SuperTracts

a Schema for Better Mapping of Data from the American Community Survey

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Outline for talk

- **Purpose.** I propose that we develop a new level of geography *for the Portland Metro Area* based on the aggregation of 4-6 adjacent census tracts into what I am calling *SuperTracts* and that we coin a place name for each.
- **Outline of talk**
  - The American Community Survey (ACS)
  - Mapping ACS data
  - SuperTracts – Pros and Cons
  - The Tract2Super tool

Do you use the ACS in your work?

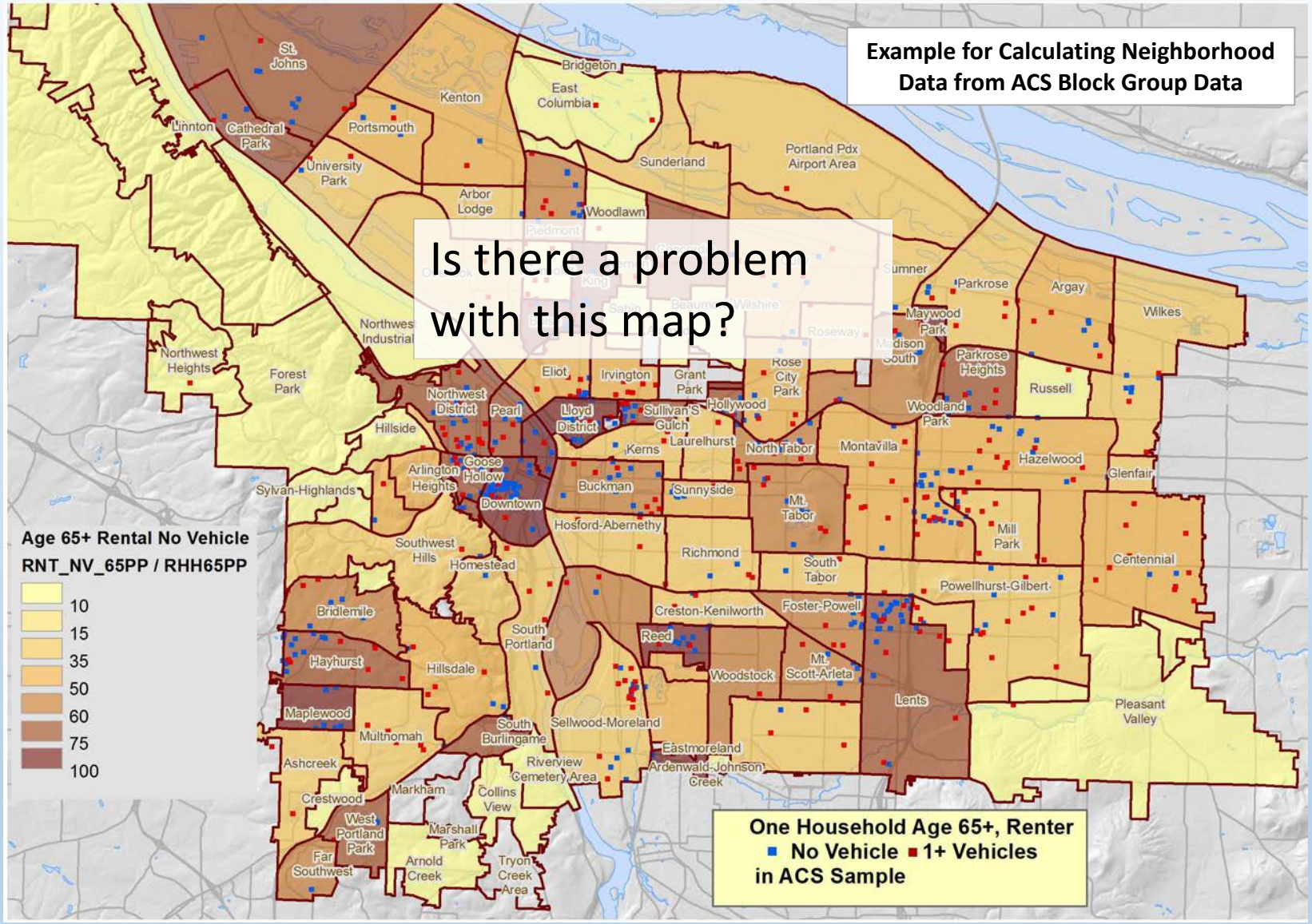
o Love it?

o Hate it?

o Love/hate relationship?

Sometimes the ACS sample is too small to get the job done.

- This *simulation* shows the loss of ACS sample as one drills down into detailed tables.
- We start with the ACS sample for the City of Portland, approximately 20,000 households in 2013-2017 5 year ACS
- Then we filter out all but households age 65+.
- Next we consider only renter households age 65+
- And from this group show vehicle ownership
- Note the very small number of red and blue dots in many neighborhoods.
- Finally we allocate the data to neighborhoods and map vehicle ownership.

