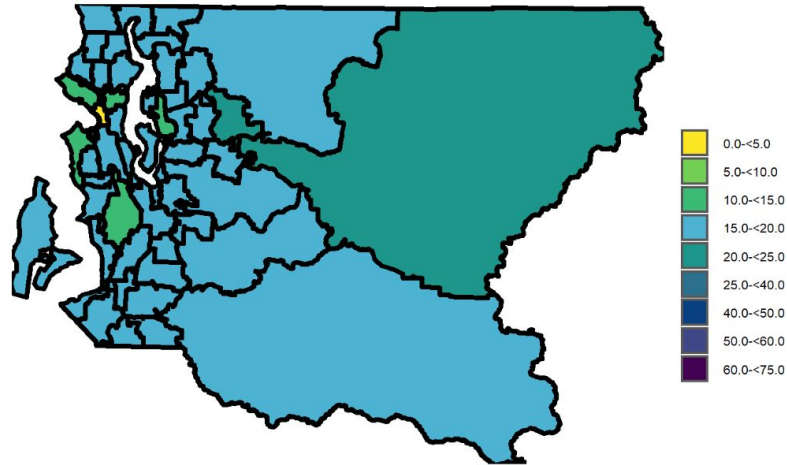
- Ranged between 30% (28-32) in Beacon Hill/Georgetown to 44% (40-46) on Vashon in 2020

