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Ohio COI aggregation at Zip Code level

Creating an area-level deprivation index and using a dashboard tool to communicate information about the index – a public health informatics workshop

W13

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Disclosure

I have no relevant relationships with commercial interests to disclose.

Learning Objectives

After participating in this session the learner should be better able to:

- Understand the relationship between census geographies and other areal units
- Transform data between geographic units that do not share common boundaries
- Recognize certain limitations when transforming data

Introduction: OCOI

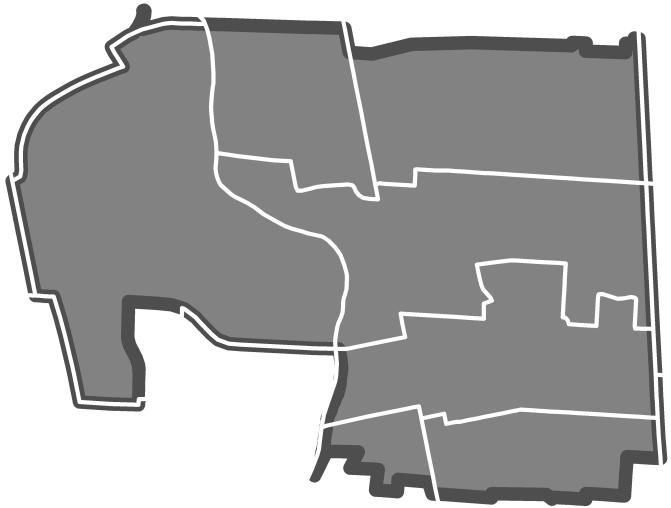
- The OCOI is an area-level measure indicating the opportunity for development and well-being in children based on neighborhood factors that include conditions based on social determinants of health (SDoH).
- A variety of individual measures were to reflect the different facets of SDoH and these are then combined into an overall score for a specific area.
- SDoH information was collected across various sources and aggregated to census tracts
- Census tracts are commonly used in this method of analysis for a variety of reasons

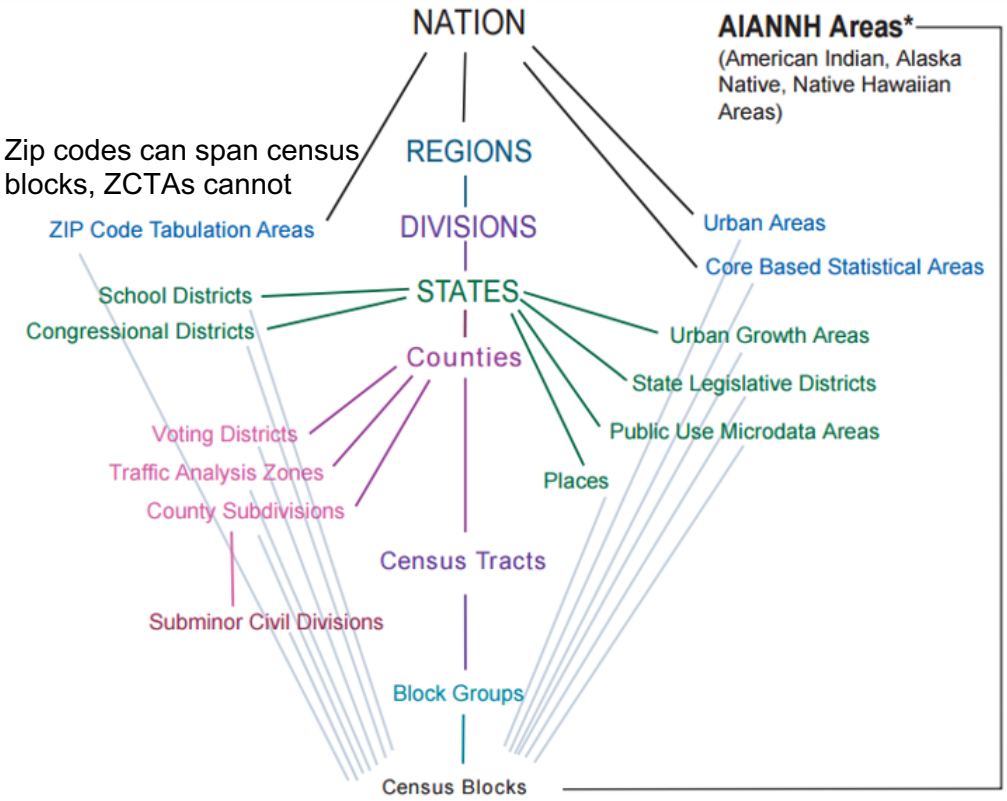
Census Tracts vs Zip Codes

- Census tracts are geographic subdivisions that are intended to “provide a stable set of geographic units for the presentation of statistical data”. (Full Definition)
- Zip Codes are a collection of addresses used by the United State Postal Service (USPS) to group addresses together to aid in mail delivery.
- Zip Code Tabulation Areas (ZCTA) are geographic representations of zip codes (Full Definition)
- When we talk about zip codes, actually talking about ZCTAs

Why Zip Codes?

