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
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.

Is there a problem with this map?
Mapping with ACS Data

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

- 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?

SuperTracts

<table>
<thead>
<tr>
<th>Means of Transportation to Work, ACS, 2012-2016</th>
<th>Coefficient of Variation (CV)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PUMA</td>
</tr>
<tr>
<td>Persons Age 16+</td>
<td>1.1</td>
</tr>
<tr>
<td>Owner</td>
<td>2.1</td>
</tr>
<tr>
<td>Renter</td>
<td>2.6</td>
</tr>
<tr>
<td>Drove alone:</td>
<td>1.7</td>
</tr>
<tr>
<td>Owner</td>
<td>2.7</td>
</tr>
<tr>
<td>Renter</td>
<td>2.5</td>
</tr>
<tr>
<td>Carpoole to work</td>
<td>6.7</td>
</tr>
<tr>
<td>Owner</td>
<td>8.5</td>
</tr>
<tr>
<td>Renter</td>
<td>11.5</td>
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<tr>
<td>Public transportation</td>
<td>4.8</td>
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<tr>
<td>Owner</td>
<td>7.7</td>
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<tr>
<td>Renter</td>
<td>6.7</td>
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<tr>
<td>Walked to work</td>
<td>7.6</td>
</tr>
<tr>
<td>Owner</td>
<td>11.1</td>
</tr>
<tr>
<td>Renter</td>
<td>10.2</td>
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<tr>
<td>Other means</td>
<td>5.7</td>
</tr>
<tr>
<td>Owner</td>
<td>6.7</td>
</tr>
<tr>
<td>Renter</td>
<td>8.7</td>
</tr>
<tr>
<td>Worked at home:</td>
<td>4.3</td>
</tr>
<tr>
<td>Owner</td>
<td>5.2</td>
</tr>
<tr>
<td>Renter</td>
<td>1.0</td>
</tr>
</tbody>
</table>

CV classed as high, medium, and low reliability after Lynn Wombold, ESRI, 2014
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 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 \textit{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.
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.
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

Questions, Suggestions?

Download application at:

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