# Prevalence of 3-person households by Tenure

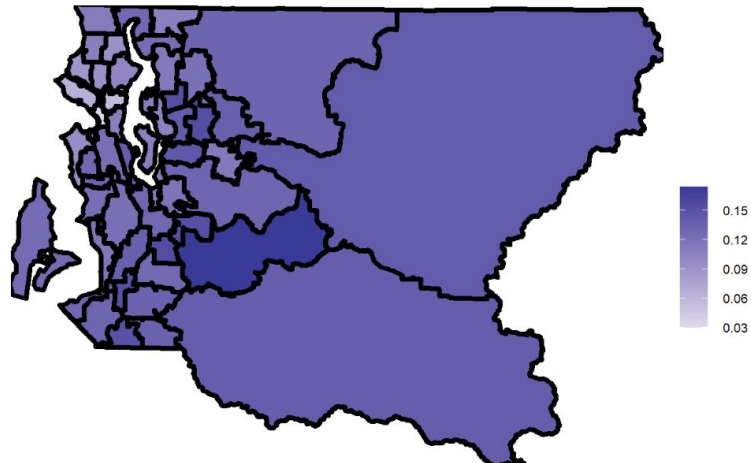
A. Prevalence among renters 2020



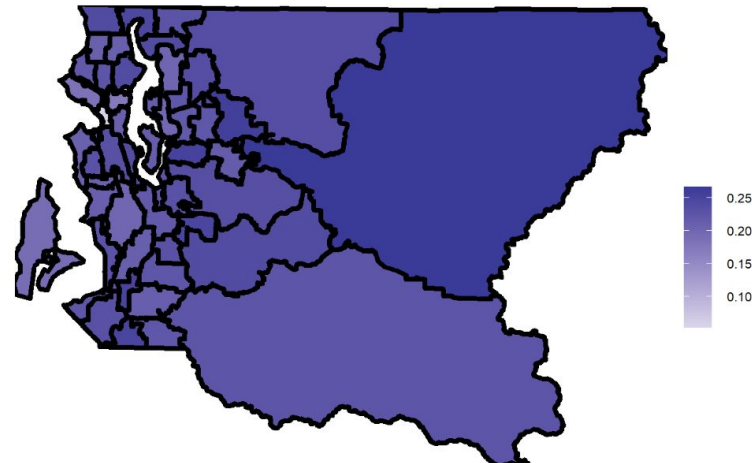
C. Prevalence among owners 2020



B. Change renters (2000-2020)

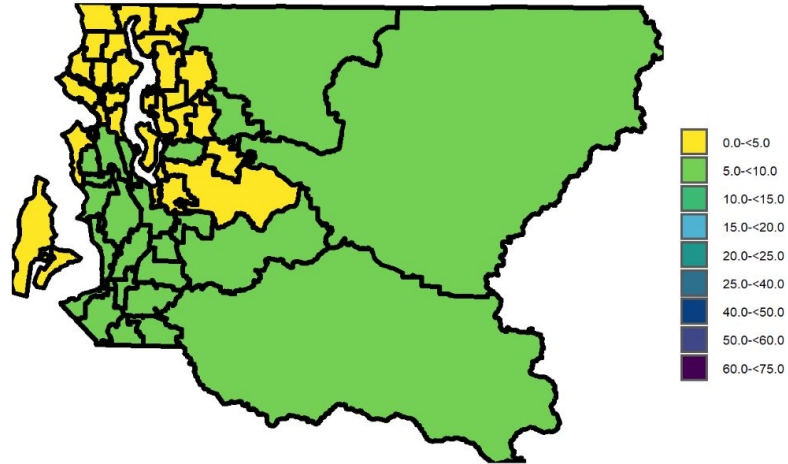


D. Change owners (2000-2020)

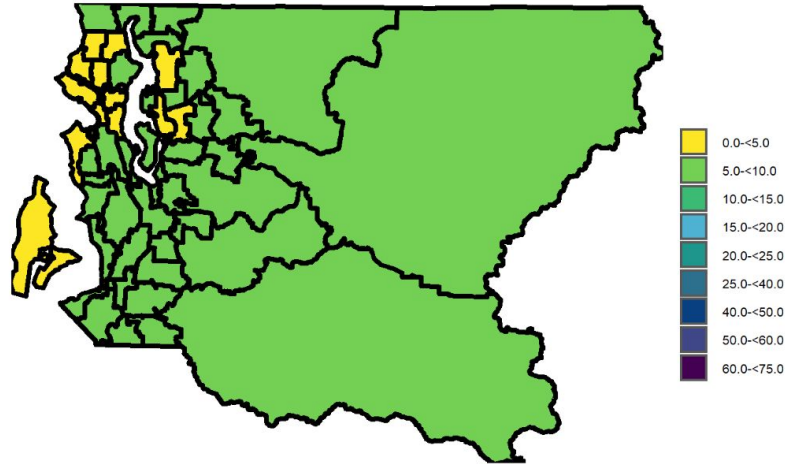


# Prevalence of 4+-person households by Tenure

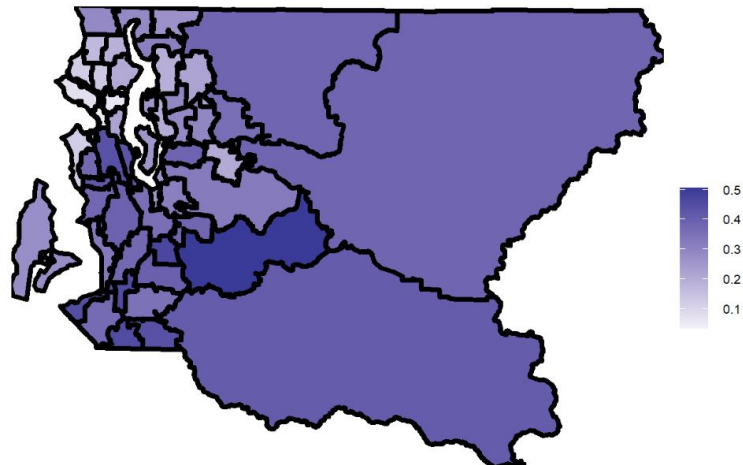
A. Prevalence among renters 2020



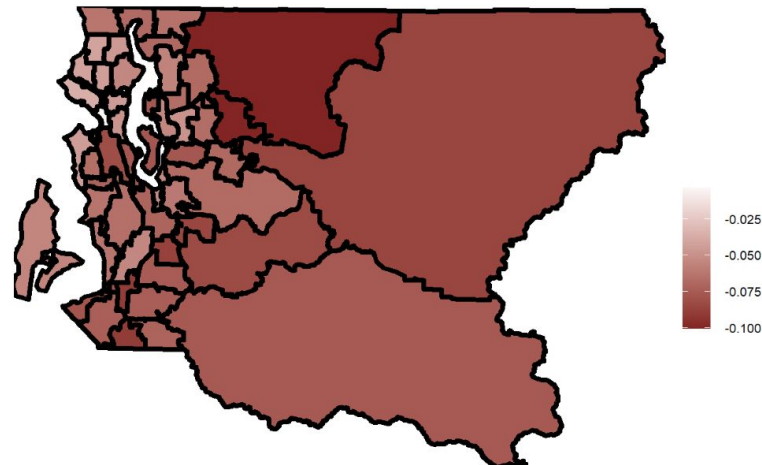
C. Prevalence among owners 2020



B. Change renters (2000-2020)



D. Change owners (2000-2020)



## Housing Size: Data Limitations

- No information on **which added households** in each category are **in-migrants**
- Limited by 3-way interaction for tabulated ACS data (e.g. household size + tenure + family status)
- Spatiotemporal smoothing limited to **HRAs** in **5-year periods** in intercensal years and **prevalence or distribution** outcomes
- Future work could look at housing stock over time to understand where growth doesn't match stock → population projections could help identify areas of future need or inequity



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# Hazards and Disasters



**Nisqually Earthquake - 2001**



**Flooding - 2006**



**Flooding - 2009**



**Wildfire Smoke - 2020**



**Extreme Heat - 2021**

## Data Sources

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- Interviews with experts at the County and UW
- FEMA flood maps
- Assessor data for apartment, condo, and residential parcels
- Unreinforced masonry mapping
- Urban heat mapping

## Interview Participants

### **Lara Whitely Binder**

DNRP, King County Climate Action Team

### **Leigh Bunn**

Residential HVAC subject matter expert

### **Robert Freitag**

UW, Urban Design & Planning

### **Teresa Lewis**

DNRP, River and Floodplain Mgmt Section

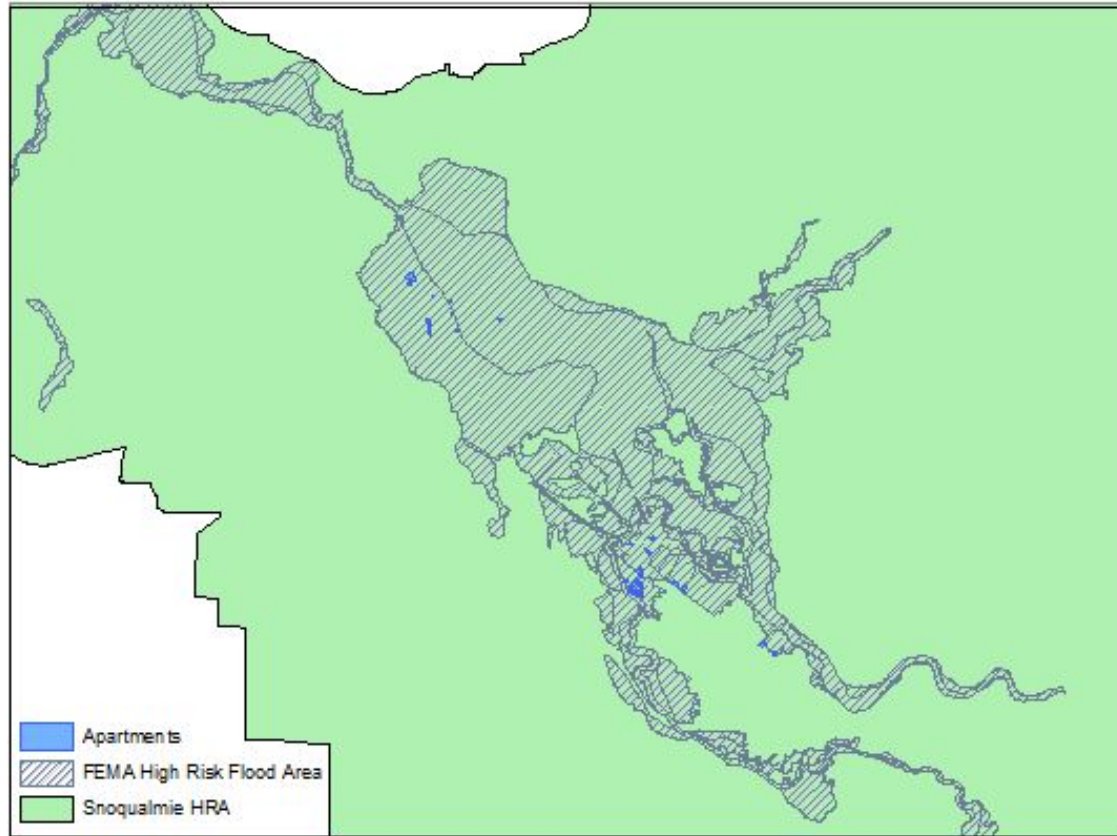
### **Jared Schneider**

King County Emergency Management

### **James Young**

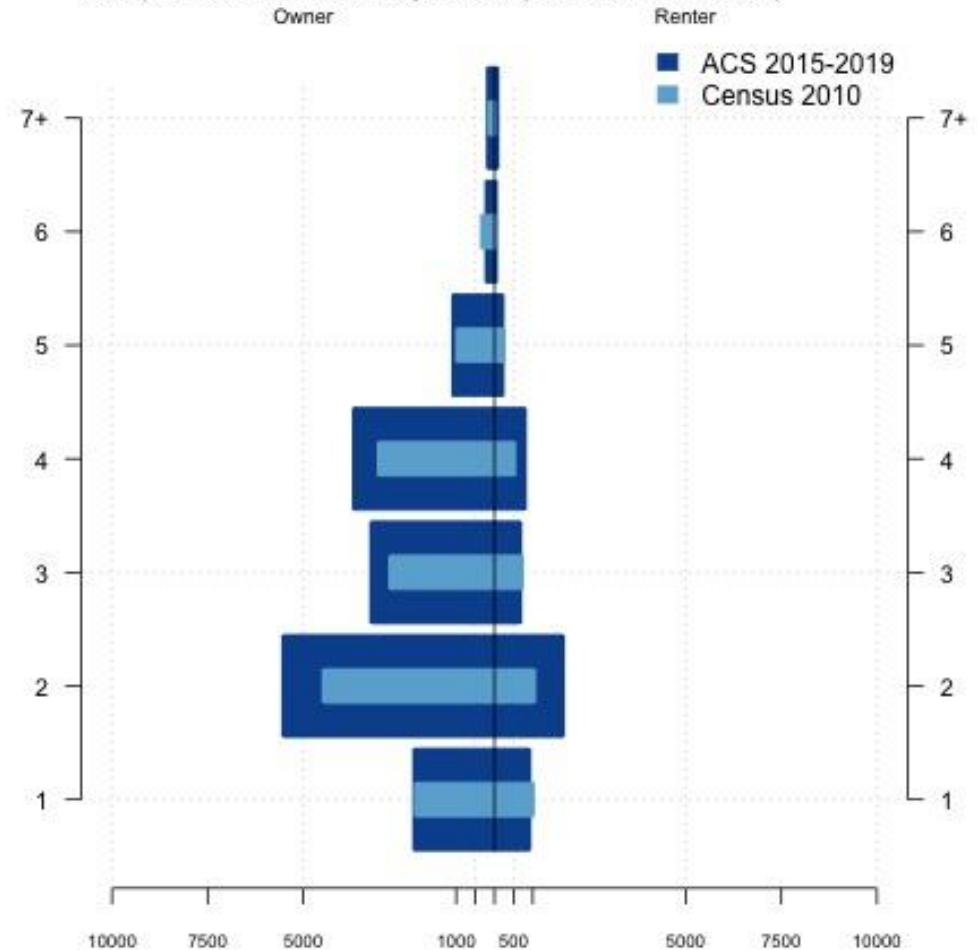
UW, WA Center for Real Estate Research

# Flooding and Housing



Apartment parcels in the FEMA high-risk floodplain in the Snoqualmie/North Bend/Skykomish HRA.

