

Name: Residential Segregation

Short Description: The Index of Concentration at the Extremes (ICE) is measure of economic and racial/ethnic spatial polarization and proxy for residential segregation, defined as the difference between the percentage of the total population that is high-income and majority versus low-income and minority.

Data Source(s):

- **Name:** United States Census Bureau, American Community Survey (ACS)
- **Link to Source:** <https://www.census.gov/programs-surveys/acs/data.html>

Year(s): 2015-2019

Source Geographic Level: Zip Code Tabulation Area (ZCTA)

Stratification: Black populations

Selection Rationale: Residential segregation is a marker of structural racism. In the United States there is a persistent racial wealth gap¹ and widening income inequality.² Poverty and socioeconomic disparities have a significant impact on mental health. This residential segregation measure is calculated using the ICE, a method for quantifying the spatial distribution of socioeconomic polarization that captures both income and race disparities that exist within a population. Exploring the interplay of this relationship is essential to understanding the effect of structural racism on population mental health.

Strengths and Limitations:

- **Strengths:**
 - *[Equity]* The ICE methodology can effectively measure spatial social polarization at the neighborhood level, capturing insights into social and economic relationships that influence health inequities in a single measure. Traditional tools for measuring income inequality (like the Gini coefficient) or residential segregation (like the Index of Dissimilarity) are not designed to capture the

¹ Bhutta, N., Chang, A. C., Dettling, L. J., & Hsu, J. W. (2020, September 28). *Disparities in Wealth by Race and Ethnicity in the 2019 Survey of Consumer Finances*. Board of Governors of the Federal Reserve System. <https://www.federalreserve.gov/econres/notes/feds-notes/disparities-in-wealth-by-race-and-ethnicity-in-the-2019-survey-of-consumer-finances-20200928.htm>

² Horowitz, J., Igielnik, R., & Kochhar, R. (2020, January 9). *Trends in U.S. income and wealth inequality*. Pew Research Center. <https://www.pewresearch.org/social-trends/2020/01/09/trends-in-income-and-wealth-inequality/>

interaction between income and race,³ nor are they suitable for evaluating geographic variations for small areas, like ZCTAs.

- [Importance] The detrimental effect of income inequality on health is well-documented in the literature, both for overall health outcomes⁴ and mental health in particular.⁵ This relationship may be exacerbated by social inequity embedded within the structures of society through structural racism. For these reasons, it is important to measure the interaction between income and spatial social polarization to best understand its impact on the mental health of a community.
- [Relevance and Usability] The ICE has proven to be effective in measuring health disparities in outcomes like hypertension,⁶ pre-term birth, and various mortality measures.⁷
- [Scientific Soundness] ACS data provide valid and reliable estimates of household income data. The ICE score can be easily calculated from these data, and ICE has been validated as an effective public health monitoring tool.⁸
- [Feasibility] The ACS is an ongoing survey that provides data in the year immediately following the year in which they are collected. It produces reliable income data that can be used to calculate an ICE score.

- **Limitations:**

- [Scientific Soundness] The reliability of an ICE score for a particular area depends on the accuracy of income data in that area. It is likely that areas with the most disenfranchised populations will also be those without highly reliable income data.

³ Krieger, N., Waterman, P. D., Spasojevic, J., Li, W., Maduro, G., & Van Wye, G. (2016). Public health monitoring of privilege and deprivation with the Index of Concentration at the Extremes. *American Journal of Public Health*, 106(2), 256–263. <https://doi.org/10.2105/ajph.2015.302955>

⁴ Pickett, K. E., & Wilkinson, R. G. (2015). Income inequality and health: A causal review. *Social Science & Medicine*, 128, 316–326. <https://doi.org/10.1016/j.socscimed.2014.12.031>

⁵ Patel, V., Burns, J. K., Dhingra, M., Tarver, L., Kohrt, B. A., & Lund, C. (2018). Income inequality and depression: a systematic review and meta-analysis of the association and a scoping review of mechanisms. *World Psychiatry*, 17(1), 76–89. <https://doi.org/10.1002/wps.20492>