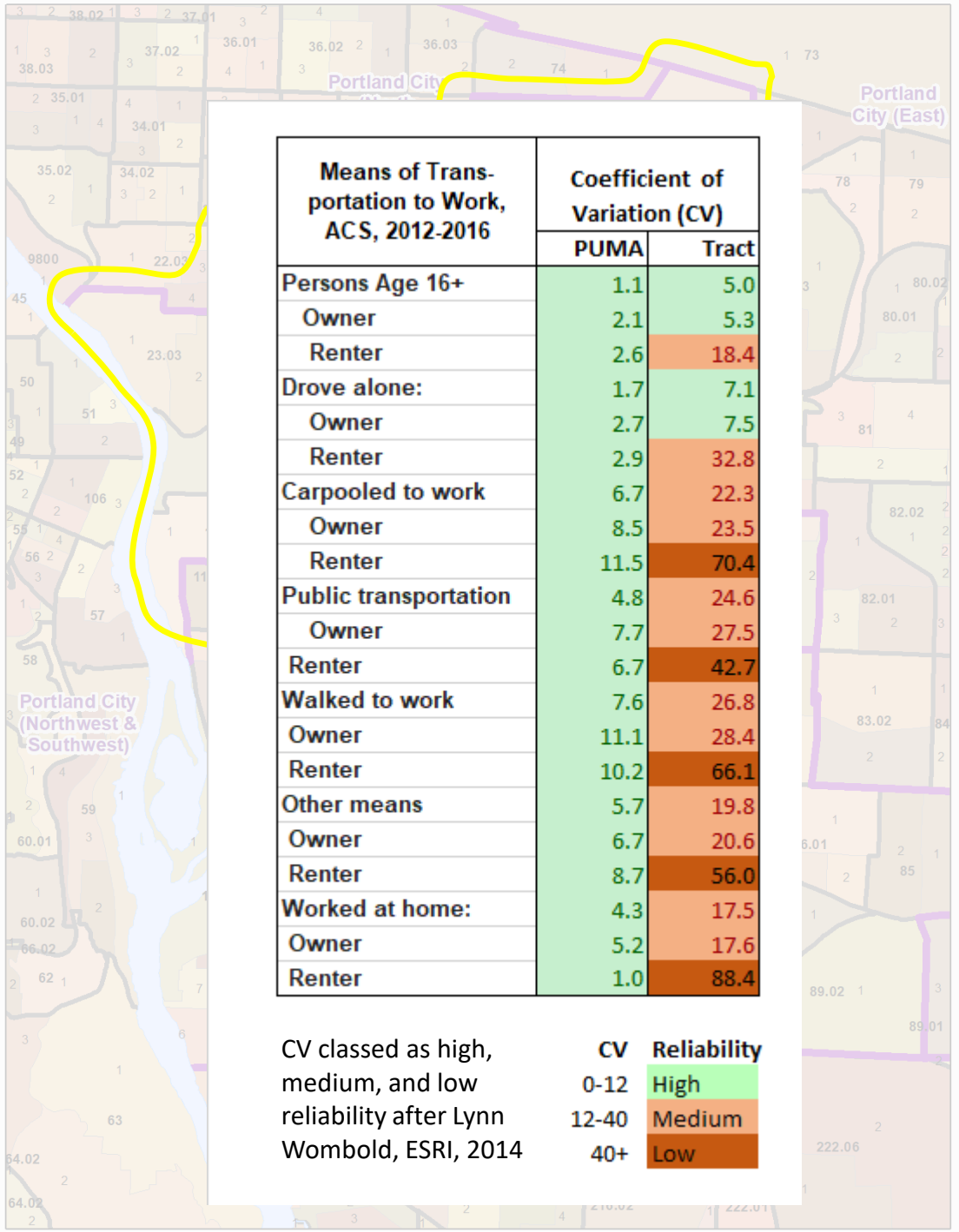


Mapping with ACS Data

- Census geographies
  - Block groups
  - Census tracts
  - PUMAs
  - Counties, States

SuperTracts

- Sampling errors relatively larger for small geographies
  - Compare census tract with PUMA.
  - Example Portland City Central East PUMA and within that PUMA census tract 19
  - Based on the coefficient of variation all of the values for the PUMA are deemed reliable whereas most of those for tract 19 are of medium to low reliability.
- What about a new geography between census tract and PUMA?



Means of Transportation to Work, ACS, 2012-2016	Coefficient of Variation (CV)	
	PUMA	Tract
Persons Age 16+	1.1	5.0
Owner	2.1	5.3
Renter	2.6	18.4
Drove alone:	1.7	7.1
Owner	2.7	7.5
Renter	2.9	32.8
Carpooled to work	6.7	22.3
Owner	8.5	23.5
Renter	11.5	70.4
Public transportation	4.8	24.6
Owner	7.7	27.5
Renter	6.7	42.7
Walked to work	7.6	26.8
Owner	11.1	28.4
Renter	10.2	66.1
Other means	5.7	19.8
Owner	6.7	20.6
Renter	8.7	56.0
Worked at home:	4.3	17.5
Owner	5.2	17.6
Renter	1.0	88.4

CV classed as high, medium, and low reliability after Lynn Wombold, ESRI, 2014

CV	Reliability
0-12	High
12-40	Medium
40+	Low

The next several slides

describe the process by which the SuperTracts were delineated.

Building *SuperTracts*

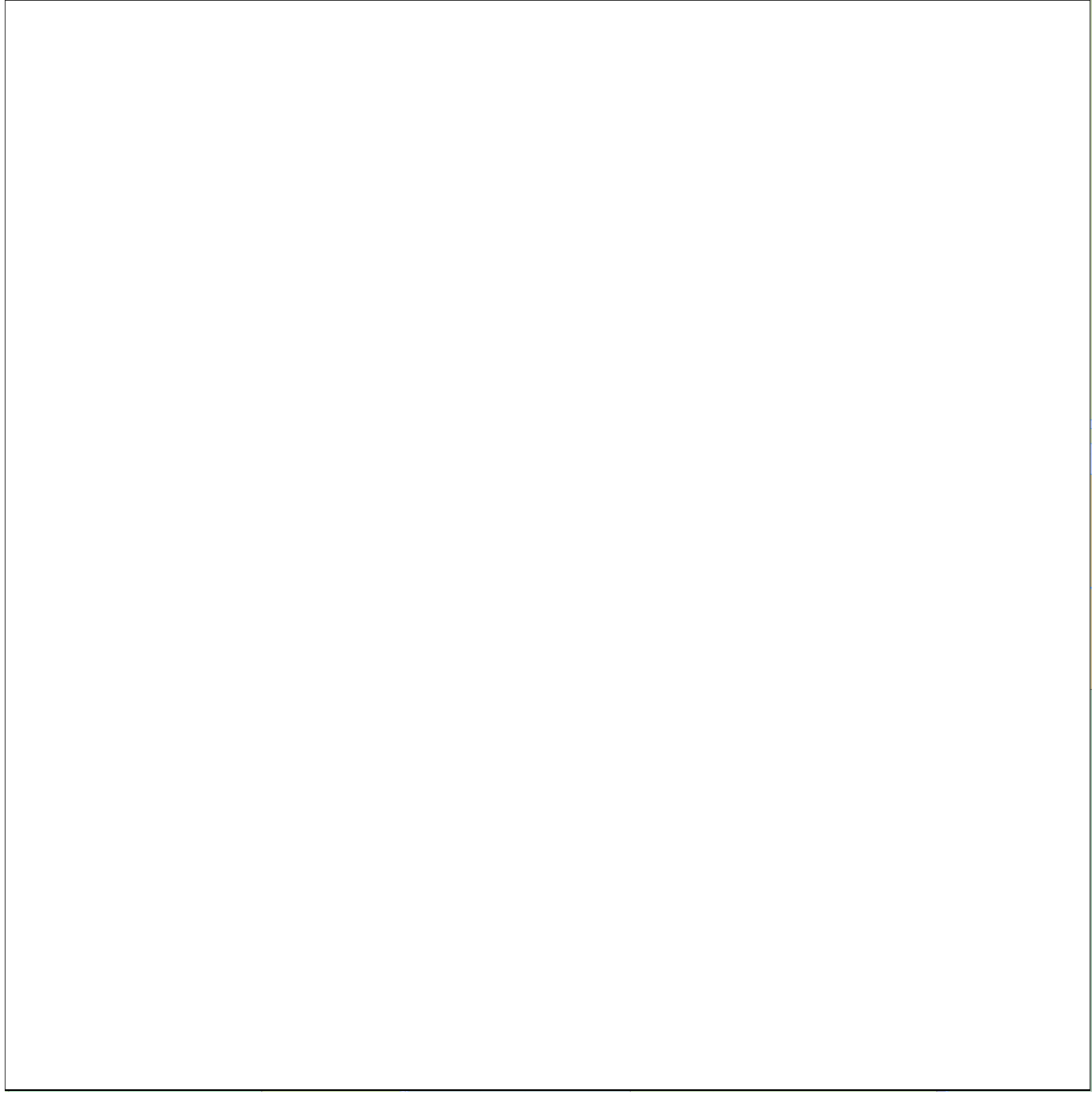
- Patterned after City of Portland *twenty minute neighborhoods*.
- "*One where you can walk to essential amenities and services in 20 minutes*." Portland Oregonian.
- They comprised of a grouping of census tracts.
- Extend concept to seven county Metro area
- I asked county GIS staffs to build tract aggregates, like Portland's twenty minute neighborhoods, and give them a place name.
- I provided my first cut and suggested some criteria
- They did it!