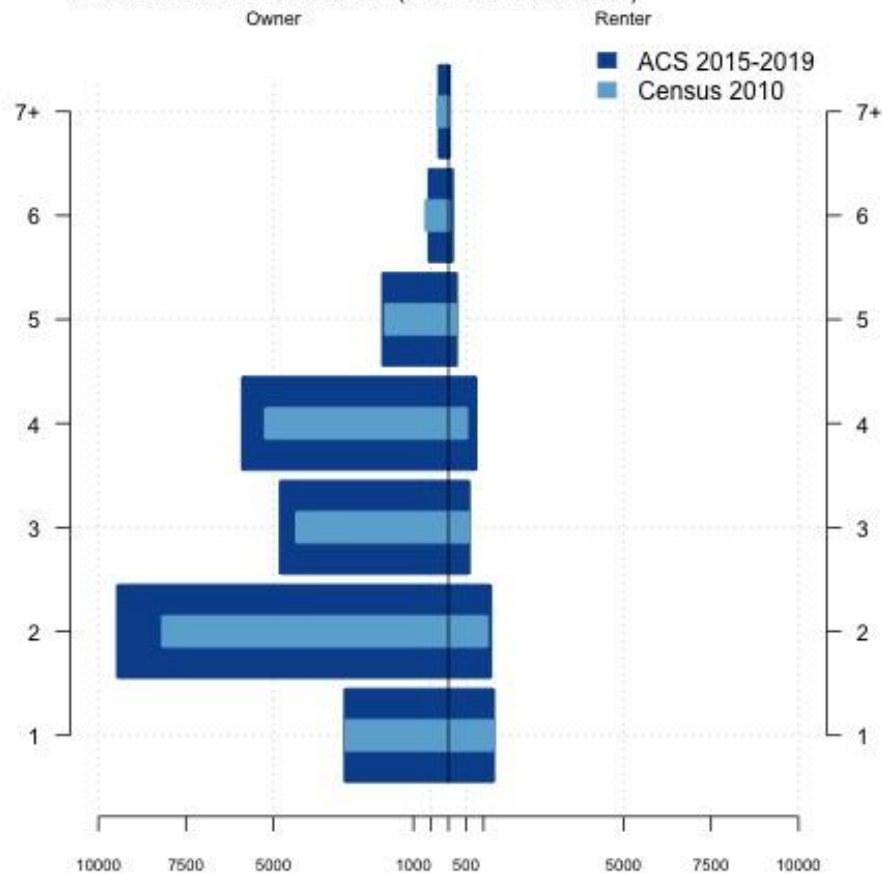
**Households by Size and Tenure**  
Snoqualmie/North Bend/Skykomish (Estimated from ACS)



# Flooding and Housing

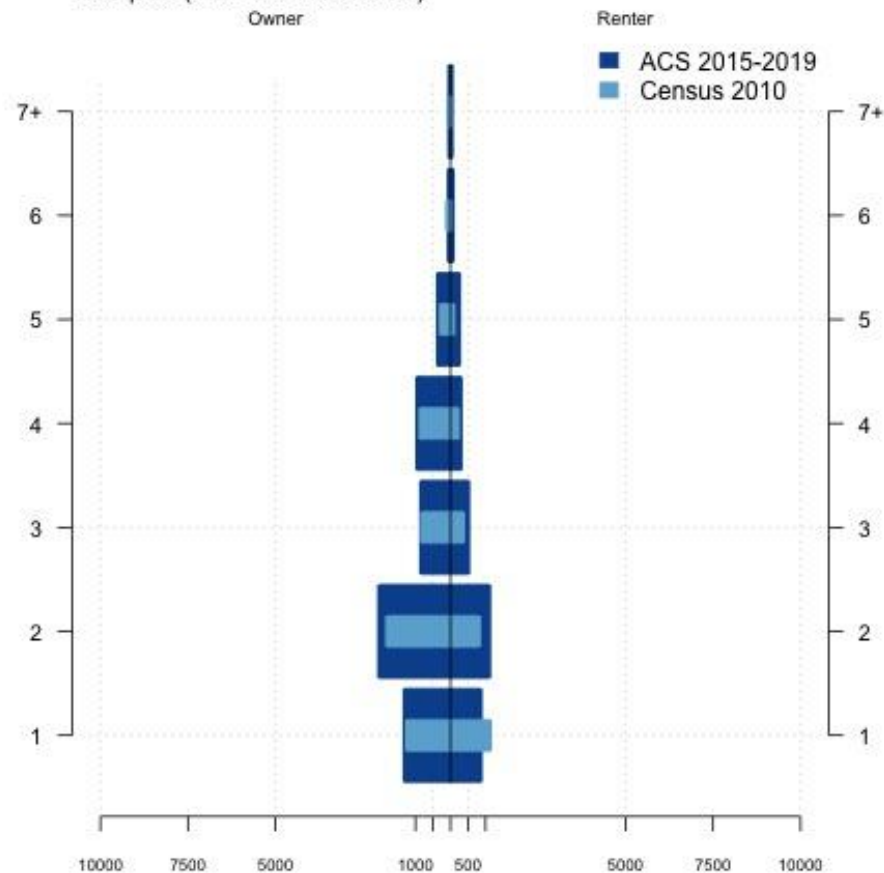
## Households by Size and Tenure

Bear Creek/Carnation/Duvall (Estimated from ACS)



## Households by Size and Tenure

Issaquah (Estimated from ACS)