⁶ Feldman, J. M., Waterman, P. D., Coull, B. A., & Krieger, N. (2015). Spatial social polarisation: using the Index of Concentration at the Extremes jointly for income and race/ethnicity to analyse risk of hypertension. *Journal of Epidemiology and Community Health*, 69(12), 1199–1207. <https://doi.org/10.1136/jech-2015-205728>

⁷ Chambers, B. D., Baer, R. J., McLemore, M. R., & Jelliffe-Pawlowski, L. L. (2018). Using Index of Concentration at the Extremes as indicators of structural racism to evaluate the association with preterm birth and infant mortality—California, 2011–2012. *Journal of Urban Health*, 96(2), 159–170. <https://doi.org/10.1007/s11524-018-0272-4>

⁸ Krieger, N., Kim, R., Feldman, J., & Waterman, P. D. (2018). Using the Index of Concentration at the Extremes at multiple geographical levels to monitor health inequities in an era of growing spatial social polarization: Massachusetts, USA (2010–14). *International Journal of Epidemiology*, 47(3), 788–819. <https://doi.org/10.1093/ije/dyy004>

- [Scientific Soundness] The income data used to calculate this measure are self-reported and depend on the accuracy of the person surveyed.

Calculation:

The ICE output is a number that “ranges from –1 to 1, whereby –1 and 1 respectively connote that 100% of the population is concentrated into the most extreme groups for deprivation and for privilege,” according to both racial makeup and income. A score closer to zero indicates that the population has a more evenly distributed makeup of “privileged” and “deprived” groups.⁹

$$\text{Index of Concentration at the Extremes} = \frac{H - L}{T}$$

- H = number of high-income, majority individuals
- L = number of low-income, minority individuals
- T = total population (including all races and ethnicities)

Overall Population:

- H = non-Hispanic White persons making at or above the 80th percentile (\$125K) in household income in the past 12 months
- L = non-White persons (total population minus White population) making below the 20th percentile (\$25K) of household income in the past 12 months
- T = total population in the ZCTA (including all races and ethnicities)

ACS tables and variables used:

- Table B19001: Household Income in the Past 12 Months (in 2019 inflation-adjusted dollars)
 - B19001_001: Estimate Total
 - B19001_002: Estimate Total: Less than \$10,000
 - B19001_003: Estimate Total: \$10,000 to \$14,999
 - B19001_004: Estimate Total: \$15,000 to \$19,999
 - B19001_005: Estimate Total: \$20,000 to \$24,999
- Table B19001H: Household Income in the Past 12 Months (in 2019 inflation-adjusted dollars) (White alone, not Hispanic or Latino Householder)
 - B19001H_002: Estimate Total: Less than \$10,000
 - B19001H_003: Estimate Total: \$10,000 to \$14,999
 - B19001H_004: Estimate Total: \$15,000 to \$19,999
 - B19001H_005: Estimate Total: \$20,000 to \$24,999
 - B19001H_015: Estimate Total: \$125,000 to \$249,999
 - B19001H_016: Estimate Total: \$150,000 to \$199,999
 - B19001H_017: Estimate Total: \$200,000 or more

⁹ Ibid

Black Populations:

- *H* = non-Hispanic White persons making at or above the 80th percentile (\$125K) in household income in the past 12 months
- *L* = non-Hispanic Black or African American persons making below the 20th percentile (\$25K) of household income in the past 12 month
- *T* = total population in the ZCTA (including all races and ethnicities)

ACS tables and variables used:

- Table B19001: Household Income in the Past 12 Months (in 2019 inflation-adjusted dollars)
 - B19001_001: Estimate Total
- Table B19001H: Household Income in the Past 12 Months (in 2019 inflation-adjusted dollars) (White alone, not Hispanic or Latino Householder)
 - B19001H_015: Estimate Total: \$125,000 to \$249,999
 - B19001H_016: Estimate Total: \$150,000 to \$199,999
 - B19001H_017: Estimate Total: \$200,000 or more
- Table B19001B: Household Income in the Past 12 Months (in 2019 inflation-adjusted dollars) (Black or African American Alone Householder)
 - B19001B_002: Estimate Total: Less than \$10,000
 - B19001B_003: Estimate Total: \$10,000 to \$14,999
 - B19001B_004: Estimate Total: \$15,000 to \$19,999
 - B19001B_005: Estimate Total: \$20,000 to \$24,999