HUMANE HOUSING INDEX

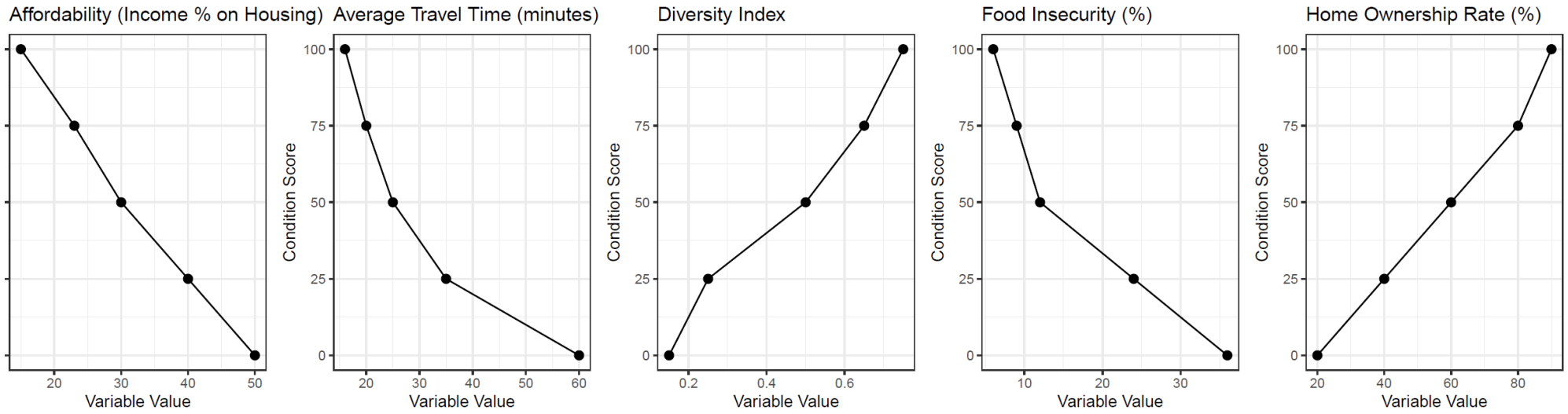
- Created from the current dataset from fvdex.org
- 6 Variables were used to calculate the index based on these topic data points:
  1. Affordability (Income % on Housing)= MHC: Median Monthly Housing Cost / INC: Median Household income (monthly)
  2. Home Ownership Rate (%)= HUO: Owner Occupied (proportion of people owning the housing they are currently occupying)
  3. Average Travel Time (minutes) = TRV: Mean Travel Time to Work
  4. Diversity Index = REX: Race-Ethnicity Diversity Index
  5. Food Insecurity (%) = FAI: (proportion of people who don't have consistent access to food)
- This is done at a "total" level (no demographic breakdowns) for each geographic layer and year.
  - Comprehensiveness
  - Some variables lacked necessary granularity to calculate with slicers

LINEAR INTERPOLATION MODEL

- An interpolation curve of thresholds of quality for each variable was constructed.

Table 1: Scoring Thresholds for Each Variable

variable_name	terrible	bad	average	good	ideal
Affordability (Income % on Housing)	50.00	40.00	30.0	23.00	15.00
Home Ownership Rate (%)	20.00	40.00	60.0	80.00	90.00
Average Travel Time (minutes)	60.00	35.00	25.0	20.00	16.00
Diversity Index	0.15	0.25	0.5	0.65	0.75
Food Insecurity (%)	36.00	24.00	12.0	9.00	6.00



INTERPOLATION SCORING EXAMPLE

- The actual value for a geography/year is then scored according to the interpolation curve using some algebra. Sample calculation for 54911's affordability score:

Our affordability index (`icPct`) for this zipcode is 19.183, which falls between the Ideal and Good quantiles, corresponding to the points $(15, 100)$ and $(23, 75)$. We can then use some algebra to calculate the affordability score for 54911:

The slope of the line connecting these two boundary points are:

$$m_{AC} = \frac{75 - 100}{23 - 15} = \frac{-25}{8}$$

We can then easily use point-slope form

$$y - y_1 = m(x - x_1)$$

to get the equation of the line

$$y - 75 = \frac{-25}{8}(x - 23)$$

Plugging in our `icPct` value of 19.183 yields an affordability score of

$$\begin{aligned} y - 75 &= \frac{-25}{8}(19.183 - 23) \\ y - 75 &= \frac{-25}{8}(-3.817) \\ y - 75 &= (-3.125)(-3.817) \\ y - 75 &\approx 11.928 \\ y &\approx 11.928 + 75 \\ y &\approx 86.928 \end{aligned}$$

HUMANE HOUSING INDEX CALCULATION

- Apply a weight to each of the 5 Variable Scores (some areas more important than others). Housing Index =

  (2 * Affordability Score) + (Home Ownership Score) + (.5 * Average Travel Time Score) + (.5 * Diversity Index Score) + (.5 * Food Insecurity Score) / 4.5 (total of variable weights)

- Caveats and data imputation:
  - When data is not available for a geography/year, the previous available value is used.

    Example: food insecurity data was last available in 2022. That is then used to calculate the index for the following years (2023, 2024).
  - If a variable is missing for a geography entirely, the Housing Index calculation drops that score and adjusts the total weight of multipliers to what is available.

    Example: if Food Insecurity data is not available, the formula is

    (2 * Affordability Score) + (Home Ownership Score) + (.5 * Average Travel Time Score) + (.5 * Diversity Index Score) / 4

- Future directions:
  - More robustness checks and automation (Census Data → Automatically calculated Human Housing Score)