Getting local input

- In order to help gain acceptance of the tract groupings it was important to get local input from county planners and GIS staff.
- I did an initial grouping of tracts and assigned a name and shared this with county staff.
- The twenty minute neighborhoods for for the City of Portland became their *SuperTracts*.
- I asked them to edit my groupings and names based on the following:
  - Form groups of 4 – 6 adjacent census tracts
  - The resulting *SuperTracts* should be approximately equal in population.
  - To the extent possible tracts *SuperTracts* should be similar on socio-economic measures.
  - Provide a name for each *SuperTract* that would be familiar to county residents and would help them relate data to that locale.
- Here are the maps with the groupings by the county staff

Here are our results

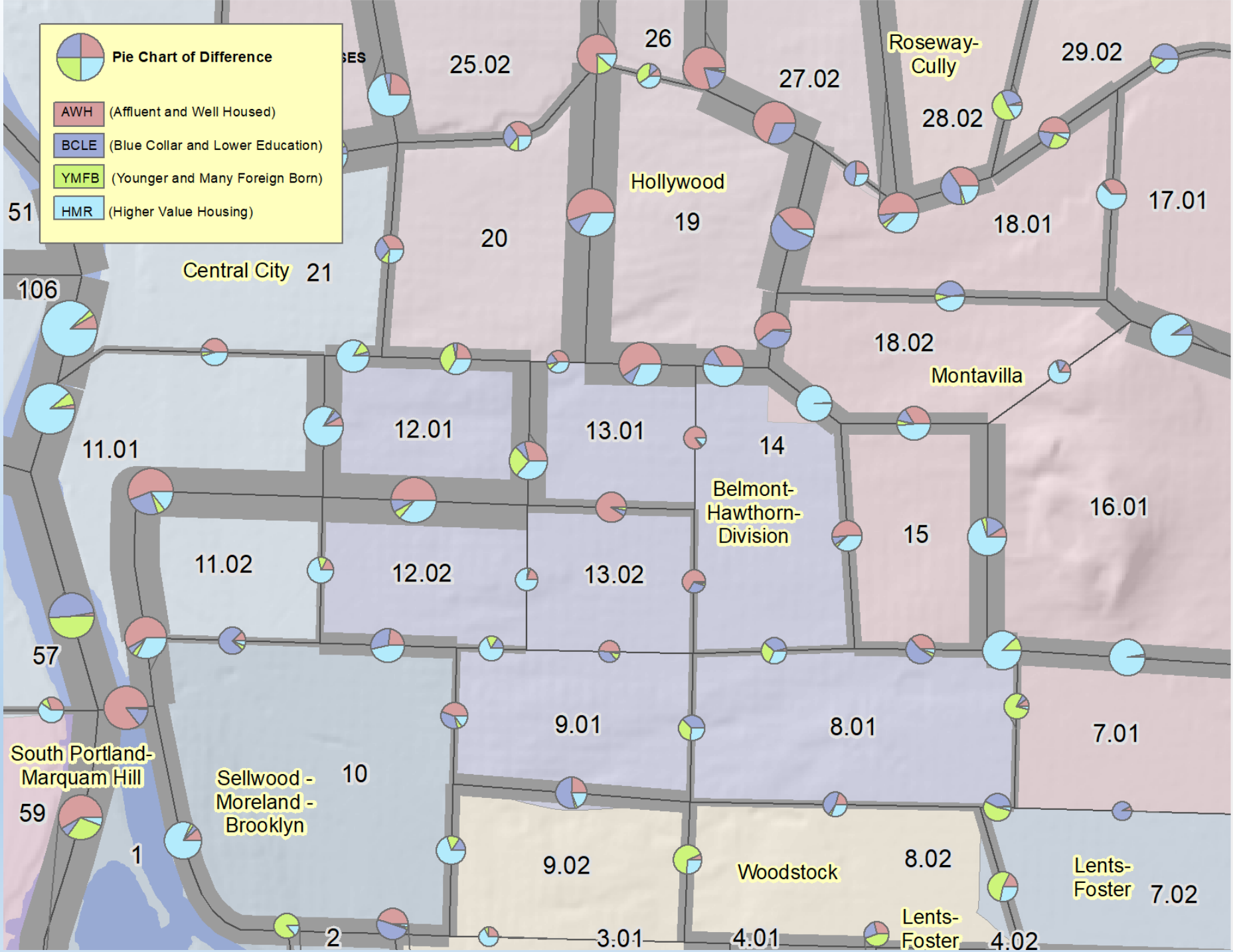
- The census tracts colored by *SuperTract*
- The census tracts dissolved into *SuperTracts*
- Labeling added to *SuperTracts*
  - Labels don’t all fit
- Zoomed out to where labels are readable
- Maybe need abbreviated names



Criteria for clustering of census tracts

- Methods considered were:
  - Portland's 20 minute neighborhoods – We used these.
  - Homogeneous – Census tracts within a cluster are similar on socio-economic measures. Considered, but many *SuperTracts* quite heterogeneous..
  - Nest within political jurisdictions – For example the city of Beaverton could be split into two or three tract clusters. In some cases.
  - Popular recognition – Assign a place name. Should be recognized by persons living in region as a distinct region. A major factor.
  - Split on the UGB – Metro suggested that the groupings would be more useful if they split on urban growth boundaries. Not practical.

