Lab: Urban Models of Segregation by Race and Class

American cities have historically been highly segregated by race, ethnicity, and class. While researchers in the Chicago School of Urban Ecology were theorizing models of urban structure in the 1930s and 1940s, the redlining policy of the Home Owners' Loan Corporation was simultaneously imposing a spatial structure of residential segregation.

Let's re-examine Chicago as of 2020, asking:

- Does the city still have the same residential spatial structure?
- Do any 20th century models still apply in 2020, and if so, how?
- How have processes of redlining and gentrification reinforced and/or changed urban structure?

PURPOSE

- Develop spatial thinking skills with concepts of direction and distance on maps and graphs.
- Practice visualizing and interpreting quantitative data in thematic maps and graphs.

OUTCOMES

❑ Map of majority racial or ethnic groups in 2020

❑ Map of median gross rent (rent including utilities) in 2020 by census tract

❑ Map of HOLC redlining indicator by 2020 census tracts boundaries
(best visualized with classes from 1 to 1.5, 1.5 to 2.5, 2.5 to 3.5, and 3.5 to 4)

❑ Graph of distance (kilometers) from the central business district and median gross rent as a scatterplot

❑ Graph of direction (degrees) from the central business district and median gross rent as a polar plot

REFERENCES

Nelson, R. K., Winling, L, et al. (2023). *Mapping Inequality: Redlining in New Deal America.* Digital Scholarship Lab. https://dsl.richmond.edu/panorama/redlining.

Meier, Helen, and Bruce Mitchell. (2022) "Tracing the Legacy of Redlining: A New Method for Tracking the Origins of Housing Segregation." Washington, D.C.: National Community Reinvestment Coalition. https://ncrc.org/redlining-score/.

DATA

The following two data sources should be acquired using R:

`tracts_dp.gpkg`

- **Title**: 2020 Census Tracts with Race and Ethnicity
- **Responsible Party**: U.S. Census
- **Description**: Census tract geographic data for Cook County Illinois with racial and ethnic data from the U.S. Census.
- **Spatial Coverage**: Cook County, Illinois
- **Coordinate Reference System**: `EPSG:4269` NAD 1983 geographic coordinate system
- **Spatial Resolution**: Census tracts
- **Spatial Representation Type**: vector polygons
- **Temporal Coverage**: 2020 census
- **Lineage**: Downloaded from the U.S. Census API using `tidycensus` in R
- **Distribution**: U.S. Census API
- **Constraints**: Public Domain data free for use and redistribution.

- **Variables**:
  1. `GEOID`: code to uniquely identify tracts
     - Definition: code to uniquely identify tracts in 2020 census with state-county-tract codes
     - Type: text string
     - Domain: nominal unique codes
  2. `TRACTCE`: code to uniquely identify tracts
     - Definition: code to identify tracts within counties in 2020 census with 6-digit tract code
     - Type: text string
     - Domain: nominal unique codes
  3. `DP1_0095C`:
     - Definition: Hispanic or Latino by Race: Total Population
     - Type: decimal representing total count
  4. `DP1_0096C`:
     - Definition: Hispanic or Latino by Race Total Population Hispanic or Latino
     - Type: decimal representing total count
  5. `DP1_0105C`:
     - Definition: Hispanic or Latino by Race Total Population Not Hispanic or Latino White alone
     - Type: decimal representing total count
  6. `DP1_0106C`:
     - Definition: Hispanic or Latino by Race: Total Population Not Hispanic or Latino Black or African American alone
     - Type: decimal representing total count
  7. `DP1_0108C`:
     - Definition: Hispanic or Latino by Race: Total Population Not Hispanic or Latino Asian alone
     - Type: decimal representing total count

`tracts_acs.csv`

- **Title**: 2020 Rent Data by Census Tract
- **Responsible Party**: U.S. Census
- **Description**: Census tract data table (without geographic data) for Cook County Illinois with median rent data from the American Community Survey
- **Spatial Coverage**: Cook County, Illinois
- **Spatial Resolution**: Census tracts
- **Spatial Representation Type**: none
- **Temporal Coverage**: 2016-2020 5-year estimate
- **Lineage**: Downloaded from the U.S. Census API using `tidycensus` in R
- **Distribution**: U.S. Census API
- **Constraints**: Public Domain data free for use and redistribution.
- **Variables**:
  1. `GEOID`: code to uniquely identify tracts
  2. `B25064_001E`:
     - Definition: Median gross rent (dollars per month, including utilities)
     - Type: decimal representing total dollars
     - Domain: Missing data should be represented with an empty text string so as to be recognized as NULL in QGIS.