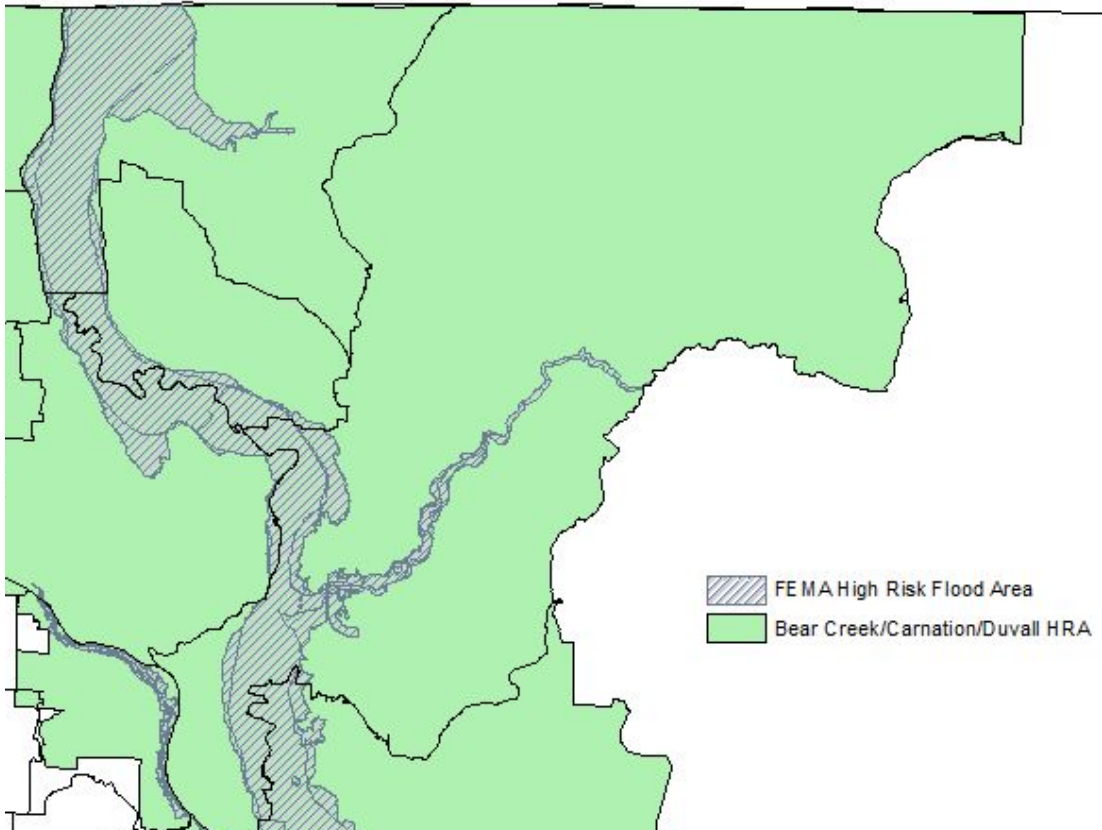
# Flooding and Housing: Data Needs

## King County Assessor Data: floodplain definition

Health Reporting Area (HRA)	Residential buildings intersecting FEMA high-risk flood area	Residential buildings listed as 100-year floodplain	Residential buildings in the floodplain listed as other environmental restriction	Total residential buildings in HRA
Issaquah	517	329	168	7149
Snoqualmie/ North Bend/ Skykomish	5945	2656	3268	19602
Bear Creek/ Carnation/Duvall	2025	706	1270	26833

# Flooding and Housing: Data Needs

More granular data



2010 Census tracts in the BearCreek/Carnation/Duvall HRA with the FEMA High Risk Flood Area.

## HRAs large in area

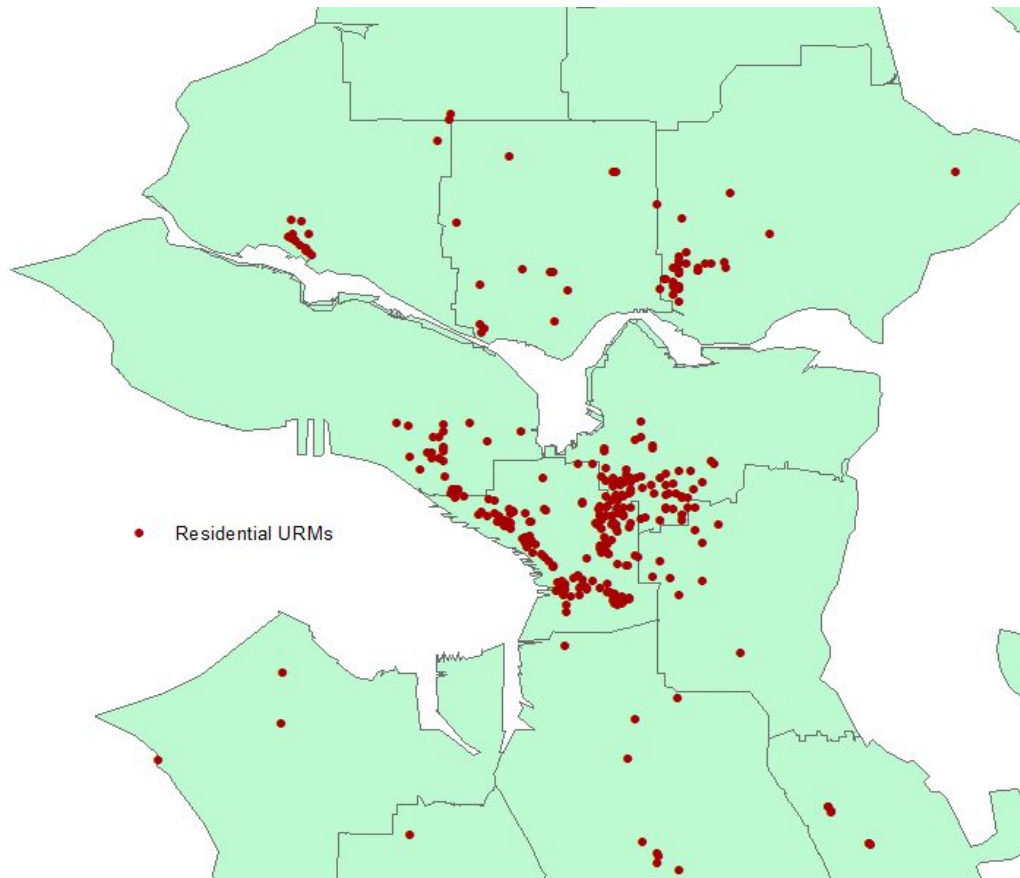
- are comprised of **tracts also large in area**
- have **non-uniform distribution of households**
- have **non-uniform distribution of floodplain**

## More information on

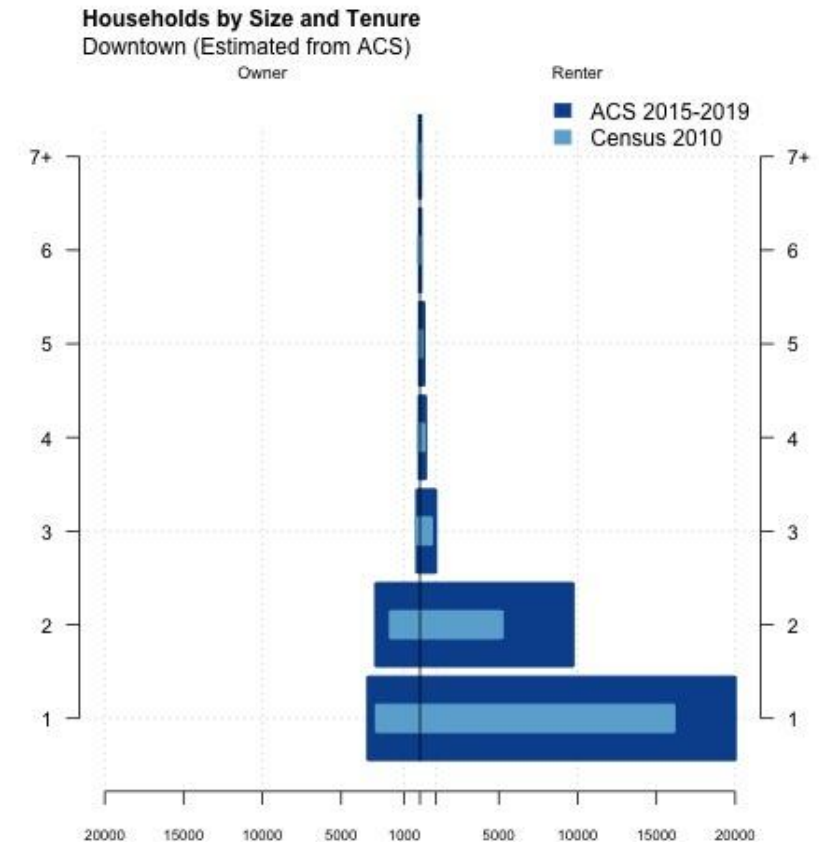
- Household tenure
- Language for resource planning