- Less information would be lost if the census tracts within a *SuperTract* were similar to each other.
- Width of line how much tracts differ.
- Size of slice - how they differ.
- The Belmont-Hawthorn-Division *SuperTract* is relatively homogeneous except for tract 12.01
- This measure of difference did not play a large role in the grouping of the tracts by the county GIS cooperators.

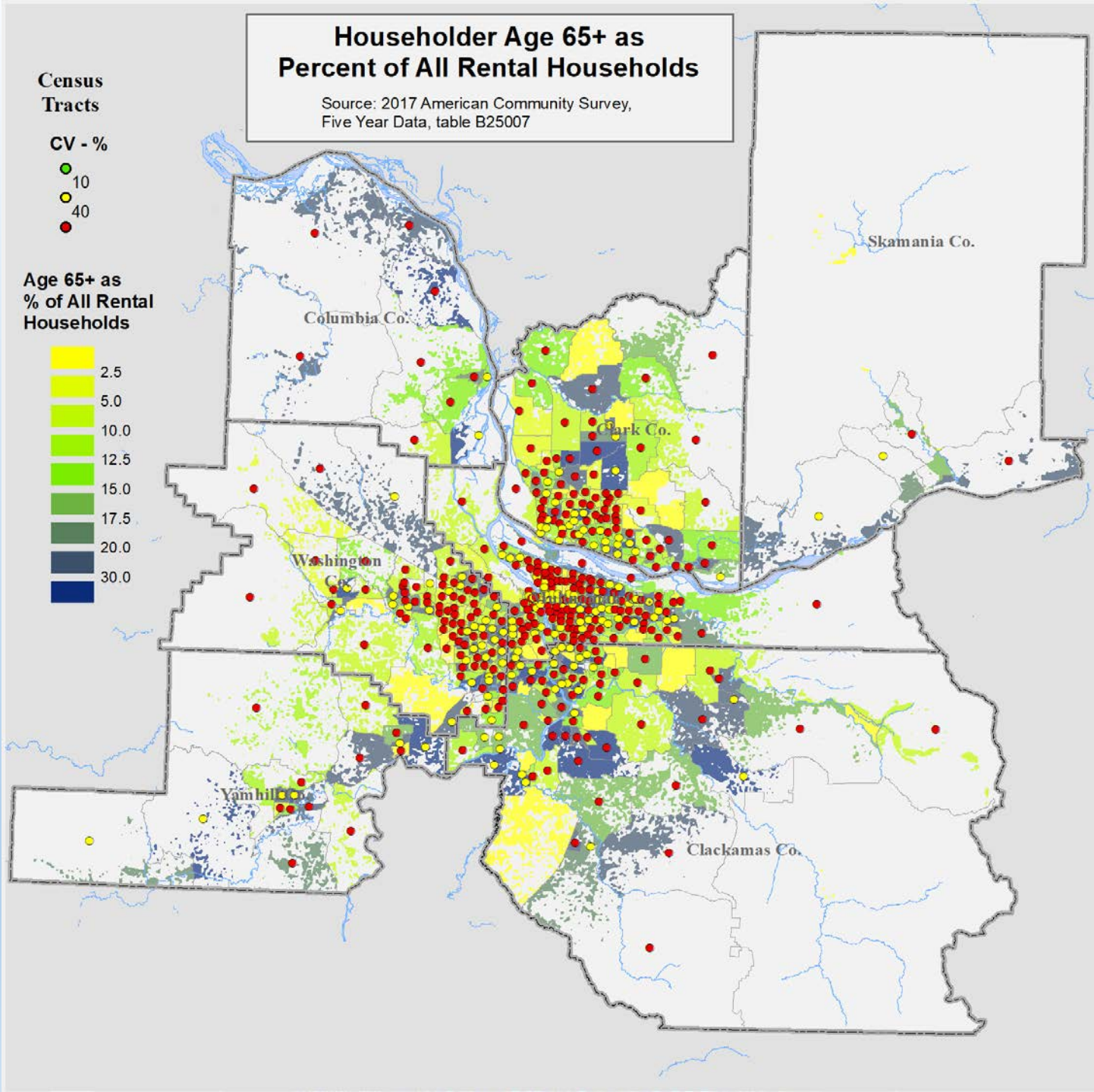


Remainder of presentation

- Tract and *SuperTract* maps showing reduced sample variability for SuperTracts
- An example for tract and *SuperTract* maps where aggregation to SuperTracts does not sufficiently reduce the sampling variability.
- A tool for aggregating tracts to SuperTracts and organizing data for use in ESRI's ArcMap/Pro