`redlining_indicator.csv`
- **Title**: Historic Redlining Indicator for 2020 US Census Tracts: Spreadsheet
- **Responsible Party**: Helen C.S. Meier and Bruce C. Mitchell
- **Description**: Spreadsheet of 2020 Census tracts with a redlining score assigned to each tract.
- **Spatial Coverage**: United States metropolitan areas
- **Coordinate Reference System**: `EPSG:4269` NAD 1983 geographic coordinate system
- **Spatial Resolution**: Census tracts
- **Spatial Representation Type**: none
- **Temporal Coverage**: Attribute data is derived from 1935-1940 and remapped to 2020 boundaries.
- **Lineage**: Meier and Mitchell (2023) report: "The Home Owners' Loan Corporation (HOLC) was a U.S. federal agency that graded mortgage investment risk of neighborhoods across the U.S. between 1935 and 1940. HOLC residential security maps standardized neighborhood risk appraisal methods that included race and ethnicity, pioneering the institutional logic of residential "redlining." The Mapping Inequality Project digitized the HOLC mortgage security risk maps from the 1930s. We overlaid the HOLC maps with 2010 and 2020 census tracts for 142 cities across the U.S. using ArcGIS and determined the proportion of HOLC residential security grades contained within the boundaries. We assigned a numerical value to each HOLC risk category as follows: 1 for "A" grade, 2 for "B" grade, 3 for "C" grade, and 4 for "D" grade. We calculated a historic redlining score from the summed proportion of HOLC residential security grades multiplied by a weighting factor based on area within each census tract. A higher score means greater redlining of the census tract."
Data was downloaded by professor Holler from OpenICPSR and saved in CSV format.
- **Distribution**: Available for download via OpenICPSR at https://doi.org/10.3886/E141121V3 https://www.openicpsr.org/openicpsr/project/141121/version/V3/view .
Download requires a free account and acceptance of the terms of use.
- **Constraints**: Licensed under the Creative Commons Attribution-NonCommercial 4.0 International License. The data should be cited as follows:
Meier, Helen C.S., and Mitchell, Bruce C. . Historic Redlining Indicator for 2000, 2010, and 2020 US Census Tracts. Ann Arbor, MI: Inter-university Consortium for Political and Social Research [distributor], 2023-09-25. https://doi.org/10.3886/E141121V3
- **Variables**:
  1. `GEOID20`
     - Definition: code to uniquely identify tracts in 2020 census
     - Type: text string
     - Domain: nominal unique codes
  2. `CBSA10`: text string with metropolitan combined statistical area (CSA) code
     - Definition: code to uniquely identify CSAs in 2020 census
     - Type: text string
     - Domain: nominal primary key codes
  3. `METRO_NAME`:
     - Definition: name of metropolitan statistical area
     - Type: text string
     - Domain: nominal label/name
  4. `HRI2020`:
     - Definition: HOLC Redlining Indicator
     - Type: decimal
     - Domain: Scores range from `1` (Desirable) to `4` (Hazardous). Fractions indicate that a portion of the census tract was covered by a HOLC zone. Zones with no redlining data are not included in the table.

METHODS

☐ Before you begin analysis on the computer, draw a workflow to solve the lab, using the additional methodological guidance below.

☐ Using R, acquire the necessary Census data for Cook County, Illinois in the year 2020. We use Cook County because the City of Chicago fills nearly the entire county.

☐ The `EPSG:6454` NAD83(2011) Illinois East projection is suitable for this analysis.

☐ Filter the data to focus only on tracts with 20 people or greater and valid (non-zero) data on rent.