# Earthquake Risk and Housing

## Unreinforced Masonry

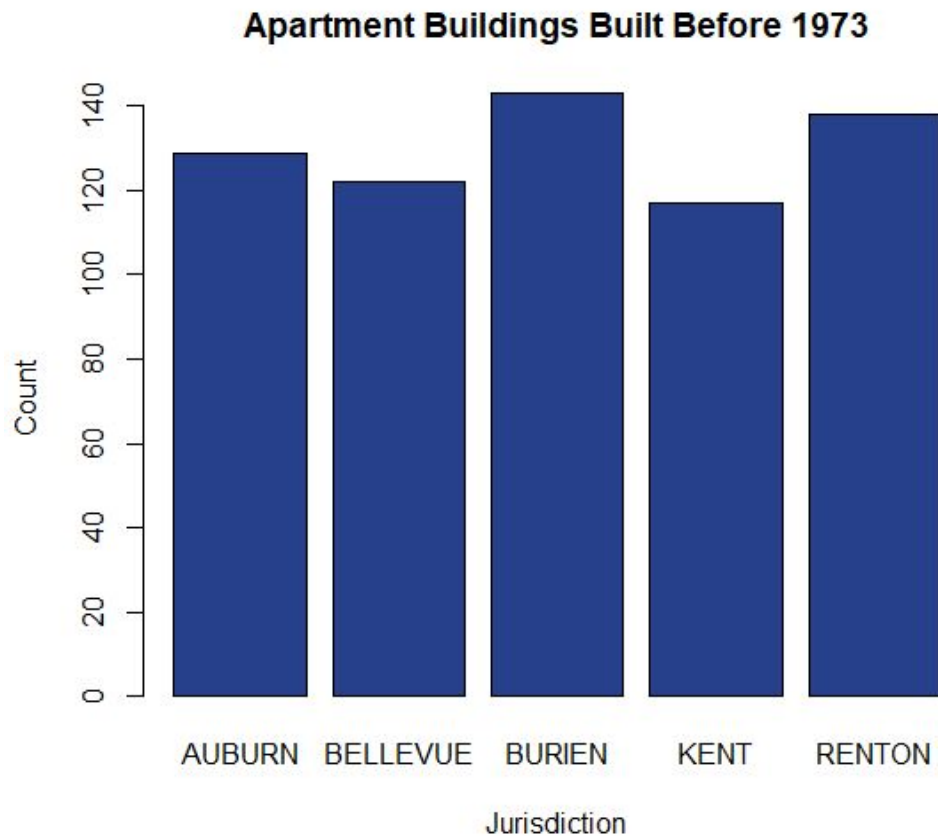


Residential URMs mapped in the city of Seattle  
UNIVERSITY of WASHINGTON



Households by size and tenure in the Downtown HRA  
(includes Pioneer Square and the International District)

# Earthquake Risk and Housing: Data Needs



Counts of apartment buildings built before 1973 in jurisdictions with more than 100 of those buildings

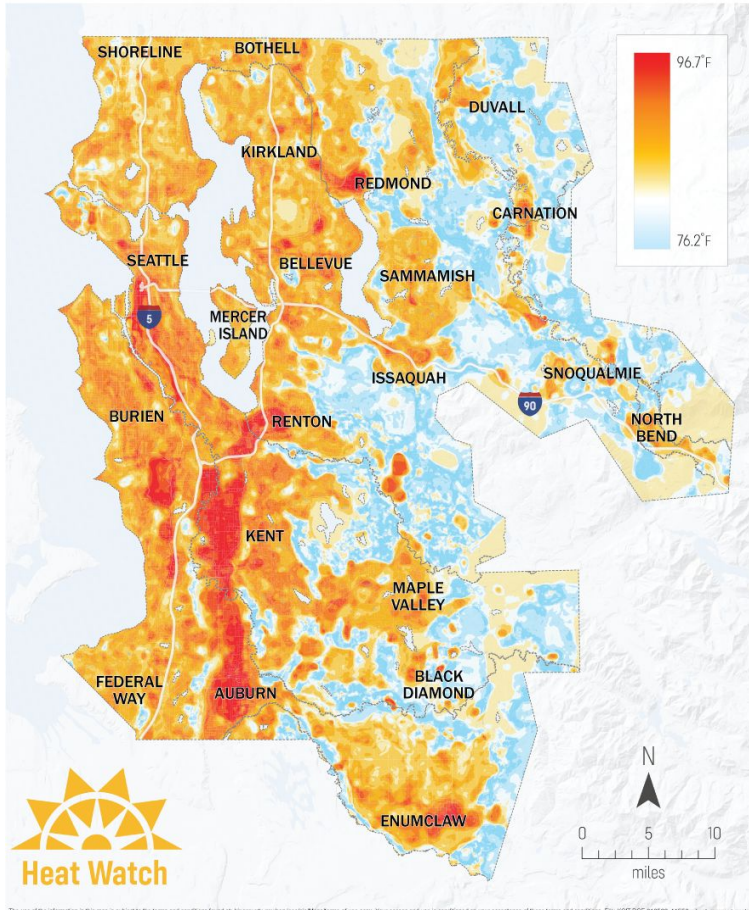
UNIVERSITY of WASHINGTON

## Apartment buildings

- The comprehensive URM inventory only applies to the city of Seattle
- 5,131 buildings built before 1973
  - 3,884 located in Seattle
  - Pre-1973 is considered pre- or low-code
- Large increase in renters in the downtown area
  - Not clear what type of buildings these new renters are living in
  - URM's provide a lot of affordable housing

# Urban and Extreme Heat and Housing

## Evening Study Results



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Evening results from an urban heat study in Seattle/King County