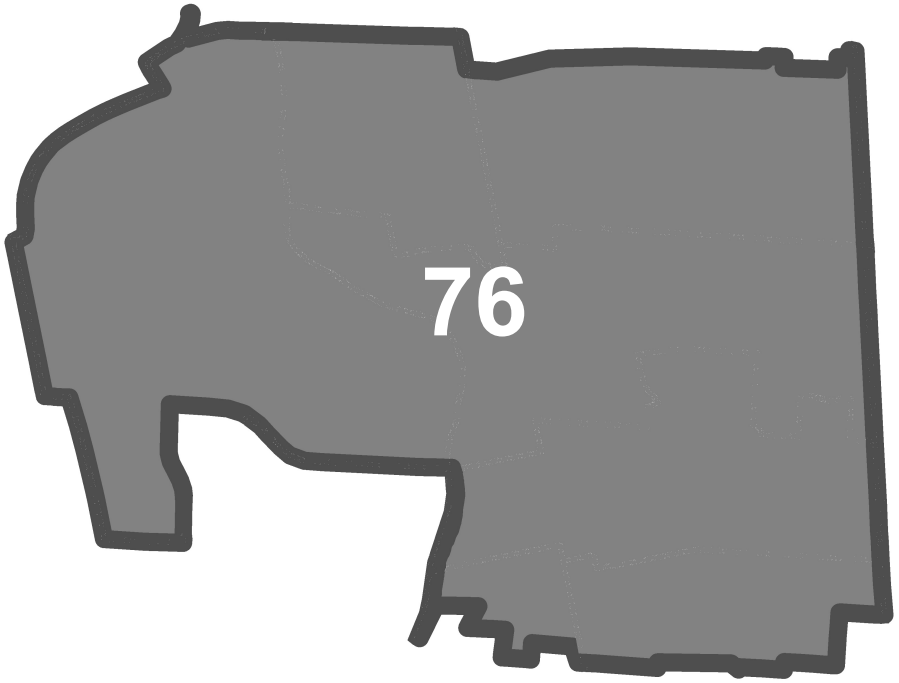
- What zip code do you live in?
- How about census tract?





Census Tracts to Zip Codes

- How to create OCOI scores at the ZCTA level?
- Geographic areal unit value transformation
  - Assigning values from one overlapping geographic unit to another
- Recreate the index from scratch
  - Use ZCTA as areal units instead of census tracts



How?

Software:

- ArcMap
  - QGIS, Python, etc

Data:

- Ohio census blocks with population
- Ohio census tracts with OCOI scores
- Ohio zip code tabulation areas

Methods:

- Geographic centroid assignment
- Population-weighted centroid assignment
- Areal weighting
- Population weighting

Method 1

Geographic centroid assignment

Overview: Each census tract centroid (CTC) is assigned to a zip code tabulation area (ZCTA) based on where they are located and the Opportunity Index (OI) scores are averaged for each ZCTA.

1. Create CTC dataset with associated OI scores from census tract polygons
2. Spatially join CTC to ZCTA
3. Average OI scores of CTC when spatially joined

Method 2

Population-weighted centroid assignment

Overview: Each population-weighted census tract centroid (pCTC) is assigned to a ZCTA based on where they are located and the OI scores are averaged for each ZCTA.

1. Create pCTC dataset with associated OI scores from census block centroids with population data
2. Spatially join CTC to ZCTA
3. Average OI scores of CTC when spatially joined

Method 3

Areal weighting

Overview: The percentage of area covered by the overlap between census tracts and ZCTAs is used as the weight to calculate the weighted average OI score for the ZCTA.

1. Calculate the area of overlap between the census tract and the ZCTA
2. Divide area of overlap of each tract by the total area of each census tract
    1. This percentage is the Areal Weight
3. Calculate weighted average of OI scores for each ZCTA
    1. Sum (OI score*areal weight)/sum areal weights = weighted average

Method 4

Population weighting

Overview: The percentage of population covered by the overlap between census tracts and ZCTAs is used as the weight to calculate the weighted average OI score for the ZCTA.

1. Calculate the population in the area of overlap between the census tract and the ZCTA
2. Divide the covered population of each tract by the total population of each tract
    1. This percentage is the Population Weight
3. Calculate weighted average of OI scores for each ZCTA
    1. Sum (OI score*pop weight)/sum pop weights = weighted average

Limitations?

- ZCTAs aren’t perfect zip code representations
- Introduction of error during the transforming
- Unknown population distribution
- Small numbers issues

Solutions?

- Go back to the source – recreate the index
- Geocoding

Thank you!

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