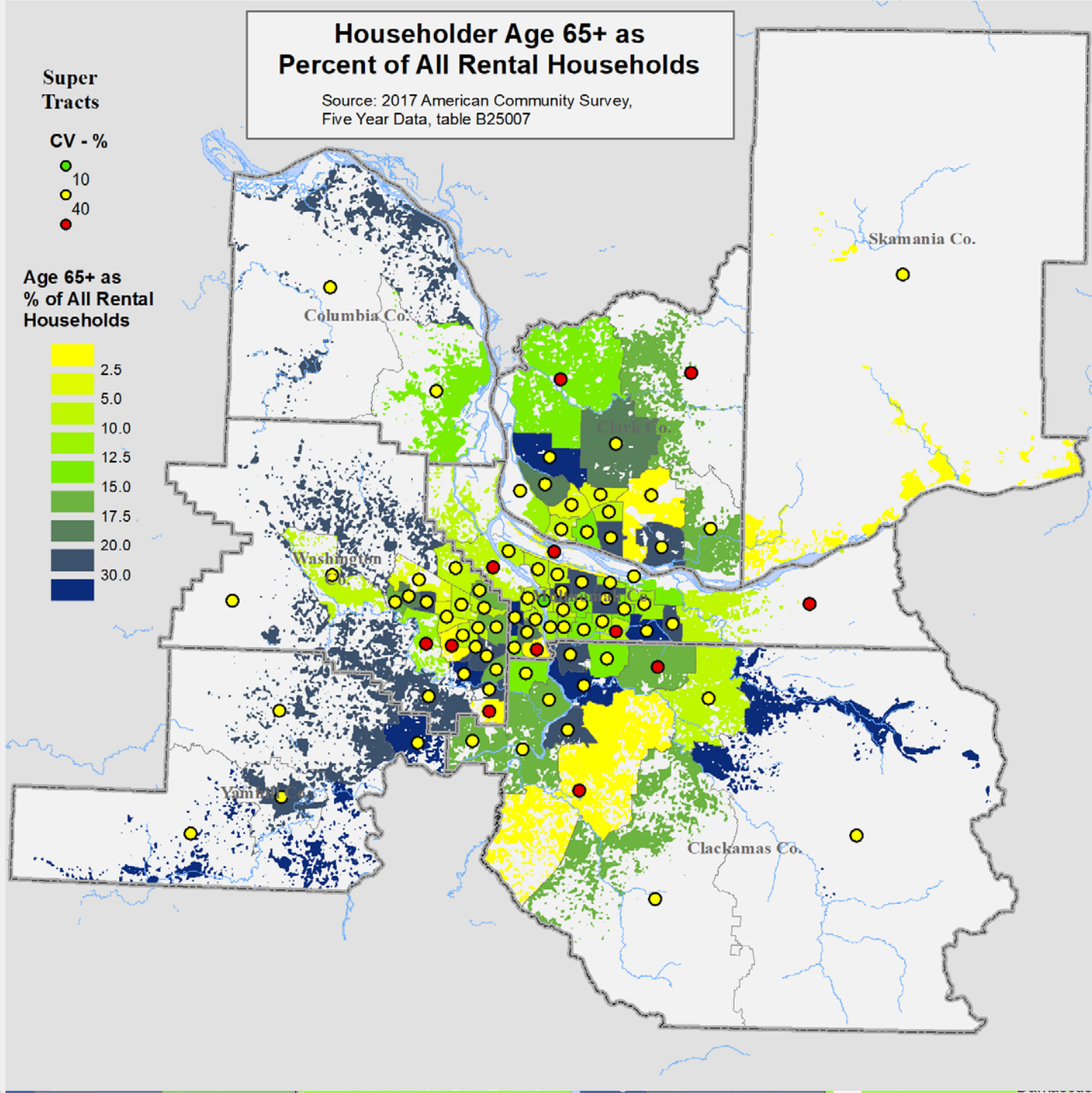
Mapping of tract and *SuperTract*

- First the map of the census tract level data.
- Note that there are some groupings of high and low value tracts but
- there also is considerable local heterogeneity suggesting sampling variability.
- We can add place names for a geographical reference, but tract numbers would mean little to a typical audience.
- When we add the CV values we see that the majority of the census tracts show data of poor reliability – making the map difficult to explain.