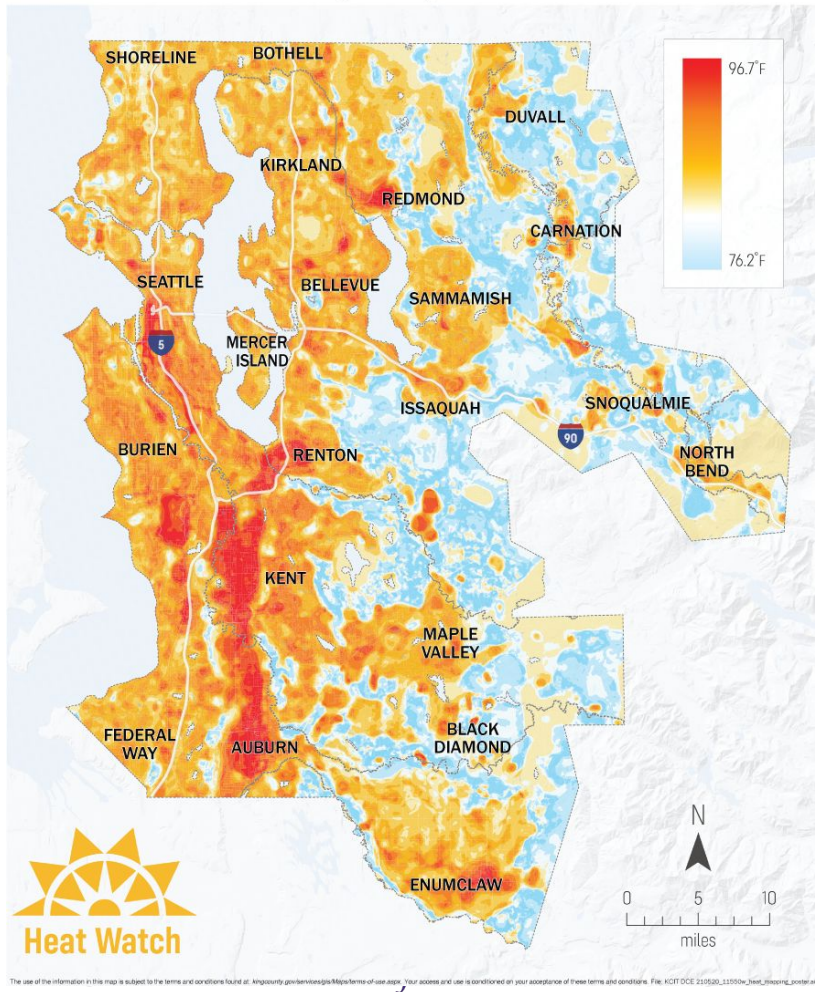
## Air conditioning

- 46% of units in Seattle-Tacoma-Bellevue have air conditioning
  - 29% of rental units have air conditioning
  - 57% of owned units have air conditioning
- Heating, ventilation, and cooling systems are difficult to install in older multi-family buildings
  - Ceilings do not fit new duct work
  - Options like mini-splits difficult for large buildings
  - Buildings are not insulated for energy efficiency

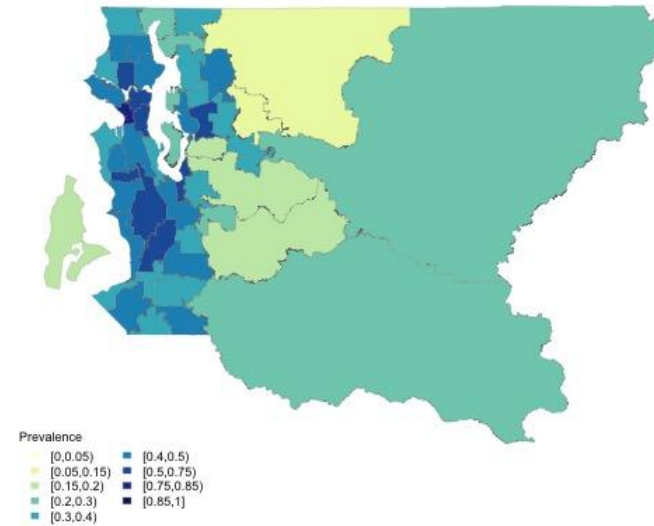


# Urban and Extreme Heat and Housing

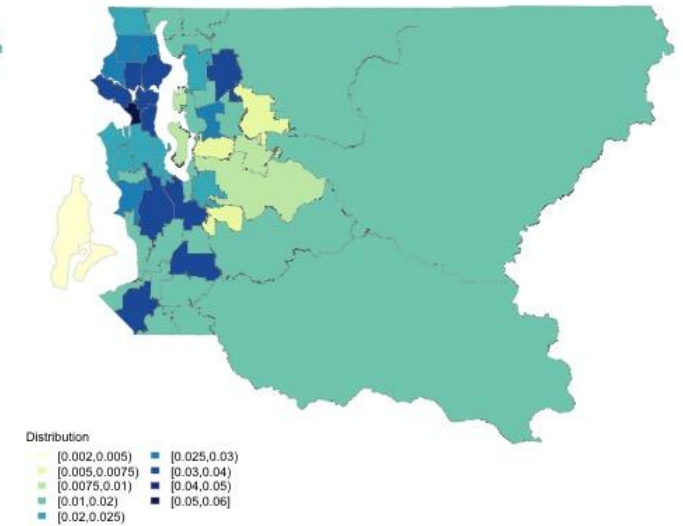
## Evening Study Results



Prevalence of Renter-occupied Households  
King County (ACS 2013-2018)



Distribution of Renter-occupied Households  
King County (ACS 2013-2018)



Prevalence and distribution of renter-occupied households in the county by HRA

# Urban and Extreme Heat and Housing

## Air Conditioning & Utility Burden

### Multiple options for air conditioning

- Some not feasible for building type
- Others add to household utility burden

### Lack of data outside of Seattle and Bellevue

- Assessor data has heat source and type but not cooling
- American Housing Survey Data does not cover areas such as Kent and Auburn



# COVID-19 and Housing

## King County Identified High-Impact Areas

Burien

Kent-SE, Kent-West

SeaTac/Tukwila

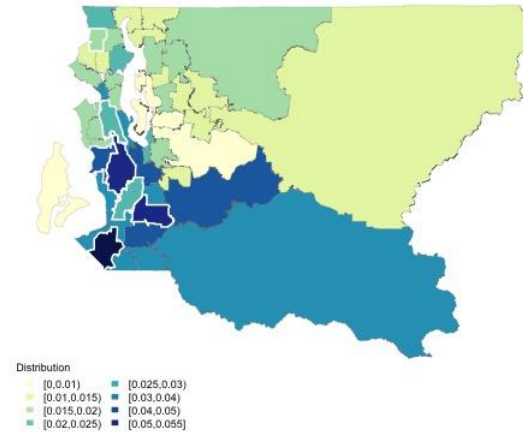
Beacon/Georgetown/

South Park

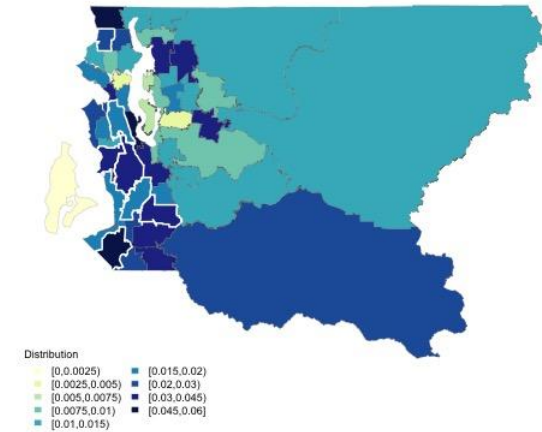
Fed Way-Central/Military Rd

- Multi-family housing has greater risk of eviction
- Policy implications: importance of eviction “bridge” program and local moratoria

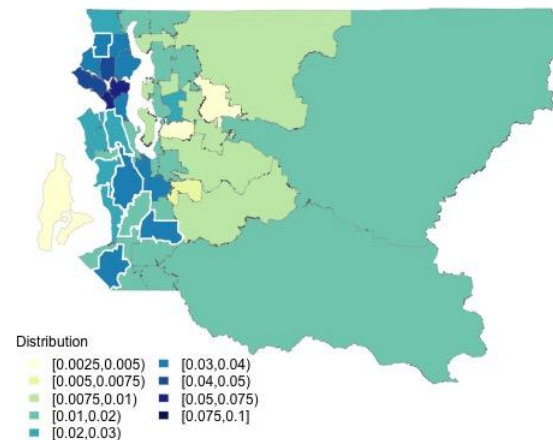
Distribution of Cumulative COVID-19 Hospitalizations  
King County (as of Aug. 30, 2021)



