Parcel-Based Estimates of Population for Nonstandard Geographies

Combining Data From the ACS and the County Assessor's Office to Create Accurate Estimates of Children and Adults

Katherine Nesse, PhD

ACS Data Users Conference | May 17, 2021
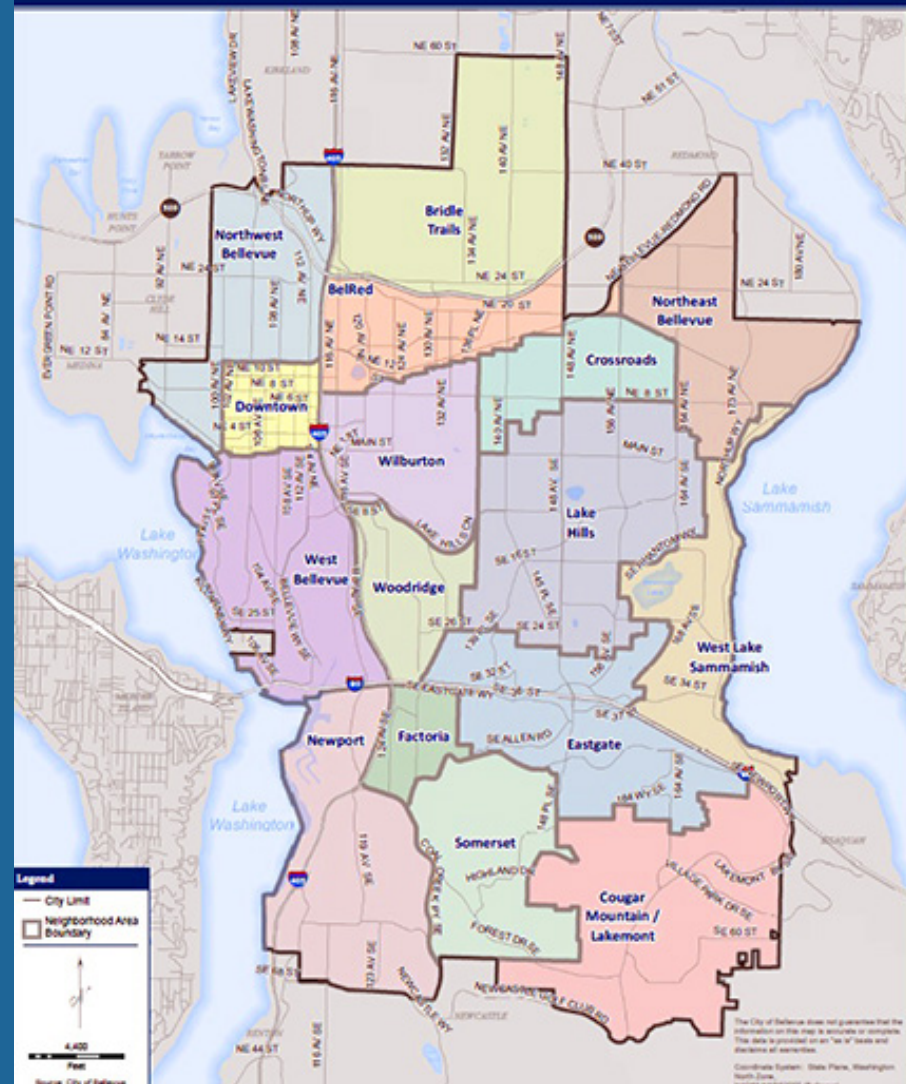
CITY OF BELLEVUE WASHINGTON

Problem

Census Bureau releases estimates in standard geographic areas

BUT

City needs population estimates for nonstandard geographic areas (e.g., neighborhoods)

Solution

- General Housing Unit Method

$$\text{Population} = \text{Average HH Size} \times \text{Number of Units}$$

For the Census Tract
where the parcel is located

Separate estimates for SF and MF

Solution

- Detailed Housing Unit Method

$$\text{Population} = \sum_{i \in PIN} \text{Average HH Size} \times \text{Number of Units}$$

For the Census Tract
where the parcel is located

Separate estimates for SF and MF

Solution

- Nesse Method:

$$POP = \sum_{i \in PIN} \vec{A}\alpha_i\gamma_i * \overrightarrow{HU_i} + \sum_{i \in PIN} \vec{K}\alpha_i\gamma_i * \overrightarrow{HU_i}$$

For the number of bedrooms

Separate estimates for SF and MF

Solu

• Nesse Method:

$$POP = \sum_{i \in PIN} \vec{A}\alpha_i\gamma_i * \overrightarrow{HU_i} + \sum_{i \in PIN} \vec{K}\alpha_i\gamma_i * \overrightarrow{HU_i}$$

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Scalar household size adjustment factor based on the census tract that the parcel is located in

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- Nesse Method:

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Scalar vacancy/occupancy adjustment factor based on the census tract that the parcel is located in

Resulting Population Estimate

- Official Washington State OFM April 1, 2020 Population Estimate:
  148,100

Resulting Population Estimate

- Official OFM April 1 population estimate: **148,100**

- Nesse Method population estimate: **148,489**

- Difference: 389

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Housing Units & Bedrooms

- King County has detailed, publicly available assessment records

- Number of bedrooms is a factor in assessments

Assessments Data Download

Comma Delimited Files   Click here for tab delimited data files.