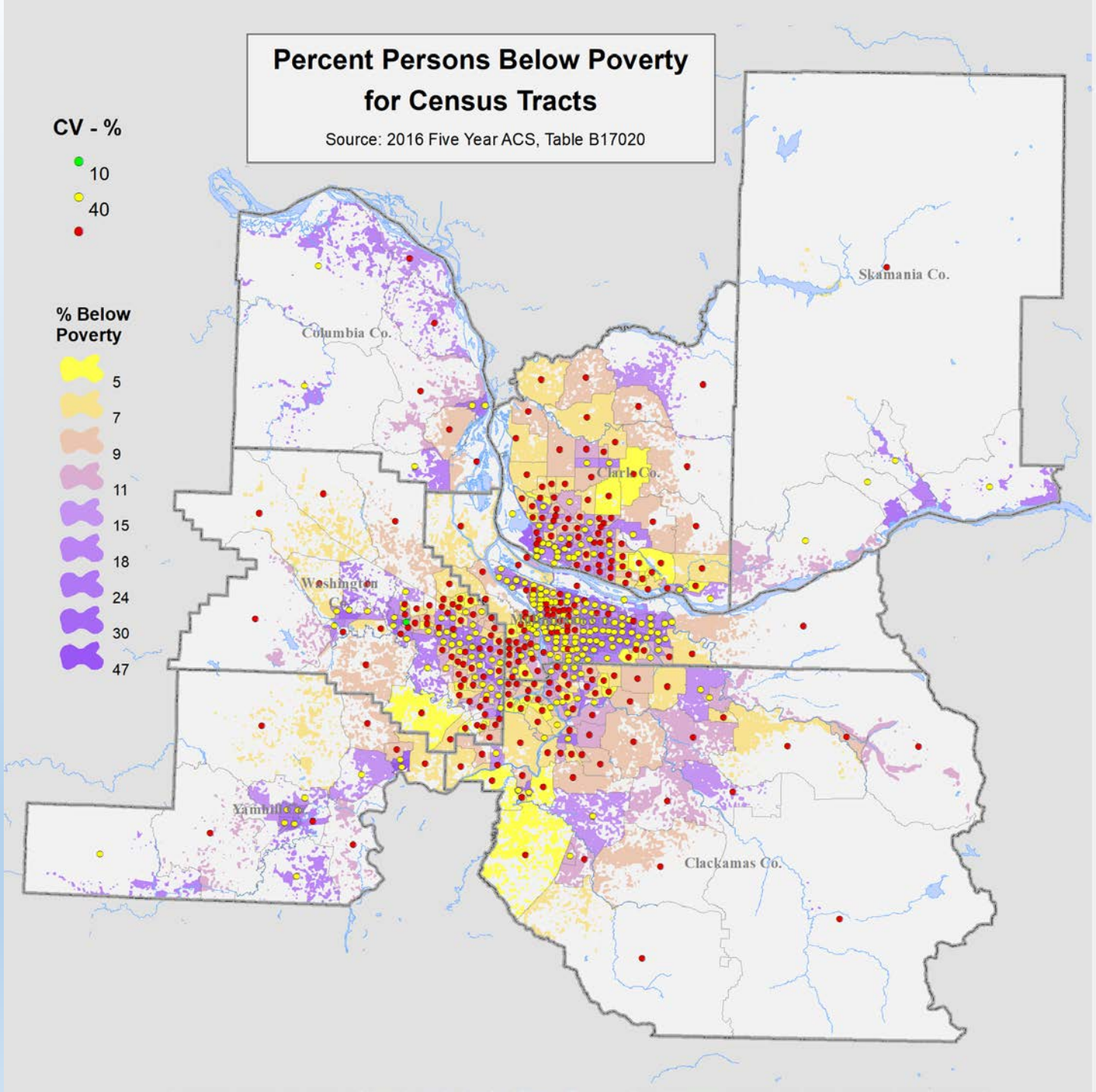
SuperTract data mapped

- Here is the same sequence of maps for *SuperTracts* using the same shadings and classes as for census tracts.
- The variability is somewhat less due to averaging our of sampling error and tract to tract variability within *SuperTracts*.
- The *SuperTract* names were provided by county GIS staff and meant to be familiar to persons in the county.
- When the CV values are added to the map we see that most of the *SuperTract* data show moderate reliability.
- The low reliability *SuperTracts* generally are those with little rental housing.



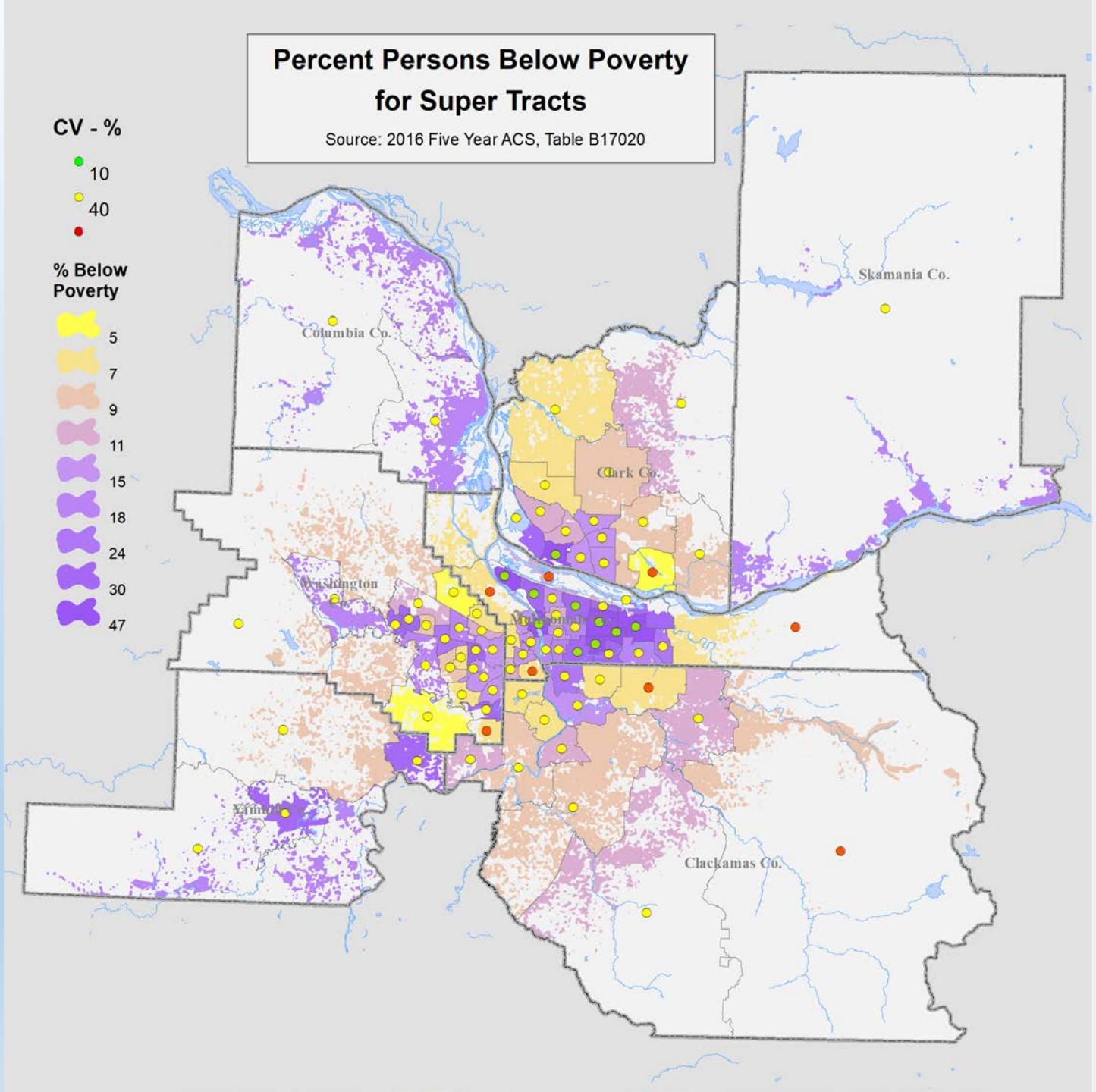
A second example

- Percent persons with income below poverty.
- This series of maps shows the proportion of persons with incomes below poverty level for census tracts.
- A large proportion of the CV values are red (> 40%) indicating that the estimate value may not be reliable.