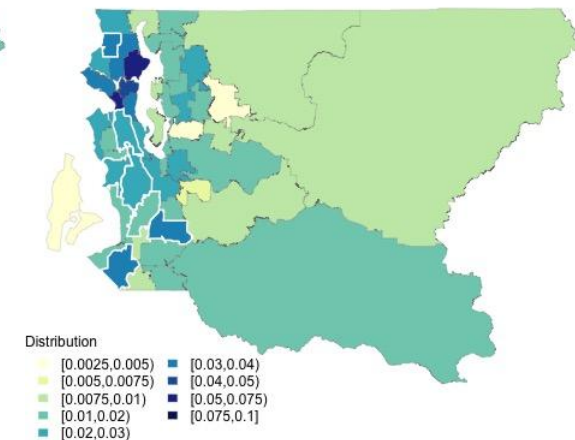
Distribution of Cumulative COVID-19 Deaths  
King County (as of Aug. 30, 2021)



Distribution of Households  
High Rent Burden

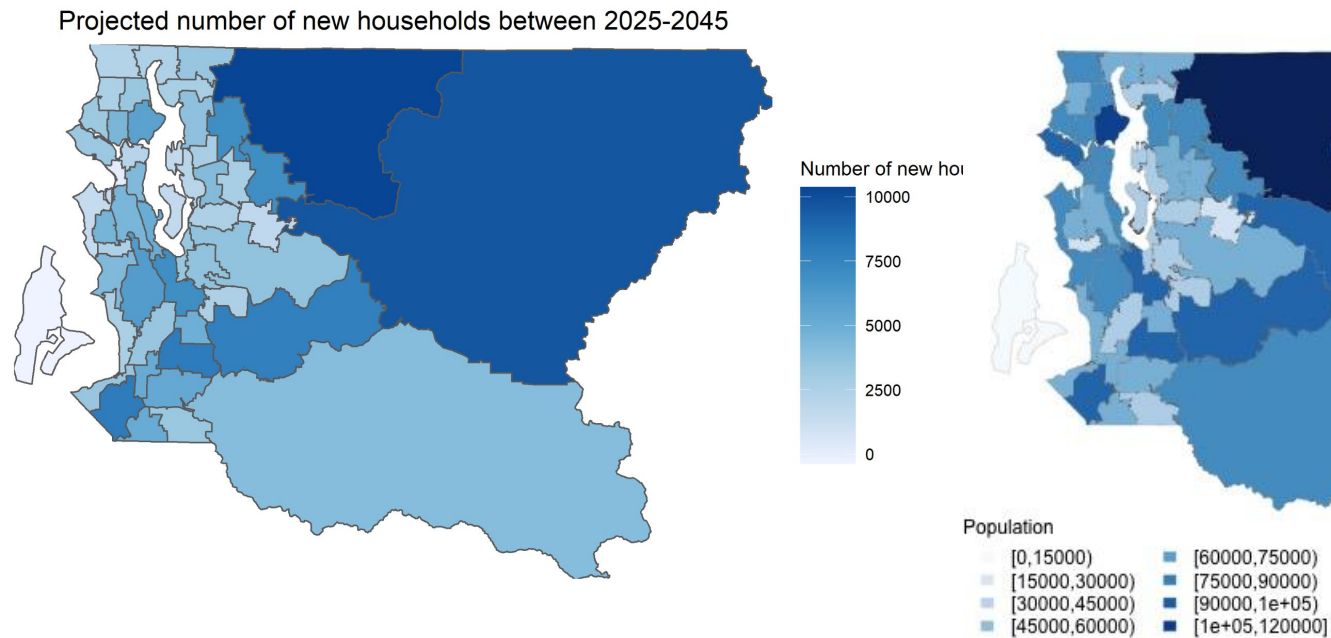


Distribution of Households  
Severe Rent Burden





# Household projections



## Population projections

- Derived from last year's project

## Household representative method

- Proportion of people in the household population who are household representative persons

→ Largest gains in number of new households in Bear Creek/Carnation/Duvall and Snoqualmie/North Bend/Skykomish

# Updates to Visualization Tool for Population Forecasts

## Counts, Prevalence & Distribution

Outcome	By	Geography
Tenure		Tract, HRA
Rent Burden		Tract, HRA
Household Size	Tenure	Tract, HRA
Educational Attainment	Race	Tract, HRA
Mode of Transportation	Median Age	Tract, HRA
Population & Projections	Race, Age, Sex	Tract, HRA

## Continuous Outcomes

Outcome	By	Geography
Median Rent		Tract, HRA
Median Income		Tract, HRA
Average Household Size	Tenure	Tract, HRA

## Other

Floodplains  
Unreinforced Masonry Buildings  
Units, Bedrooms

# **Main Takeaways**

## **Household size and projections**

- Population gains in King County, in the last decade, have come from both an increase in larger households of owners, and smaller households of renters
- Household size estimates bring contextual information to understand other important trends in housing locally

## **Hazards**

- Renting households disproportionately live in areas with high hazard risk, are more impacted by disasters, and have fewer resources available to prepare their homes for disasters. The number of renters in some of these areas is increasing.
- Lack of granular and specific types of data may make it difficult to adequately prepare certain communities for the impacts of future disasters.

# **Acknowledgements**

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## **Interview Participants**