☐ Find the direction (in decimal degrees) and distance (in kilometers) from the CBD to each census tract. The CBD can be defined as the centroid of the census tract with `TRACTCE` code `839100.`

☐ Classify each census tract by its majority race/ethnic group:
- 50% or more Hispanic/Latino
- 50% or more non-Hispanic White (reporting one race only)
- 50% or more non-Hispanic Black (reporting one race only)
- 50% or more non-Hispanic Asian (reporting one race only)
- Other / Mixed (no clear majority)

☐ Summarize tracts into one feature for each majority classification, including averages of their median rent and their redlining scores, and a single feature

Shortcut: CASE Statements

There is a shortcut to using a series of SELECT BY EXPRESSION and FIELD CALCULATOR to classify data in a new field. A FIELD CALCULATOR **CASE** statement does the trick, e.g. in 1940 the only race categories were "white" and "black", and therefore the tracts could have been classified with one expression:

```
CASE
WHEN "pctWhite" >= 50 THEN 'White'
WHEN "pctBlack" >= 50 THEN 'Black'
ELSE 'Mixed'
END
```

`CASE` expressions solve each `WHEN` expression sequentially. As soon as the first `WHEN` expression is `TRUE` for a given feature, the calculation ends with the `THEN` value. If *none* of the `WHEN` expressions were `TRUE` for a given feature, it is assigned the `ELSE` value.

Am I done?

- Means for all 1291 tracts with sufficient data:
  - Median Gross Rent: 1242.45
  - Percent Latinx: 25.43
  - Percent Non-Latinx White: 36.91
  - Percent Non-Latinx Black: 27.60
  - Percent Non-Latinx Asian: 6.92
  - Distance (km): 17.67
  - Direction (degrees): 253.21
- After categorizing tracts by majority group, you should have the following feature counts, average median rent, and average redlining index for each majority group:
  - Latinx: 237 features; $1020.69;   3.23 redlining index
  - Non-Latinx White: 515 features; $1503.88 rent;   3.02 redlining index
  - Non-Latinx Black: 339 features; $1012.04 rent;   3.37 redlining index
  - Non-Latinx Asian: 6 features; $914.50 rent;   4.00 redlining index
  - Mixed / Other: 194 features; $1232.14 rent;   3.21 redlining index

SECOND VISUAL ESSAY

- You may check in with instructors about how you are building the argument for your visual essay
- You may talk with others, including instructors, about *technical software operation issues* using software to create maps and graphs.
- You may ask instructors or people outside of the class to view your map and share their impression of your visual hierarchy. Ask them, e.g.:
  - Can you please look at my map and list what you see, from what you notice first to what you notice last?
  - Do you find anything about my map layout distracting?
  - Can you tell what the main purpose of the map is? If so, what is it?

Rubric

- ☐ 5pts: **cover page** with title, author, date and photograph with basic caption (title, credit and date)
- ☐ 30pts: **maps** with appropriate design elements (legend, north arrow, and scale bar), the CBD point for reference, and three thematic layers:
  - Racial/ethnic patterns in 2020
  - Rent in 2020
  - Redlining
- ☐ 20pts: **graphs** illustrating the relationships between rent, race, and
  - Distance from the CBD
  - Direction from the CBD
- ☐ 15pts: map and graph **visual design** and **hierarchy**
- ☐ 15pts: **captions** for each figure/chart/table, with **no more than 75 words per figure.** These should *interpret* data in the context of *concepts* and *theories/models*.
- ☐ 5pts: **data sources** section at the end of the essay should credit all of your data sources and where they appear in the visual essay, e.g. in which figures and in which layers of which figures. Include any formal citations or statements required by the data provider(s) and pertinent information about when the data was created.
- ☐ 10pts: **overall excellence** in the presentation, coherence, and aesthetics of the visual essay

Guidance

- Design for an audience: the college community of administrators, staff, professors, and fellow students.
- Use *either* landscape *or* portrait layouts
- Titles should be more like thesis statements or story headlines than topics.
- Every figure (photo, map, graph, or table) needs a title. For maps, the title may be on the map itself.
- **Individual maps/graphs do not need titles (now in the caption) or "credit" information (now in the data sources section)**
- Begin captions with a sequentially numbered label, e.g.
  - Map 1: caption …
  - Figure 2: Title. Caption content.
  - Table 4: Title. Caption content.
- Arrange captions adjacent to figures
- Do not write about design decisions in captions. All of the content should be interpretive. Browse a good textbook for inspiration: the books' captions reinforce the main concepts/theories *and* demonstrate how they apply in the data visualization.
- **Specific theories include Burgess's concentric zone theory, Hoyt's sector theory, and Smith's more recent theory of the gentrification rent gap.**