Same map for *SuperTracts*

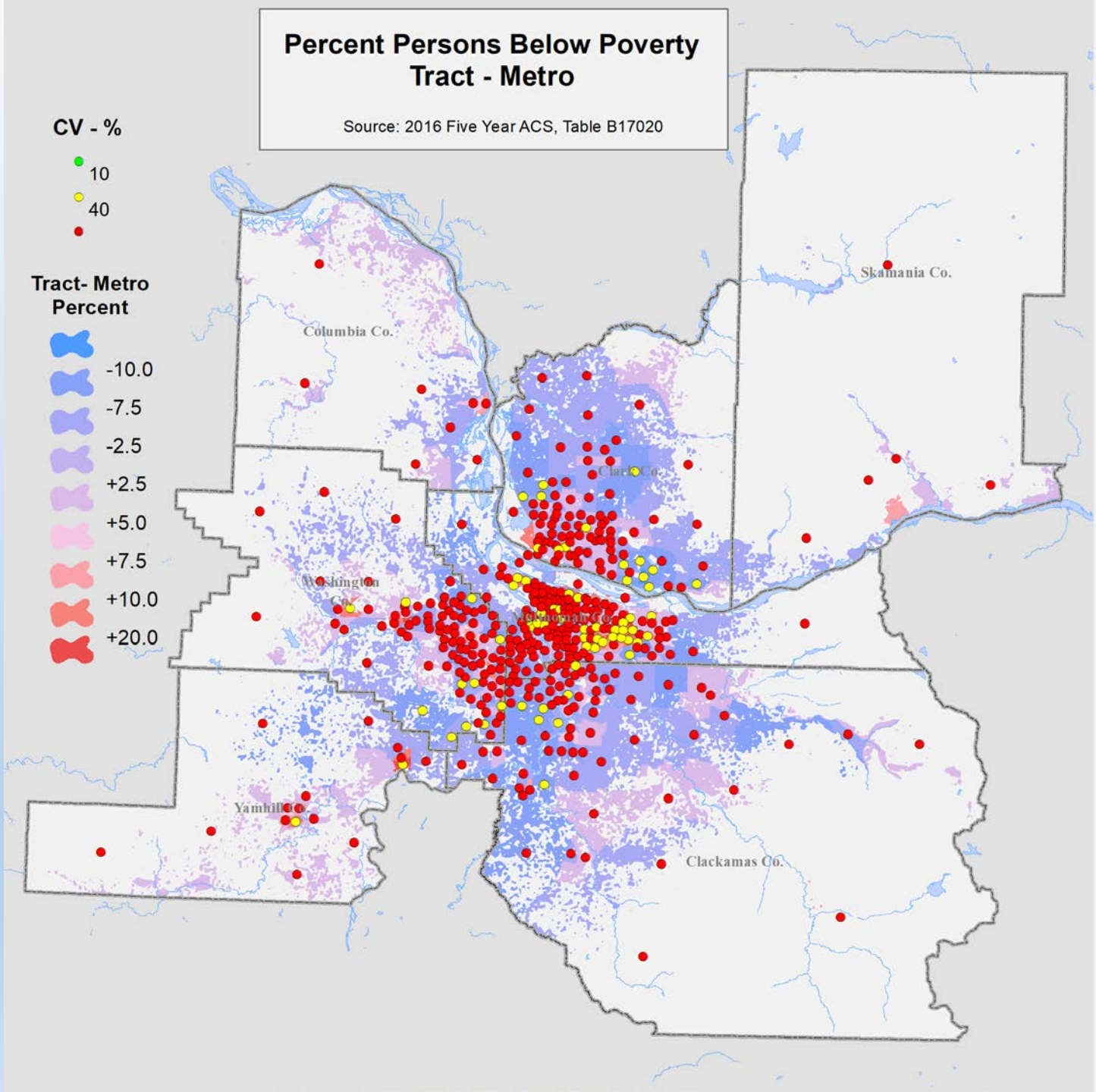
- Here are the results for SuperTracts using the same classes and colors.
- Place names added.
- Most of the CV values for *SuperTracts* are in the high (green) to moderate (yellow) reliability range.



Comparing to a benchmark

Map of tract data

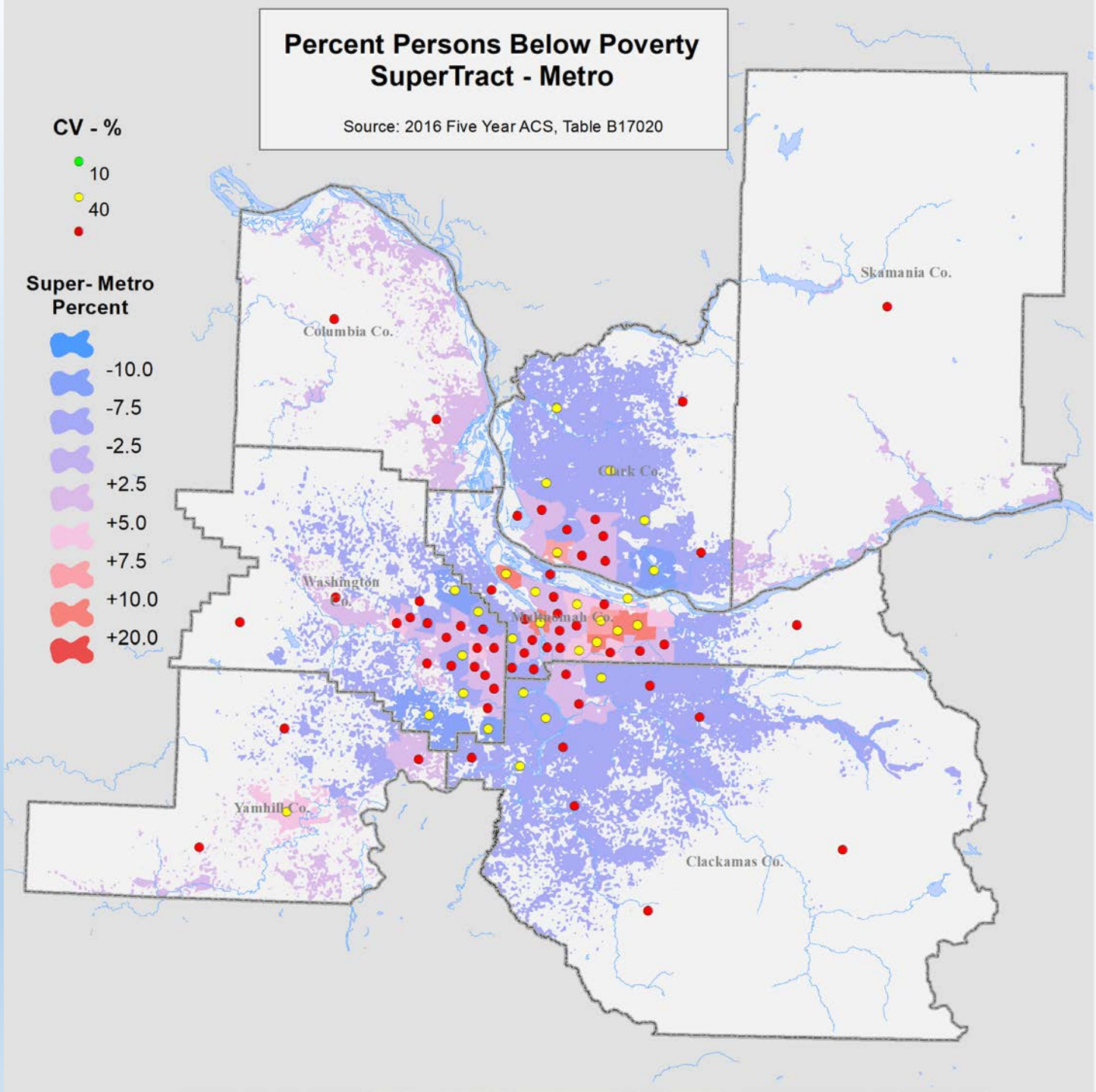
- In this map we compare poverty level by census tract to the Metropolitan poverty level of 12.8%.
- On the map the tracts with poverty levels above that of the Metro area are shown in shades of red. Those below are shown in shades of blue.
- Some place names help orient out view.
- The MOE values show that most of the tract level values are of low reliability. Some of those of medium reliability could be due to sampling error