**Lara Whitely Binder**

DNRP, King County Climate Action Team

**Leigh Bunn**

Residential HVAC subject matter expert

**Robert Freitag**

UW, Urban Design & Planning

**Teresa Lewis**

DNRP, River and Floodplain Mgmt Section

**Jared Schneider**

King County Emergency Management

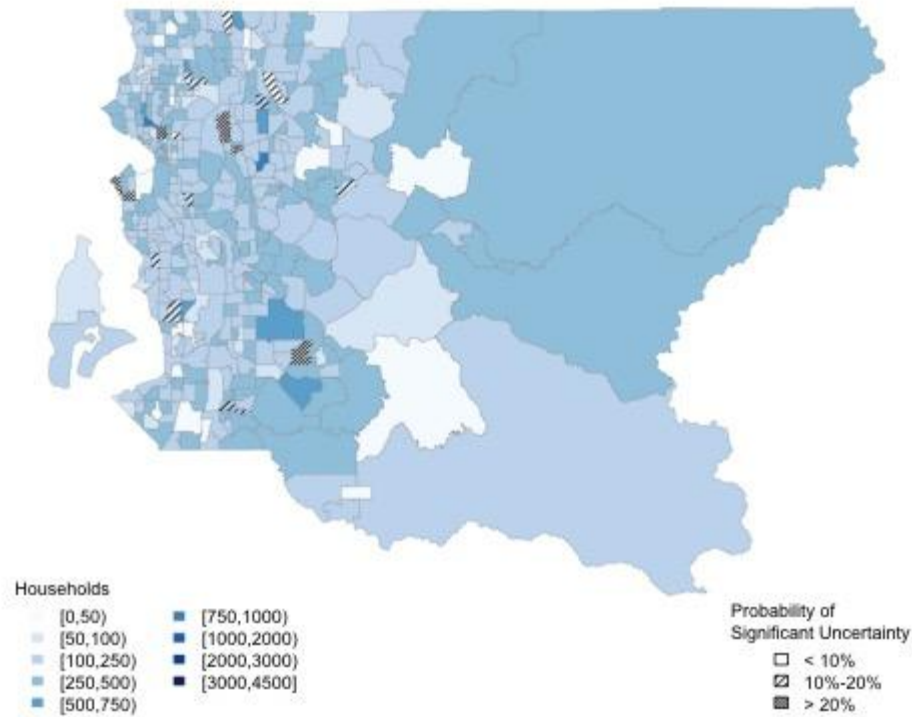
**James Young**

UW, WA Center for Real Estate Research

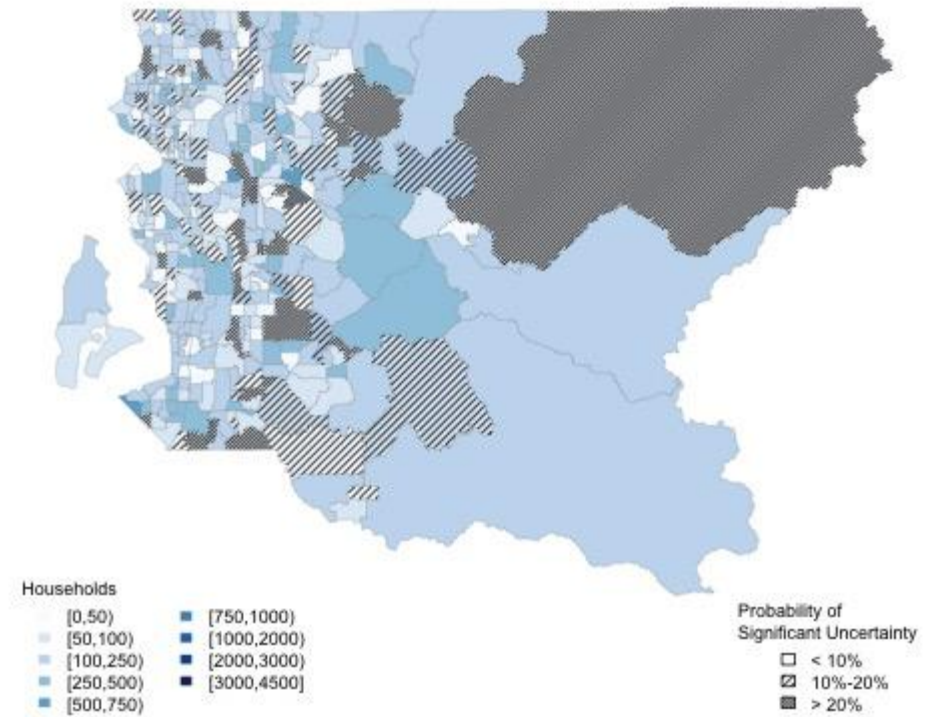
# ACS Estimates and Uncertainty

In King County, Renter households of size 3 are **rarer in number than** Owner households of size 3, which leads to **more uncertainty** in estimates from ACS.

**Owner Households of Size 3**  
2015-2019 (Estimated from ACS)



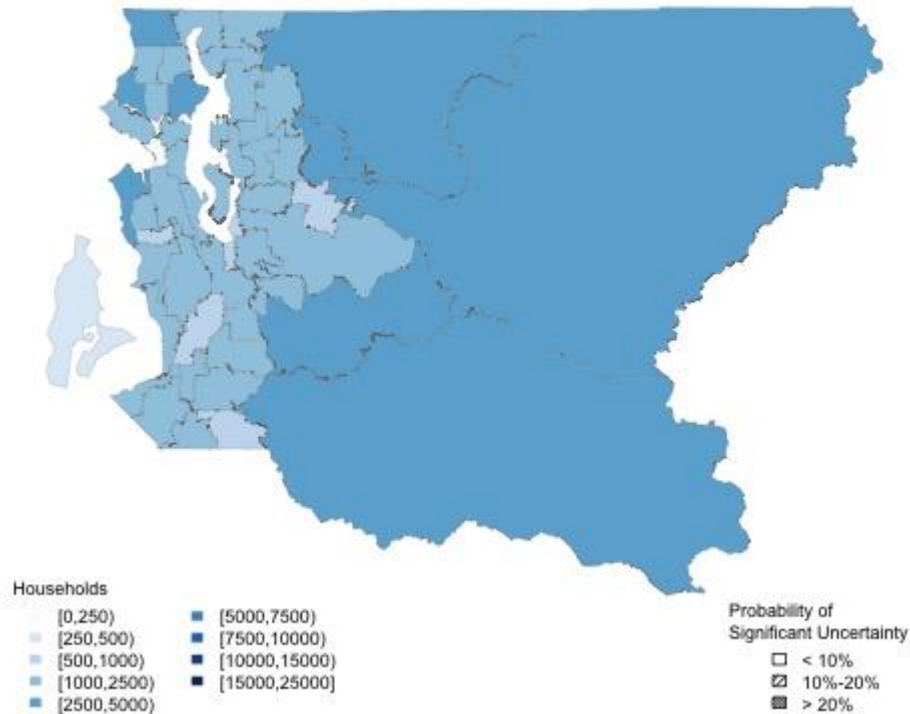
**Renter Households of Size 3**  
2015-2019 (Estimated from ACS)



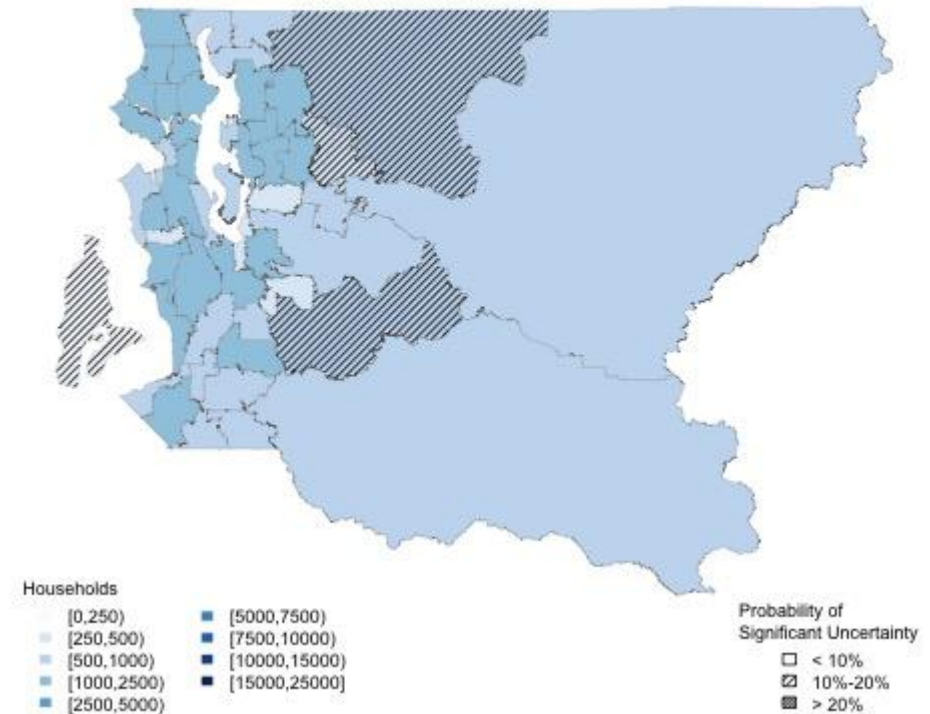
# ACS Estimates and Uncertainty

**Aggregating** households from the **tract level to HRAs** can provide **more precision**, but **not always enough for small categories** in the population.

**Owner Households of Size 3**  
2015-2019 (Estimated from 2015-2019)



**Renter Households of Size 3**  
2015-2019 (Estimated from 2015-2019)





# COVID-19 and Housing

- Lapsing of eviction moratoria happening at different times across King County → differential increase in risk of COVID incidence
- Lapsing of mortgage relief, student loan relief, and unemployment benefits → possible displacement of non-Renters + increase in risk of COVID incidence
- Wildfires found to be associated with increased COVID incidence in PNW → household insulation & ventilation differences possibly related

## Distribution of Renter-occupied Households