File	File Size	Date Data Extracted	File Description
Accessory (.ZIP)	5,461 KB	5/14/2021	Accessory (.DOC)
Apartment Complex (.ZIP)	263 KB	5/14/2021	Apartment Complex (.DO
Change History (.ZIP)	214,906 KB	5/14/2021	Change History (.DOC)
Change History Detail (.ZIP)	1,083,833 KB	5/14/2021	Change History Detail (.D
Commercial Building (.ZIP)	3,654 KB	5/14/2021	Commercial Building (.DO
Condo Complex and Units (.ZIP)	6,186 KB	5/14/2021	Condo Complex and Unit
District Levy Reference (.ZIP)	3 KB	5/14/2021	District Levy Reference (
Environmental Restriction (.ZIP)	901 KB	5/14/2021	Environmental Restriction
Home Improvement Applications (.ZIP)	1,631 KB	5/14/2021	Home Improvement Appli
Home Improvement Exemptions (.ZIP)	1,236 KB	5/14/2021	Home Improvement Exem
Legal (.ZIP)	26,410 KB	5/14/2021	Legal (.DOC)
Lookup (.ZIP)	16 KB	5/14/2021	Lookup (.DOC)
Notes (.ZIP)	188,723 KB	5/14/2021	Notes (.DOC)
Parcel (.ZIP)	30,460 KB	5/14/2021	Parcel (.DOC)
Permit (.ZIP)	17,752 KB	5/14/2021	Permit (.DOC)
Real Property Account (.ZIP)	18,618 KB	5/14/2021	Real Property Account (.D
Real Property Appraisal History (.ZIP)	335,173 KB	5/14/2021	Real Property Appraisal H
Real Property Sales (.ZIP)	129,713 KB	5/14/2021	Real Property Sales (.DO **Starting Feb 9, 2020, the** changed from length of
Residential Building (.ZIP)	24,496 KB	5/14/2021	Residential Building (.DO
Review History (.ZIP)	51,400 KB	5/14/2021	Review History (.DOC)

Average HH Size Based on Number of Bedrooms

- IPUMS microdata to find the average HH size based on the number of bedrooms

- Geography: City level only

	Average number per occupied unit		Number of IPUMS Records
	Adults	Children	
Multi-family			
0 Beds	1.26	0.01	95
1 Bed	1.46	0.12	291
2 Beds	1.77	0.43	459
3 Beds	2.20	0.47	64
4+ Beds	2.62	1.42	5
Group Quarters & Other			
0 Beds	0.96	0.04	156
Single-family			
0 & 1 Beds	1.60	0.19	14
2 Beds	1.89	0.29	142
3 Beds	2.05	0.60	658
4 Beds	2.27	0.76	811
5 Beds	2.47	0.96	319
6+ Beds	2.62	1.42	53

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Adjustment factors

- Vacancy rate for multi-family and single-family is recorded at the census tract level

- Average household size is recorded at the census tract level. The adjustment is the ratio of the average HH size in the tract to the average HH size in the city

- B25032 is a helpful table for converting tenure to structure type

TENURE BY UNITS IN STRUCTURE

Survey/Program: American Community Survey

TableID: B25032

Product: 2

Universe: (

Label	Bellevue city, Washington
	Estimate
∨ Total:	58,107
∨ Owner-occupied housing units:	31,420
1, detached	24,849
1, attached	1,718
2	166
3 or 4	792
5 to 9	783
10 to 19	743
20 to 49	836
50 or more	1,477
Mobile home	56
Boat, RV, van, etc.	0
∨ Renter-occupied housing units:	26,687
1, detached	4,313

Result

	BelRed	Bridle Trails	Cougar Mountain / Lakemont	Crossroads	Downtown	Eastgate	Factoria	Lake Hills	Newport	Northeast Bellevue	Northwest Bellevue	Somerset	West Bellevue	West Lake Sammamish	Wilburton	Woodridge
Population	2,703	11,982	11,951	13,866	13,892	7,546	3,383	18,543	10,346	10,986	9,514	8,971	8,653	6,501	4,566	5,086
Percent of Population in Multi-family Units	100	59	16	82	100	15	84	28	14	3	43	0	37	15	53	43
Percent of Population in Single-family Units	0	41	84	18	0	85	16	72	86	97	57	100	63	85	47	57
Average Household Size	1.77	2.54	3.07	2.36	1.55	2.94	3.01	2.8	2.85	2.86	2.38	3.17	2.43	2.82	2.43	2.48
Number of Households	1,531	4,723	3,894	5,867	8,949	2,567	1,124	6,612	3,625	3,846	4,001	2,833	3,565	2,302	1,878	2,054
Vacancy Rate	1.58	4.46	6.99	8.89	13.84	5.77	16.09	4.33	4.78	5.1	9.18	2.53	9.67	5.01	3.58	8.25
Number of Housing Units	1,556	4,944	4,187	6,439	10,386	2,724	1,340	6,911	3,807	4,053	4,406	2,906	3,947	2,423	1,948	2,239
Number of Multi-Family Housing Units	1,556	3,254	799	5,697	10,386	453	1,147	2,352	550	190	2,230	0	1,903	451	1,206	1,143
Number of Single-Family Housing Units	0	1,690	3,388	742	0	2,271	193	4,559	3,257	3,863	2,176	2,906	2,044	1,972	742	1,096
Percent of Population in Age Groups																
Under 18	13	20	24	17	12	23	19	23	23	24	21	25	22	24	20	21
18 to 44	39	49	31	54	55	33	36	40	32	29	35	24	36	31	40	37
45 to 64	31	22	32	19	19	31	33	24	29	28	27	35	28	28	25	27
Over 65	18	10	13	10	17	13	12	14	15	18	17	16	15	17	15	15
Percent of Population by Race																
White	60	41	55	34	49	45	40	50	57	61	57	45	63	66	45	49