Map of *SuperTract* data

- Here is a map showing relative levels of poverty – compared to metro level
- On this map for *SuperTracts* the same class intervals and colors were used.
- The map of CV values is not as positive as we might have hoped. While there are a fair number of yellow dots signifying medium reliability the red dots predominate.

- Limitations - One should not be too hopeful that aggregation into *SuperTracts* will stabilize the sampling error variation for variables such as:
  - Subgroups, such as older persons
  - Comparisons to benchmarks
  - Time comparisons between five year sets of data, e.g. 2013-2017 compared to 2008-2012

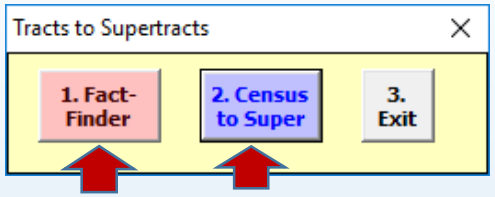


A VBA Tool for tract to *SuperTract* aggregation

Basic Excel skills are all that are needed to aggregate the census tract data into SuperTracts.

However, I wanted to make the process as easy as possible to encourage GIS staff, planners, and research analysts to create and use the Super Tract geography

To facilitate this I built an Excel VBA application to do the hard work and make the tables nice for ArcMap/Pro.



- The application is operated by a two button tool.
- The Factfinder button opens Factfinder to ACS data for a pre-selected set Portland Metro area census tracts.
- Select a table, download, and open the table.
- Press the Census to Super button and the aggregation is performed and the table is formatted for use with ArcMap/Pro and saved to the *MyACS* directory.

	A	B	C	D	E	F
1	SuperTract ID	Census Tract	Value of one for count of tracts	Estimate; Total	Margin of Error; Total	
2	SuperID	TractID	One	HD01_VD01	HD02_VD01	
3	41005X008	41005020100	1	3946	254	
4	41005X008	41005020200	1	6133	386	
5	41005X008	41005020302	1	3944	305	
6	41005X008	41005020303	1	5307	384	
7	41005X008	41005020304	1	5621	377	
8	41005X008	41005020401	1	5666	305	
9	41005X008	41005020403	1	3663	216	
10	41005X008	41005020404	1	3922	285	
11	41005X009	41005020501	1	7221	333	
12	41005X008	41005020503	1	2244	123	
13	41005X009	41005020504	1	6437	329	
14	41005X009	41005020505	1	2512	133	
15	41005X009	41005020600	1	8815	348	
494	Omitted rows					
495						
496	SuperTract lable	SuperTract id	Count of Tracts	Estimate; Total	Margin of Error; Total	
497	SuperLab	SuperID	Count	HD01_VD01	HD02_VD01	
498	Barton - Bull Run	41005X001	4	22790	1,070.0	
499	Beavercreek	41005X002	6	30634	1,058.2	
500	Clackamas Co. East	41005X003	5	16859	1,027.3	
501	Colton	41005X004	5	22571	830.5	
502	Damascus	41005X005	3	16658	634.6	
503	Gladstone - Johnson City	41005X006	10	50589	1,298.1	
504	Happy Valley	41005X007	7	41840	1,075.4	
505	Lake Oswego	41005X008	9	40446	912.2	
506	Marylhurst	41005X009	5	28959	632.4	
507	McLoughlin	41005X010	6	33490	1,004.5	
508	Milwaukee	41005X011	9	45563	1,252.7	
509	Stafford	41005X012	7	29652	880.6	
510	Willsonville	41005X013	4	19911	816.8	
511	North Columbia	41009X001	4	16978	738.3	

ACS_17_5YR_B01003

- The conversion program is distributed as a zip file of the directory as shown here.
- A geodatabase is provided with the map layers for census tracts and *SuperTracts* as well as various orientation features, e.g. rivers, major roads, density mask.
- The Help directory includes the Compass publication on using the ACS and a PowerPoint on how to use the tool.

The SuperTracts Package

GIS	MXD	Demo Map files for ArcMap
	PDXSuper.GDB	An ESRI Geodatabase file
		Census geography
		Supertract geography
		Orientation features: e.g river, density mask
Help	Documents	ACS references
		PowerPoint files
MyACS	ACS	ACS_16_5YR_B11006.xlsx (ACS)
		ACS_17_5YR_B02015.xlsx (ACS)
		DEC_10_SF1_H11.xlsx (Decennial)
Resources	Icon	
	PNG maps	
ACS_SuperTract_65.xlsm - Excel file, VBA code		
SuperTracts.zip - all of the above in a zip file		

Conclusions and future work

- The *SuperTracts* geography for Portland only will be useful if it comes into common use.
  - Encourage use in classrooms, workshop for GIS in Action.
  - Leverage the GIS people who helped me to publicize it.
  - Encourage Portland Metro to add to RLIS GIS database.
  - Publicize in an ESRI Story Maps website.
  - Encourage use of the Excel VBA tool.
  - Make the tool available on line to anyone.
- Looking ahead
  - Add statewide to Oregon GIS framework?
  - Add simple mapping tools? ESRI *Maps in Excel* or native Excel?
  - Add ability to handle other than count values.
  - Encourage use for other metro areas, other geographies.
  - Present at ACS Data Users Conference, May 2018

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Questions, Suggestions?

Download application at:

https://www.pdx.edu/ioa/supertracts